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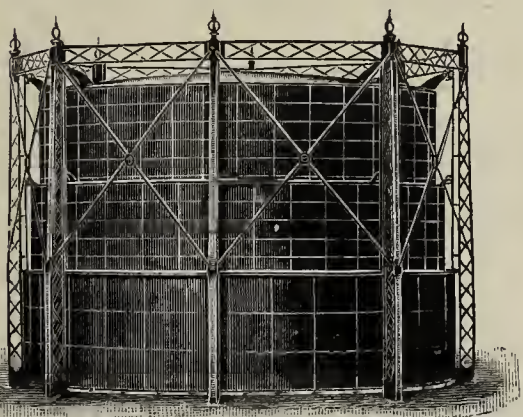
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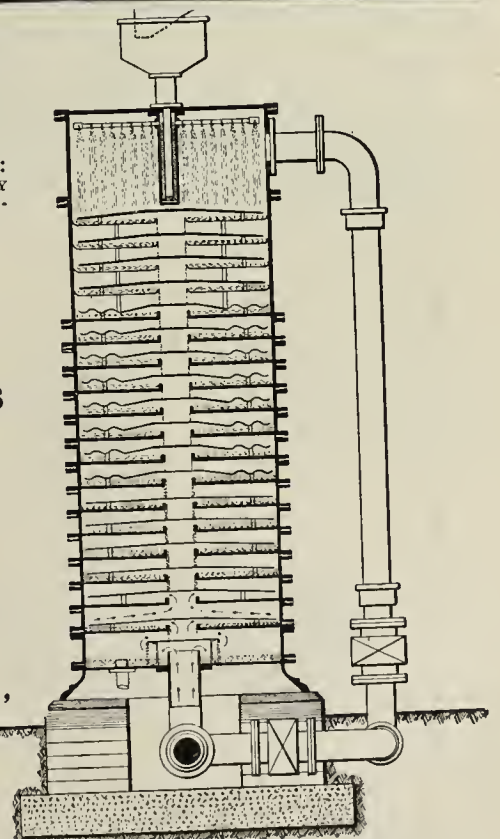
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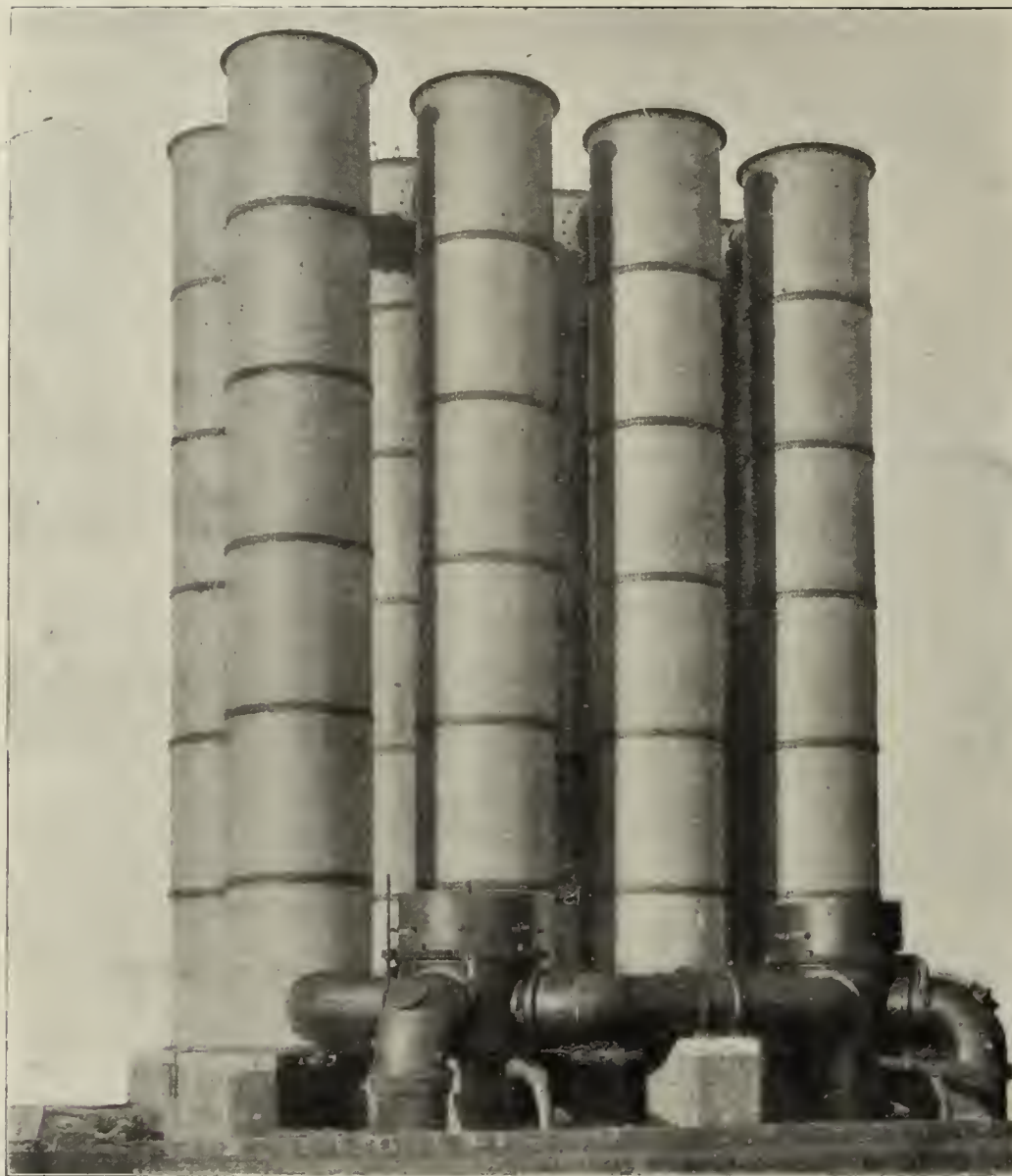
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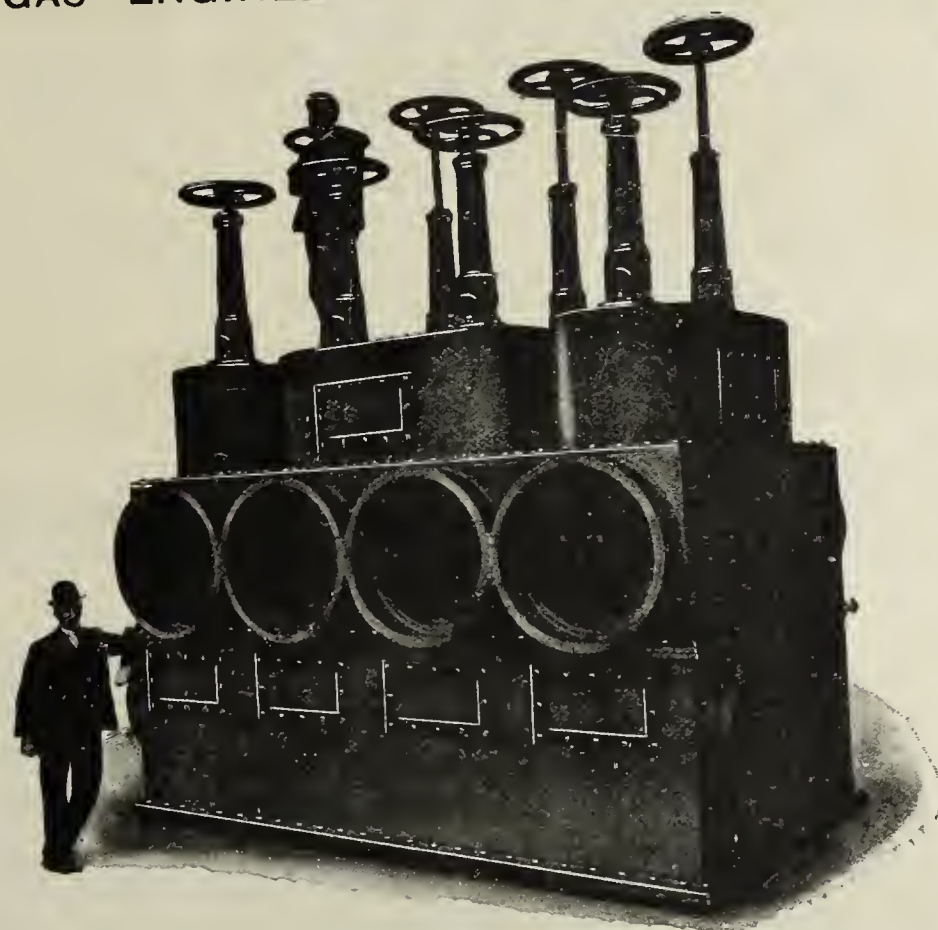
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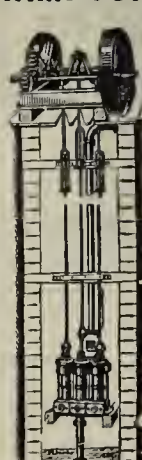
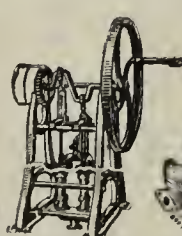
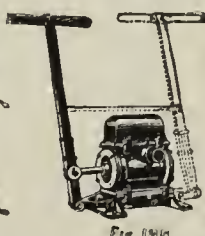
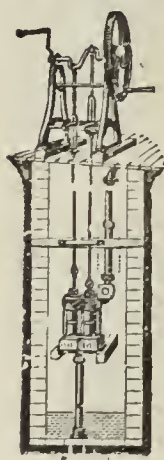
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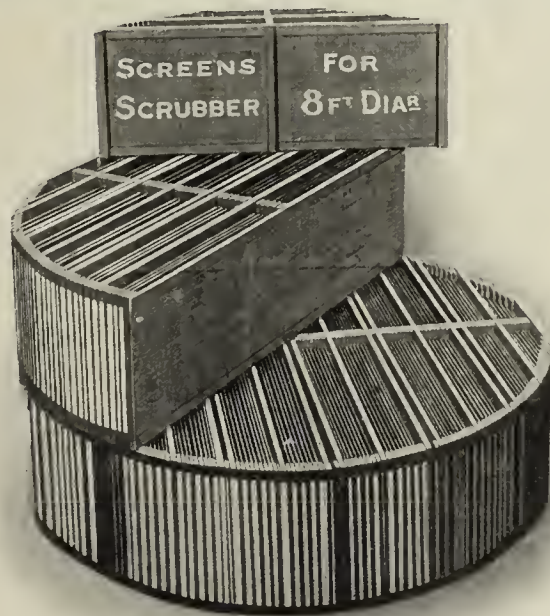
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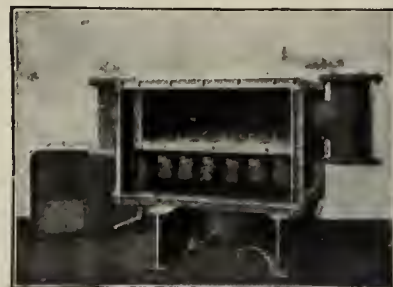
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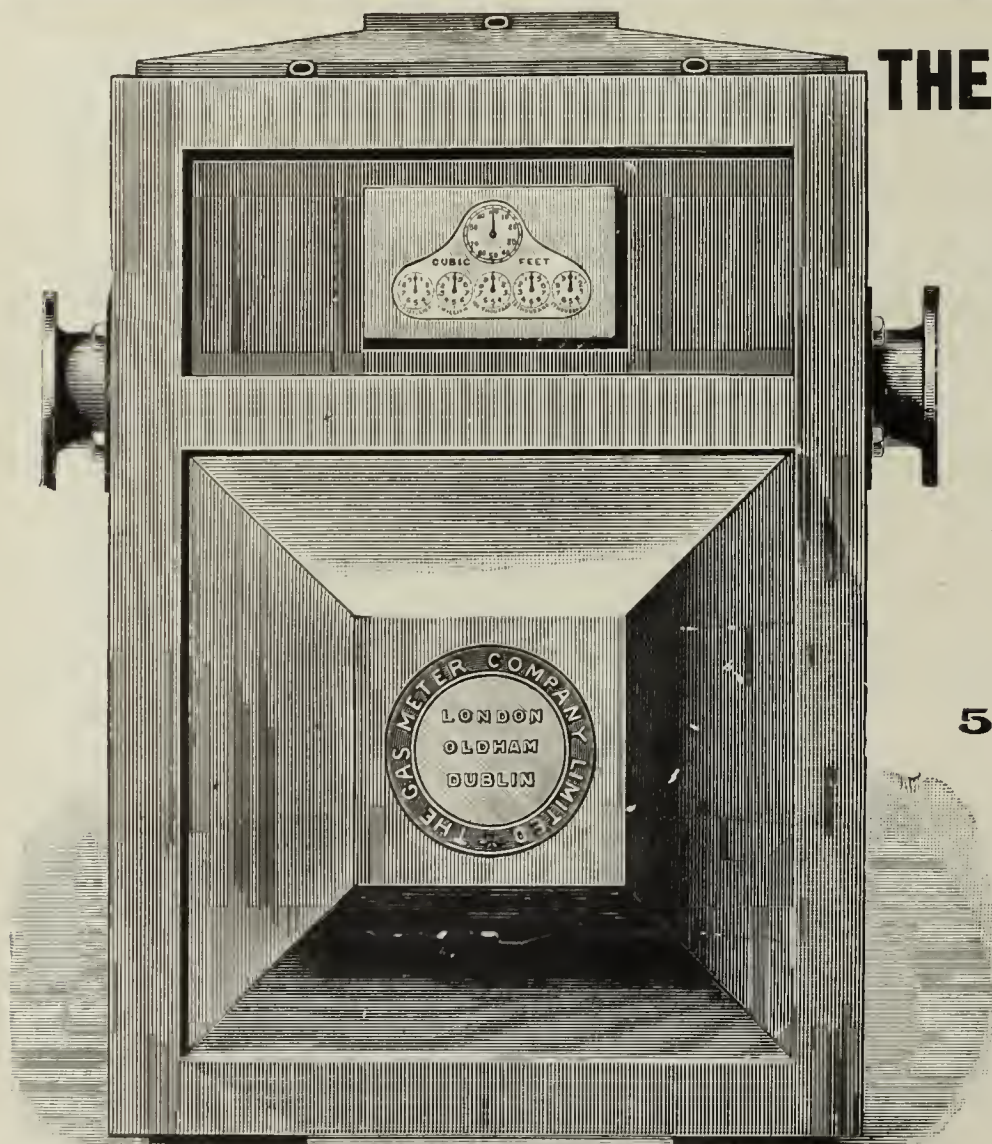
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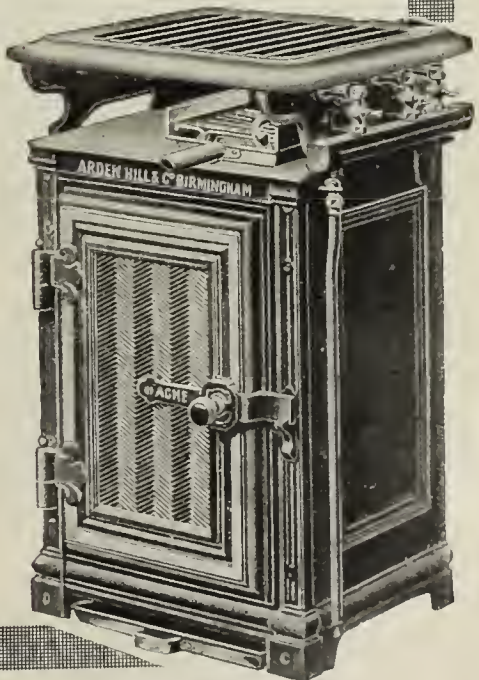
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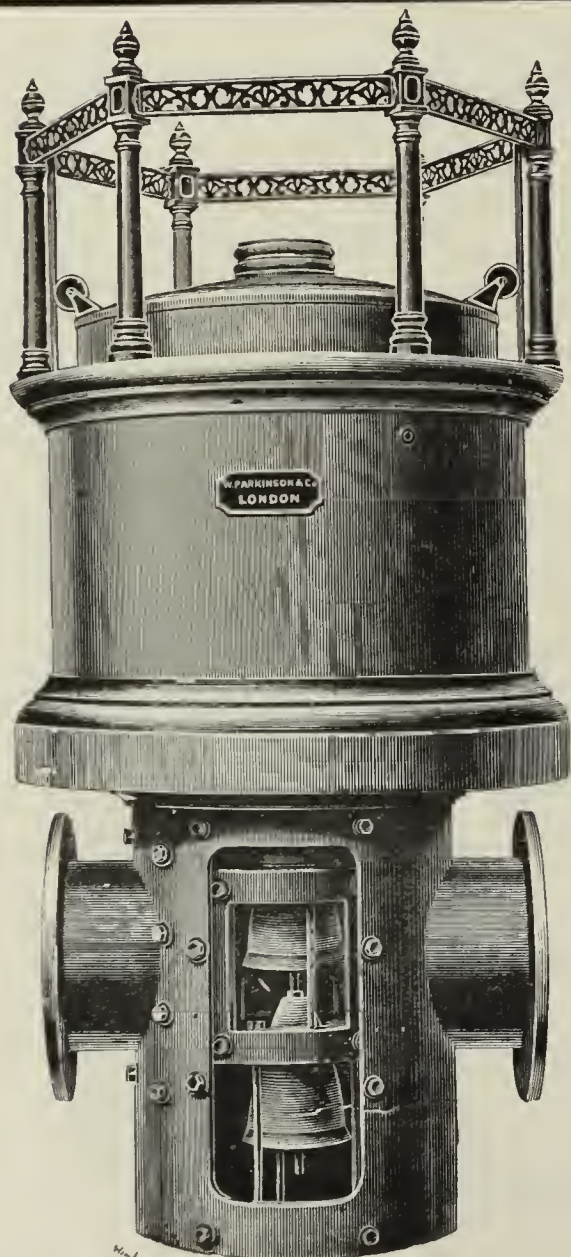
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VOL. CXV., No. 2512.—TUESDAY, JULY 4, 1911.

EDITORIAL NOTES—GAS, &c.

Education and Training of Engineers.

THERE was a veritable rhetorical torrent at the conference at the Institution of Civil Engineers last Wednesday and Thursday upon the subject of the education and training of engineers. It is a topic, well worn though it be, of never-ceasing interest. On this occasion, it attracted men from all parts of the country—professors from our Universities and other centres of learning and of education, and leaders in the engineering world; and the debates were well-sustained on the numerous short papers that paved the way for discussion. Whether any good will issue from it all, it is difficult to say at present; but a conference like this is bound to exert influence of some kind. Having, however, read the papers presented and heard some of the speeches—what has been read and what was heard we acknowledge as the limitations of the application of this expression of opinion—it must be said that there was little that could be characterized as new, but there was much that showed the great diversity of opinion that reigns even among men whose experience is of the order that entitles their views to respect, if not always to acceptance. The subject is such a trite one that it is not to be wondered at that all that was new was merely the mode of expressing the old ideas. We have therefore some little misgiving as to anything tangible really emerging from the conference, other than an amount of indirect influence, through the rooting in fresh places of thoughts and ideas, that perhaps, differently expressed, have not previously impressed themselves on the same minds.

Naturally, it is the desire of all that the best methods should be applied to the education and training of men for the engineering profession; but, as we have said before, and say again, with the view endorsed by men of high standing—academically, and in the engineering profession—it is impossible to design any course of education and training that will fit all men and all circumstances. We do not want the science and art of engineering to become a stereotyped something through the shaping of the future practitioners in one mould fashioned by a body of men, no matter how eminent they may be. Standardization of material has proceeded apace; but the standardization of the men of engineering is the last thing that should be sought. The science and art of engineering would suffer enormously were such a thing to happen—suffer immeasurably more than it is doing now through the diverse methods that are adopted in the education and training of its men. Engineering wants the best men; and the best men are those of mental capacity and discipline and active thought. Such men have their foundations laid by a liberal general education; and ultimately they are the men who are, as a rule, capable of taking a broad outlook. There was general agreement in this matter. There was also agreement—generally, but not entirely—that the best engineer is the man who is educated in the theory and principles of his profession as well as in the practical work. These dual courses of training are as essential for the man as for his work, as there is not the slightest question about it that, in the competition of the times, the men of the broadest qualifications will squeeze out men of narrower qualifications, and leave them groping about for employment at the foot of the professional ladder. Development is the natural order of things; and engineering progress demands development in the workers' qualifications. We see it all around; and it is a process that must continue.

But there being, generally speaking, quite a consensus of opinion as to the correctness of the combination of education in theory and principles and of practical training, we had at this conference the learned masters coming into conflict as of old, and as they ever will do. But if their constant con-

flict does something to amend the deficiencies of the educational centres devoted to engineering, so much the better. Those deficiencies are acknowledged. There was a distinct majority view among the readers of the papers and among speakers in the discussions that, at the centres of learning, the theory and principles of engineering should be taught, without any attempt at specialization. That would make a very good recommendation for the Universities and Colleges that are devoted to the general training of engineers, and have not facilities for specialization work. We think, however, the advocates of the lines of work in this direction had, at the conference, too much their own way, to the detriment of such places as the Leeds University, where there are facilities for specialization. At the same time, specialization of the character in mind is over and above the general education in theory and principles that is fundamentally necessary, both in the interests of the man and of engineering. There, however, we again have conflict. There are those who believe that education in theory and principles can be systematized along straight lines without consideration for the human material (which is not all of one kind) to which it is to be applied. There are others who think it cannot be, with profit to all; and we are among the latter.

Another point upon which there is conflict of opinion is the old one as to whether education in theory and principles should precede or succeed practical training. There was, however, a distinct majority of expressions in favour of the educational work taking precedence in order—by no means was it submitted in value—of the practical training. We cannot understand the reasoning of those who think to the contrary in the case of the normal man. It is surely better that there should be continuity between school studies and the study of engineering theories and principles than that, following ordinary school life, there should be three years' or so in the workshops, with the expectation that succeeding the practical work the young engineer should once again discipline his mind to the work of the college. We are much in accord with the author of one of the papers who said, in effect, you must come directly in contact with work to understand it; but you will understand it all the better from knowing the principles underlying it. The young engineer "will enter on his practical training, with his mind "disciplined and developed by his study of science; and experience comes most quickly and with most lasting effect "to one who can place each item as it presents itself in its "proper place in a connected system of knowledge based "upon general laws, the workings of which he has learned "to recognize." Thus spoke Dr. Archibald Barr; and it expresses the view of most of those who have given extended and serious thought to the matter. But, in a measure, there are indications of antagonism between the professorial view and that of the chiefs of certain of the large engineering works. They both appear to want to commence moulding the young engineers as early as possible. The compromise suggested, of alternations of college study and of practical training (the "sandwich" system), is good; but the difficulties are many, so many indeed that it would not be generally workable. But much could be done in this way, and much could be done in the improvement in engineering education and training, by greater practical sympathy on the part of employers towards the educational centres that lay themselves out specially for this work.

There is a point that received little consideration at the conference; and it is one that was pithily expressed by Mr. J. W. Horne in the concluding words of his paper, which words constitute a plea for a scheme to ensure that "poverty "or social circumstances shall not prevent access to the "highest forms of training that the community can provide." Considering the men who have made the history of engineering, it is inexplicable that this aspect of the subject should be kept so much in the background. A need of the profession it was said during the conference is "men "of widely different qualifications." It is sincerely hoped

that, as a result of this conference, nothing will be done to close the door against ability and brains, though poverty prevents the grasping of the opportunities enjoyed by those better favoured with the wherewithal to take full advantage of them.

There were many other subjects touched upon during the conference; but we limit ourselves to these comments upon some of the more salient ones. Beyond these comments, there is no intention to report in these pages the proceedings, at which the gas industry was represented by the President of the Institution of Gas Engineers (Mr. R. G. Shadbolt) and others. It may be expected that something will be done in the way of the preparation of a report upon the conference; and then there will be an opportunity of reverting to the matter. But if anything in the nature of a scheme or recommendations eventuate, it is hoped that it or they will be framed with the latitude that men of different mental capacity, ability, and talent require, and men of different social standing need, in order to give opportunity to all and preference to none in fighting for position and distinction. The story in engineering that the past has to tell holds eloquent warning against closing the door in a manner that will shut out widely differing qualifications.

The Meeting of the German Association.

THE general meeting of the German Association of Gas and Water Engineers which was held last week at Dresden attracted at least as large a number of technical men as the annual gatherings of the Association usually do. Dresden is always a favourite town; and this year there was the additional feature of a large and well-organized exhibition devoted primarily to matters connected with hygiene. The programme of the meeting was carried through with the customary success, which is a no mean tribute to the local Organizing Committee, when it is remembered that they had to make arrangements for upwards of 1200 participants. There was, however, somewhat further division of the members into groups, for visits to works and excursions, than is usually the case; and doubtless if the numbers attending the meeting in future years continue to increase as in the past, this division into groups will have to be resorted to at subsequent meetings to an even greater extent.

The three days' sessions for technical proceedings were held under the chairmanship of Herr Prenger, the President of the Association, and the distinguished Manager of the gas, water, and electricity works of the City of Cologne. His geniality and great ability are well known to English gas engineers, through (*inter alia*) the visit which members of the German Association paid to English gas-works last autumn, with him as their Chairman and spokesman. In his Inaugural Address at last week's meeting, he recalled the pleasure it had given him and his colleagues to meet their English *confrères*, and said that the hospitality which was then extended to them would always remain in their memories.

The papers read at the meeting, and referred to in our special representative's report of the proceedings in another part of the "JOURNAL," were perhaps not of quite so interesting, and certainly not of so controversial, a character as in some past years. Attention was very properly drawn, however, in an exhaustive paper by Herr Blum, Managing-Director of the "Bamag" Company, to the great development in Germany in recent years of the system of supplying outlying townships and villages with gas, which is in the first instance forced under high pressure from the nearest large town gas-works to a governor and distributing station in the district to be supplied. This system of high-pressure gas distribution to a distance is the complement of the system of conveying electricity by overhead high-tension conductors from central works to distant communities. Germany has now fairly fully developed a system of cross-country gas supply which is a very serious rival to the similar supply of electricity which, it must in justice be admitted, has in the past proved a great boon to outlying works and villages in that country. The movement indicates a further step in the direction of the centralization of gas manufacture and supply. There is clearly not the same scope for the developing of this system of high-pressure distribution in Great Britain as in Germany and other parts of the Continent, since the distances between towns are smaller here, and the facilities for obtaining a supply of gas are already greater. Mr. Körting dealt, with the mind of a business man as well as of a gas engineer, with the difficult

problem of the production and disposal of gas coke to the best advantage of the gas undertaking. Unfortunately, English readers of his paper, of which a full summary appears elsewhere, will not reap so much advantage from his suggestions as will German gas managers, for the reason that competition with gas coke is of a different character in the two countries. Of late years, for instance, an immense trade has arisen in Germany in brown-coal briquettes, which are actively exploited by a syndicate of producers. This is a form of competition with coke which fortunately the English manager has not yet to fear. He will, however, be able indirectly to draw many useful hints from Mr. Körting's remarks. Another good paper was that by Dr. Allner on the use of coal tar as a fuel in engines of the Diesel type. This paper also applies more particularly to German conditions, since the import duties on petroleum in Germany restrict the available supplies of cheap fuel for engines of this type. The paper, however, gives some very generally useful information on the qualities and composition of tar from different types of carbonizing plant. There were, further, two papers of an interesting character on the working for several years past of installations of pressure lighting devices for public lamps in the streets of Bromberg and Königsberg, contributed by the respective gas engineers of those towns.

The work of the Technical Committees of the Association during the year has been of a very valuable character; and the reports, of which a summary will be given in an early number of the "JOURNAL," will be read with interest. The papers relating to water supply which were read at the meeting were of a more fundamental and generally interesting character than usual, and evoked in several instances most lively discussions. It is pleasing to record that in these Sir William Lindley took an active part, and that his high attainments as a water engineer, and his great services to the Association as Chairman of more than one of its Technical Committees, were recognized by his nomination by the Council as an honorary member of the Association. The announcement was received by the meeting with very marked signs of approval and congratulation.

Standard Burner Joint Promotion.

THE time is opportune for again prosecuting vigorously the conversion of the old standard test-burners to the new one, approved by Parliament and the Board of Trade. Last week we referred to the success of the Newcastle-upon-Tyne Gas Company in obtaining—quite inexpensively and promptly—under the power possessed by them in their Act, and through the Board of Trade, the "Metropolitan" No. 2 burner as their standard one; and we then advised all companies who are fortunate enough, in their testing clauses, to have the right to the supersession of their old standard test-burners by the new one, subject to the approval of the Board, to go and do likewise. There are, of course, several hundreds of gas companies in the country who are not fortunate enough to possess the power; and it is a pity, in view of the friendly attitude that Parliament and the Board of Trade have displayed in this matter, and their obvious wish that gas testing should be placed on a uniform footing throughout the country, that other companies who have not the appendix regarding "other approved burner" in their testing clauses should not now make a move collectively to have the "Metropolitan" No. 2 burner substituted for their present instrument. The fight over the Joint Bill of the session of 1910, and the defeat all along the line of the authorities who imagined they had a substantial grievance, which proved to have been but visionary, and has all vanished into thin air, paved the way for something bigger in the nature of a promotion. Those who fought in 1910, just as those who had fought before, were doing so for the whole industry; and to them is due the credit for clearing the paths of those who afterwards might desire to bring themselves into line in the matter of the use of a scientific instrument which correctly defines the illuminating quality of the gas.

Since the success of the Joint Bill of 1910, there have been several companies who have regretted that time was against them in participating in those promotions; and they have asked whether the Gas Companies' Protection Association cannot even now assist them in procuring the conversion of their test-burners to the "Metropolitan" No. 2. The Gas Companies' Protection Association desire to be of as much use as possible in this matter as in others that come

within their province; and therefore Mr. Fred. E. Cooper, the Secretary (5, Victoria Street, S.W.), has been instructed by the Committee to ascertain how many companies are prepared to join if a fresh promotion be undertaken. He is doing this betimes, in order that there may be no subsequent regrets that a narrow time-limit prevented many companies uniting in the promotion. But there should be no delay in signifying a willingness to participate (gas companies who are not members of the Association are quite at liberty to join in it), inasmuch as, if the movement is going to be a large one—and the larger the better and the cheaper—ample time will ensure comfortable sailing throughout. The first thing, however, is to give Mr. Cooper notice of a desire to unite in the promotion; and if the proposal meets with support satisfactory to the Committee of the Association, then a meeting will be convened to further consider the matter, at which all information as to procedure, probable expense, &c., will be given. When Mr. Cooper asks the number of gas companies who are likely to take part in the promotion, we should say “all will do so who have not the right to use the No. 2 burner at the present time, or who have not in their testing clause the power to directly ask the Board of Trade for their approval to the change.” There were, we know, a few companies who had some fears, at the time of the 1910 promotion, that the local authorities would secure all sorts of amendments in existing legislation as the result of the new burner being prescribed. But Parliament courteously and firmly told the local authorities who tried to get things to which they were not entitled, that all that was under consideration was the question as to whether or not it was right to apply the new burner; and ever since, those companies who took part in the joint measure, and came out of the conflict in possession of the new test-burner, unaccompanied by any conditions whatsoever, have been the objects of envy by those who then feared. If there are any who fear in the same way now, all they have to do is to read the proceedings on the Joint Bill of 1910, and their fears will be dispelled. We shall hope to see a joint promotion next session that will make the 1910 one look small in comparison, and that will place another red-letter year in the history of the march-forward of the gas industry.

Carbonization Doubts.

THERE is evidence in our columns to-day, as there was last week, that the extraordinary supply of literature on carbonization at the Glasgow meeting of the Institution has revived interest among British gas engineers in the respective merits of the carbonizing methods that are courting favour in the industry. This was to be anticipated, in view of the fact that, in the main, the papers constituted the first record of results and experiences over long periods of working under British conditions. But there is abundant testimony that the papers have not produced any complete satisfaction in the minds of critical carbonizing experts, nor that they have done much in producing any pronounced favour among engineers who have been vacillating between full horizontal, intermittent vertical, or continuous vertical working. It is well to look for the reason or the reasons, and when found to treat them with the seriousness that they demand. There are, it is observed, from the voluntarily contributed communications to our columns, certain clear points that the advocates of the vertical systems have to deal with in the prosecution of their “proselytizing” work; and it will surely be to the interest of all carbonizers if they are deliberately and pointedly handled before possible misconception becomes a widely acknowledged truth.

It is complained that most of the published comparisons of working so far have been between the vertical systems and light charges in horizontal retorts, and not between vertical working and, with the same coals, full or heavy charges in horizontal retorts. Probably one of the best pieces of usefulness in this connection has been furnished by the carbonization of a quantity of Derbyshire coals in the Dessau verticals at Sunderland, at Mr. J. Ferguson Bell's request, for comparison with his heavy-charge working at Derby, as described in his Institution contributions of 1909 and 1910. The results of the vertical trial of the coal appeared in Mr. Dru Drury's Glasgow paper. The comparison can be extended by taking the results of the carbonization of Derbyshire coal in the table headed Glover-West settings at Droylsden, as presented in the “Summary of Tests” in Mr. J. G. Newbigging's paper. Now Mr. Bell is so far satisfied with the results from the verticals that, though

he does not say that they would justify scrapping horizontal retorts in which heavy charges can be used, he is persuaded that the results are of a character that should command attention when considering the question of extensions or reconstruction work.

This brings us to a question which has been made in two separately contributed articles in our columns; and it is the question that is of all debatable matters that have arisen around this subject the most difficult to satisfactorily dispose. It has, however, to be met by our vertical friends; and, to meet it as is desired by the critics, comparison has to be made on the best of all modern lines. The point is as to whether the acknowledged additional capital cost of vertical settings will, through improved make and economies, prove a good investment when contrast is made with modern horizontal retort-settings, using heavy charges, with coal-handling plant and charger and pusher on one side of the bench only, and a coke-conveyor on only the other side of the bench. From the capital point of view, it was a bad thing for vertical retorts that the old order of coal, machine, and coke equipment in a horizontal retort house was found capable of reduction by one-half. However, those are the lines, in respect of capital, on which comparison is desired by many who are looking into the matter. Mr. P. C. Holmes Hunt dealt with it in his contribution; but it is obvious that his argument has not altogether carried conviction, and that something more is required. We are strong believers in not adhering to any old standard of capital expenditure per ton of coal carbonized, or any other unit of comparison, when a departure from it can be shown to be a remunerative investment. Directly this is conclusively done, the old standard has become obsolete. But there it is. Experienced carbonizers among British gas engineers, after exploring all that has been put before them, have their doubts as to the working results and economies of verticals having a value in excess of that of the extra capital cost involved in producing them. These are the prominent matters that have to be further argued by the exponents of carbonization in vertical retorts—both continuous and intermittent. They are of greater importance at the moment than such questions as pressures in the retorts and temperatures of carbonization, which are both amenable to treatment to produce the modification considered desirable.

Sulphate of Ammonia Production.

THE first annual report of Mr. W. S. Curphey in the office of Chief Inspector under the Alkali Works Regulation Act is a successful effort to continue the informative and directive value of these documents on the lines laid down by his eminent predecessor, Mr. R. Forbes Carpenter. If in some respects the report does not contain quite so much enlightening material—resulting from investigations into, for example, the causes of certain effects in connection with carbonization—there is no discredit in the fact to the new Chief Inspector, who has hardly had time to settle down in his new office. Such work, welcomed though it is, is over and above what is required; and it was due to the desire of Mr. Carpenter to make his department and its resources as serviceable as possible that induced him to enter into the byways in search of, and to gather, information that should be of advantage to those he served. And he served through his official capacity both the Local Government Board and the owners of works that came under the surveillance of himself and the District Inspectors. Mr. Curphey has a very difficult man to follow, whose high ideals he has adopted. We know Mr. Curphey; and this first report gives the promise that year by year there will be a growth in value, as in the case of the reports of his predecessor.

The work of the Chief Inspector's Department grows—not only in the number of works that have to be inspected, with their extended production, but in the matter of keeping a watchful eye on all new processes that are applied in the works. In the past twelve months, the number of works increased from 1857 to 1872. Looking down the constituent items, it is observed that sulphate and muriate of ammonia works have increased from 536 to 543, gas-liquor works from 55 to 57, and tar-works from 151 to 154. These three classes of works represent together 754, which is more than one-third of the total under inspection. The most interesting side of the report for gas men is found in what Mr. Curphey has to say on the subject of the production of sulphate of ammonia; for the gas industry representing the largest single producers of sulphate of ammonia in the

country is compelled to keep an eye on what is being done in other quarters. It was only in 1908 that the gas industry could claim to produce upwards of 5000 tons of sulphate of ammonia more than all the other sources combined. But 1909 saw the other sources collectively had exceeded the gas undertakings in production by more than 20,000 tons; while this year, although the make of the gas undertakings is at its record figure of 167,820 tons, the aggregate production of other sources is 32,000 tons in excess of that of the gas undertakings.

Interest is also found in examining the figures in another way. The recovery of sulphate of ammonia in 1910 totalled 367,587 tons, which is 18,444 tons more than the year before. Gas undertakings increased their production by 3544 tons; but iron-works had the small decrease of 89 tons. Shale works yielded about 2000 tons more; while coke-oven works piled 9779 tons on to their previous accumulation of 82,886 tons. This, however, is only little more than half the increase (18,659 tons) experienced in 1909 in comparison with 1908. This reduction in the rate of increase is ascribed by the Chief Inspector to the prolonged strikes, which curtailed the operations of the coke-works. Anyway, the prolonged strikes did not prevent the coke-oven works swelling their total output by nearly three times more than the gas-works were able to do. However, Mr. Curphey bids sulphate of ammonia producers (as do other investigators of, and reporters on, the subject) to be of good cheer, for with all the extended production, and the competition brought about by the fixation in serviceable form of the nitrogen of the atmosphere, Mother Earth requires it all, and the growing population needs the increase in produce.

The enlarged interest that has been shown in the process of ammonia absorption by dilute sulphuric acid both at coke-oven works and in connection with small plants for gas-works is referred to by Mr. Curphey. The subject is now of quite respectable age; but the extending application of the system keeps interest in it green at the present time. The system has its advantages. The avoidance of noisome effluvia is one; and the ease with which the sulphuretted hydrogen is dealt with is another. Beyond this, there is the escape from all loss of ammonia due to storage and transmission of ammoniacal liquor. When stored in ventilated tanks, there is bound to be loss to the atmosphere, varying with the degree of exposure, the strength of liquor, duration of storage, and other factors. Mr. John T. Sheard has estimated that, in twenty-four hours, with a still atmosphere, the loss may amount to as much as 3 to 5 per cent. of the whole amount exposed. But while there are advantages, attributable to the absorption of the ammonia by sulphuric acid, there is the disadvantage of a lower yield of sulphate of ammonia per ton of coal carbonized. Whether it is a good system to adopt depends primarily on circumstances—in the case of the Mond and coke-oven systems, the application of the method has been brought about mainly by the large volumes of gas that have to be dealt with. This is not the reason, however, that has led to its adoption in small gas undertakings. But that is a matter on which some information was given at the meeting of the Southern Association last November.

Profit-Sharing by Municipal Gas Workers.

THE question of the development for municipal gas workers of a profit-sharing scheme having close affinity with the successful co-partnership system founded, developed, and made as firm as a rock by the late Sir George Livesey has often been touched upon in debate; but everybody who has so far given the matter really serious consideration has relinquished it with the feeling of the impossible hanging over it. The nearest approach to co-partnership of anything that has been done in the way of offering reward to municipal gas workers over and above their wage is the scheme at Stafford, whereby the gas workers divide as reward for well-doing a part of all savings effected on a fixed standard rate of manufacturing costs. A contributor to our columns this week makes the best attempt that we have yet seen at framing a scheme for municipal gas workers—that is to say, a scheme that has as close an approximation to gas co-partnership as it seems possible to make it, having in view the differences of circumstances. Without accepting it as perfect, we congratulate him upon the ingenuity of the proposal.

This is, however, a matter that requires to be examined carefully by those in close touch with the circumstances under which it is contemplated to apply such a scheme.

We therefore invite those interested in the management of municipal gas undertakings to express their views in the most critical or commendatory manner that pleases them, and that gives expression to their opinions. We know our contributor will not hesitate to discuss in our columns all the matters placed before him in their various bearings. Further, it is recognized that, in the interests of freedom of discussion, anyone participating should be quite at liberty to use a *nom de plume*, as, in a matter of this kind, which is distinctly one of policy, the personal view of an engineer or secretary of a gas department might not accord with the opinions of his committee.

There are two or three weaknesses that, on first blush, we see in the scheme, in comparison with co-partnership as practised by companies. The first is the Workmen's Investment Society. The fact that the whole of the investments, care of money, &c., in connection with co-partnership in the case of a gas company are undertaken by the company, gives a sense of security and stability to the men. It is questionable whether the Workmen's Investment Society would afford the same feeling of security and stability. Then, again, the investment in municipal funds would not encourage the same feeling of direct personal part and lot in the gas undertaking as, under company co-partnership, investment in shares or stock. A further drawback is that the interest on municipal loans is not so high per cent. as the dividend on gas shares or stock. However, our contributor has done the best he can under the circumstances; and the scheme is open for consideration. We hope it will receive full and careful discussion, as we feel its importance. There may come a time when the municipal gas worker will begin to compare his position with that of the co-partner gas worker engaged with a gas company.

Further Signs of Alarm.

The alarm that the success of high-pressure gas lighting has created in the camps of those who believe—or rather who say they believe, which is quite another thing—the gas industry is in a moribund condition, had fresh exemplification at the meeting of the Incorporated Municipal Electrical Association last week. That dear old soul the “Electrical Review” thinks the gas industry is fighting in the last ditch; and the “Electrician” comes out with erude poetical effusions about gas, for the delcctation of those of its readers who are soft-pated, and who are readily delighted with any absurdity about the recession of gas and the triumphant progress of the perfect electric light. While this sort of foolishness is going on in our electrical contemporaries, Electricity Committees are gravely considering how they can stop the easy march of high-pressure gas-lamps in superseding electric lamps. But they find this is not very easy to accomplish. The matter has also been discussed at the meeting of the Municipal Electrical Association; and fresh testimony has been given to the repeated shocks that high-pressure gas is giving to electricity purveyors. The discussion on the matter was opened by Mr. A. H. Seabrook; and that spirited individual is for doing anything—we believe he would give energy away to stop gas scoring a success—to prevent any further triumphs of the enemy in this way. But there are others who look at the matter in a commercial light, and who fail to see where the ultimate advantage is coming in of doing business without any profit, even to spite the gas industry. There are also those who seem to entertain hope that, under the circumstances, some mutual understanding may be effected with the gas industry. The suggestion was actually made at the meeting. It is rather interesting. And besides interest, there is something humorous about it. It at any rate shows that there are men in the electrical industry who are descending from those lofty heights from which they thought at one time they could see in the distance the ultimate extinction of the gas industry. But Mr. Seabrook does not like this “sloppy” sentimentality on the part of electricians; for he does not like the gas people any nearer to him than he can possibly help, and thinks the proper place for them is at arm's length. That is a compliment to the gas people. Likewise, we are much in sympathy with Mr. Seabrook's views; for we do not see what the electricity industry has to offer to convince the gas industry that there would be advantage to it in a mutual working understanding. However, it is a matter of more than ordinary interest that such a proposal has emanated from the electricity industry. If that industry was marching along so

victoriously as its press would try to make people believe, does anyone think that a proposal as to a mutual understanding would have been made?

Municipal Gas-Works Results.

The report which Mr. Charles Wood, the Gas Engineer and Manager to the Bradford Corporation, submitted to the Gas Committee on Friday last, and noticed in another part of the "JOURNAL," shows results for the past financial year of which, he says, everyone connected with the Gas Department has reason to be proud, inasmuch as the trading in the twelve months showed a net improvement to the extent of £13,672 over the previous year. The net profit was £12,934, compared with a loss of £737 in the year 1909-10; the former figure being more than double that shown in any previous financial period since the price of gas was reduced to the present figure seven years ago. Mr. Wood points out that the satisfactory results he is able to present have been obtained in the face of increased expenditure for wages, rates and taxes, and nearly every class of material used, and in spite of the still heavy burden caused by the purchase of several gas undertakings since 1900. The payment of interest and sinking-fund charges on the goodwill alone of these undertakings cost £18,000 last year; and the gas consumers in the added districts benefited to the extent of no less than £13,166. Beyond this, certain repairs and renewals, &c., were charged entirely to revenue. Mr. Wood says, "in comparing the returns with those of others, it is important that these facts should not be overlooked." The only unsatisfactory feature of the year's working was the small rate of increase in the quantity of gas sold in the central area of the city, which is stated to have been due to the extended employment of electricity, and to the more economical methods of using gas; and Mr. Wood says it only proves the necessity of "utilizing every reasonable opportunity of advertising the many advantages of gas, and extending its use." During the year, a good deal more was spent in this way than had previously been the case; and Mr. Wood expresses the confident opinion that the Committee will reap the benefit of it by increased business.

There was, we learn, a considerable general improvement in working results at Cockermouth, compared with the preceding twelve months. The gross profit was £1269, against £1237; and there was a net profit of £274. It has been found here, as at other places, that there has been a large increase of business arising out of the policy adopted last year of holding an exhibition, and advertising cookers and fires in the local papers. A reduction was agreed upon of 3d. per 1000 cubic feet in the price charged to ordinary consumers; and at the same time a concession was made to the users of prepayment meters. The accounts of the Edinburgh and Leith Corporations' Gas Commissioners for the year ended May 15, show, as already announced, that (subject to audit) the gross profit on the year's working amounts to £115,874, or £9486 less than for the year 1909-10. This is accounted for by the reductions made in the price of gas. The quantity of gas sold shows a diminution of 2.39 per cent., but an increase of 1.78 per cent. on the sale for 1908-9. After deducting from the gross profit the annuities for the year, mortgage interest and expenses, and the contributions to the sinking and reserve funds, a surplus profit of £5748 remains. The demand for gas at Haverhill has gone up, and the price has gone down; the result being that, in spite of the fact that the charge for gas was reduced to the extent of 2½d. per 1000 cubic feet, the receipts have been very nearly as large as in the preceding year.

The gratifying announcement comes from Hereford that an increase in the sales of gas amounting to 7½ million cubic feet has been provided without the carbonization of any additional quantity of coal; the explanation being that the make of gas has gone up from 11,540 to 12,054 cubic feet per ton. Again, there was a record in the amount of gas sold per ton of coal carbonized—11,278 cubic feet; the unaccounted-for gas being reduced from 5.9 to 4.8 per cent. There is a gross profit of £3934. It is pointed out that the Committee are in an almost unique position in having up-to-date works and plant, including 35 miles of mains, and capable of supplying 180 million cubic feet of gas a year, with an outstanding capital of only £26,000, including £11,500 invested in slot installations. They have always paid for new meters, cooking-stoves, and gas-fires out of revenue; and now the capital account

has been closed entirely. In spite of a reduction over the whole year of 1d. per 1000 cubic feet, sales of gas at Hinckley produced £605 more than in the preceding twelve months. The net balance is £3528, against £2977. There was at Ossett an increase of about 5½ million cubic feet in the quantity of gas sold. The yield of gas was 11,160 cubic feet per ton, compared with 10,978 feet per ton in the previous year. A gross profit of £8265 is shown. Records have been scored in every direction—in make, in sale, in the number of customers, in the low percentage of leakage, and in profit; and the Town Council are justly gratified with this position of affairs. A good residuals market and increased sales of gas have resulted in a gross profit on the year's trading at Stourbridge of £11,977. The increase in the sales of gas was close upon 6 million cubic feet. The make was at the rate of 11,025 cubic feet per ton of coal carbonized. The report and accounts from Wigan (notice of which in the news columns is unavoidably held over until next week) show that, as compared with the previous year, there was a decrease in the consumption of gas for all purposes of about 3¼ millions, or 0.85 per cent. The number of gas-cookers fixed exhibits some falling off; and there was a decrease in the consumption of gas during the year under this head of some 4¼ million cubic feet, or 11.57 per cent. This abnormal slump in the use of gas for cooking purposes is confidently stated to be due to the general condition of trade being so bad, and not to any lessening of the popularity of the use of gas for this purpose. It is noticed that the make of gas per ton of coal and cannel carbonized was 11,677 cubic feet, compared with 11,625 feet in the previous year. The total net profit for the year is £10,086, as against £10,299. This sum includes £5521, the value of gas which has been supplied free for public lighting within the borough.

The Position of Nitrate of Soda.

The past half year has seemingly been an interesting one to those connected with the nitrate of soda industry. At the close of 1910, it is pointed out by Messrs. W. Montgomery and Co. in their half-yearly report, it was found, when summing up the statistical position, that the world's consumption for twelve months showed an increase of 302,000 tons over that of 1909, which, in its turn, exhibited an expansion over 1908 of 196,000 tons. That is to say, there was a growth of consumption in the two years of 500,000 tons. Now we learn that during the six months just ended there has been a further increase of 90,000 tons, or 5.7 per cent. Of this quantity, Germany absorbed 548,000 tons, or an increase of 3 per cent.; Belgium, 237,500 tons, or an increase of 7 per cent.; and France, 290,000 tons, or an increase of 3.6 per cent. Expansion is also recorded in the cases of Holland, Italy, and Austria. As far as the United Kingdom is concerned, the consumption—86,000 tons, against 77,000 tons—is regarded as very satisfactory, showing as it does an increase of 11.7 per cent. America, with 328,000 tons, exhibits an increase of 14 per cent. But these figures, the report adds, hardly do complete justice to the continued expansion of the demand for agricultural purposes, inasmuch as it is stated that for explosives and chemical uses there has of late been a falling off to the extent of from 20 to 30 per cent., which, however, it is presumed, will only be of a temporary nature. "It is," the firm assert, "from this comparatively new field for agriculture that considerable expansion may be confidently looked for from now onward." The world's consumption of nitrate of soda for the twelve months ending June is given as 2,331,000 tons, against 2,242,000 tons for the previous year, which shows an increase of 89,000 tons, or 4 per cent. Europe absorbed 3 per cent. more than in the corresponding period, and the United Kingdom 9.3 per cent. more; the increase in the case of the United States being 4 per cent., and in that of other countries 9 per cent. Stocks in Europe, at 87,000 tons, are, it is said, for so extensive an industry, decidedly small, and compare with 141,000 tons in 1910. The quantity afloat (estimating June shipments at 110,000 tons) is 259,000 tons, against 268,000 tons, so that the visible supply for Europe to-day stands at 346,000 tons, as compared with 409,000 tons twelve months ago. The course of prices during the past six months has varied for the most part to the extent of 4½d. per cwt., though one or two exceptional cases would make the difference between highest and lowest about 6d. Early in January, the value of arrived cargoes was 8s. 8d. to 8s. 9d. per cwt., cost and freight; while now due cargoes are quoted at 8s. 10d. to 8s. 11d. per cwt., without sellers, and cargoes of refined quality are held for 9s. 1d. per cwt.

GAS STOCK AND SHARE MARKET.

(For Stock and Share List, see p. 66.)

BUSINESS on the Stock Exchange was quiet enough last week; for the City was in festive mood, and on Thursday gave itself up with enthusiasm to offering another loyal welcome to its King. But inside the House depression reigned. Markets were gloomy and weak; and the choicest lines were the weakest. No one seems to understand exactly why this should be; but so it is. With cheap money and other favourable factors, Consols nevertheless keep on shrinking; and last Saturday they were marked several times at 79. Railways, of course, were oppressed by the strike. The opening day was perhaps the best of the week. The gilt-edged group were firmer, and Consols rose $\frac{1}{8}$. Americans advanced strongly, but were inclined to realize at the close. Tuesday was quiet. Consols shaped well at first, but gave way later on. Fear of the strike area extending hit Railways. Americans were very fair. Wednesday was less depressed; but Government issues were barely steady. Rails tried to be cheerful, but gave up at last; and Americans were lower. Thursday was, of course, very quiet. The tone was poor, especially in gilt-edged, and Consols fell. Rails rallied a bit upon a few buyers being tempted by the low prices. On Friday, the settlement was concluded—not without rumours of difficulties. The general tone was quite weak. Consols and other of the gilt-edged class were lower. Railways were discouraged by the failure of strike pacifiers. On Saturday there was no amendment, and the tendency was flat all round. Consols showed a loss of $\frac{5}{8}$ on the week. The Money Market was firm in face of a strong demand for the Stock Exchange and the close of the half year. Discount rates ruled lighter. Business in the Gas Market was about a fair average in point of volume, and the tone was unchanged. Changes in quotations were mostly the result of *ex div.* adjustments. In Gaslight and Coke, the ordinary was well supported and prices advanced, ranging from 106 $\frac{1}{2}$ to 107 $\frac{1}{2}$ —a rise of $\frac{1}{2}$. In the secured issues, the maximum realized 86 $\frac{1}{2}$, the preference 104 and 104 $\frac{1}{2}$, and the debenture 78 $\frac{3}{4}$ and 78 $\frac{3}{4}$. South Metropolitan was rather more active, and was done at from 119 to 120 $\frac{1}{2}$. The only mark in Commercials was one bargain in the 3 $\frac{1}{2}$ per cent. at 109 $\frac{1}{2}$. Among the Suburban and Provincial group, Alliance and Dublin changed hands at 83 $\frac{3}{4}$ (a fall of 1), Bournemouth preference at 141 $\frac{1}{2}$, Brentford old at 260, ditto new at 204, Ilford "B" at 120 (a rise of 1), and, on the local Exchange, Liverpool "A" at 215 and 216. In the Continental companies, Imperial receded another point, with transactions ranging from 184 $\frac{1}{2}$ to 186, European was done at from 191 $\frac{5}{8}$ to 19 $\frac{1}{2}$, and Tuscan at 91 $\frac{1}{8}$. Among the undertakings of the remoter world, Bombay was marked at 6 $\frac{3}{8}$, Cape Town at 2 $\frac{1}{2}$ (a fall of $\frac{1}{8}$), ditto preference at 5 (though the quotation was left standing at 6-6 $\frac{1}{2}$), Monte Video at 12 $\frac{7}{8}$ and 13 $\frac{1}{8}$, Primitiva at 71 $\frac{7}{8}$ and 7 $\frac{1}{2}$, ditto preference at 5 $\frac{3}{8}$ and 5 $\frac{1}{2}$, ditto debenture at from 97 $\frac{1}{2}$ to 98 $\frac{1}{2}$, and San Paulo at from 19 $\frac{5}{8}$ to 20 $\frac{1}{2}$ —a rise of $\frac{1}{2}$.

ELECTRICITY SUPPLY MEMORANDA.

At Brighton—"The Times" on Current Municipal Topics—Seabrook on "Other Uses"—Admirable Optimism and Tactics—How to Deal with Grumbling Consumers.

THOSE members of the Incorporated Municipal Electrical Association who travelled to Brighton, *via* London, last week for their annual conference patronized high-pressure gas-lighted railway termini; and if they were at any one of these stations at night time, it is hoped they were duly impressed with the excellence of illumination. In competition with the system, they have been duly impressed with its economical character, its reliability, and its freedom from the bad flickering habit of certain competitors. Unquestionably central station engineers do not desire to see gas make such another flight in economy and efficiency as was done when a single jump was made in efficiency from between 30 and 40 candles per cubic foot of gas to between 60 and 70 candles, according to the quality of the gas. However, out of respect for their President (Mr. John Christie), we do not suppose the members said much about the lighting of the Brighton Railway Station; and it would have been a little out of order to criticize it, seeing that, among the visits the organization were paying during the week, was one to the Brighton and Hove Gas Company's Portslade works—the Company who have shown at the railway station that, on commercial lines, gas lighting does not take second place to electric lighting.

Such parts of the proceedings at the meeting as may be deemed to be of interest will be noticed in the "Memoranda" in future issues of the "JOURNAL." Meantime, there is interest in an article in the "Engineering Supplement" of "The Times," which supplement has always a strong inclination away from gas and towards electricity. This particular article heralded the meeting, by summing up a few of the more important questions in which the Association are currently concerned. It is the view of the writer of the article in question that "we are now on the eve of expected great developments in electrical cooking and heating." No matter how this statement is looked at, there is an outstanding caution about it. The word "expected" appears to have been some afterthought, and to have been thrust into an already con-

structed sentence in order to safeguard the writer. Of course, great developments have been "expected" in cooking and heating for many long years; but electricians cannot get over the fact that some great injustice was done electricity in the dispensation of gifts originally, by investing a full-blown unit with only a thermal value of 3420 B.Th.U. or thereabouts, while a paltry cubic foot of gas can boast of from 500 to 600 B.Th.U., and 6 cubic feet of as many as 1 unit of electricity.

Another question that is well in the minds of municipal electrical engineers is that of profit appropriation in relief of the rates. There is a solid body of municipal gas engineers who are on the side of the municipal electrical engineers in inveighing against the bad policy of relieving the rates from the profits of local trading departments. It is indeed a "vicious policy." But it exists; and, where it does so, it ought surely to be applied on terms of equality, and the businesses, too, ought to be administered on the same lines. It is unfair of the writer of the article to suggest any alliance between the gas interests and the Local Government Board, in the matter of the regulation of the loans for municipal electricity supply. The development of a more rigorous inquiry into, and control of, municipal electric supply loans was brought about entirely by extravagance, by maladministration, by misapplication of loans, by over-spending, by running concerns at a loss, and by local authorities setting at naught the power of control vested in the Local Government Board. For anything that has happened in the matter of stricter control, and over which there now exists grievance, the municipal authorities have only themselves to blame. The question of wiring and hiring is also touched upon in the article; and it seems, as we long since surmised was the case, that the truth has penetrated home that the cost of promoting a joint Bill to secure the powers would be very great, in view of the opposition of electrical contractors, ironmongers, plumbers, and large ratepayers. Yet many local authorities are unwilling to confer anything more substantial than their blessing on the promotion. In consequence, there is very little chance of the measure being introduced for the wide purposes originally proposed. If a Bill is promoted, it will probably be on the lines of hiring powers only, without embracing wiring.

Mr. A. H. Seabrook, formerly of West Ham and now of Marylebone fame, has been discoursing in the "Electrician" on encouraging the use of electricity for domestic purposes other than lighting. The first thing that is necessary is a proper system of tariffs; and the only system which is effective for encouraging uses other than lighting is, in Mr. Seabrook's opinion, one which allows such uses by connecting up to the lighting wiring. Therefore, the tariff must be one which is constituted of a standard fixed charge, with a low rate (generally 1d.) per unit afterwards—that is to say, all standing charges are to be thrown on to the lighting installation, in order that "other uses" may obtain electricity at a low price per unit. But Mr. Seabrook writes: "I consider it to be perfectly justifiable to insist upon a complete installation of electric light in a house before a consumer can have current for other uses at the secondary charge only." Whether this is permissible, it appears to us, depends upon the statutory authority under which an undertaking may be working. In the first place, an electricity undertaking cannot refuse to supply a consumer who complies with the statutory conditions; and no powers whatever are conferred upon an undertaking to dictate to a consumer the manner in which he is to use the current he purchases. Then, "the undertakers shall not, when making any agreement for the supply of electricity, show any undue preference to any local authority, company, or person; but, *save as aforesaid*, they may make such charges for the supply of electricity as may be agreed upon." Now Mr. Seabrook confesses that the whole of the heavy standing charges are thrown on the lighting part of the installation; and there is no obligation upon the lighting consumer to use electricity for other purposes. But if he does use electricity for other purposes, he obtains it at 1d. per unit; there being, on Mr. Seabrook's own written confession, no standing charges attached to any consumption but for lighting. The consumer therefore obtains electricity for other purposes at 1d. per unit, because he is a lighting consumer; and therefore he obtains a preference. It is a moot question whether Mr. Seabrook is not showing an undue preference if he declines to let another person have current for other purposes than lighting at 1d. per unit. He also shows that he uses this differential charge for purposes other than lighting, to attempt to drive customers to give up their liberty (which Parliament confers upon householders by compelling both gas and electricity suppliers to furnish upon request a supply within a certain distance of the mains) in lighting matters, and to compel them to forsake gas, and use electric light only. For with all the boasted virtues of electricity, Mr. Seabrook confesses that consumers with experience of both systems "generally" use gas in the long-hour part of their houses, and electricity where it is little required. That is more eloquent testimony to gas than we have ever heard from Mr. Seabrook. These are his words, and they describe his method of procedure:

The method of application is as follows: Suppose a consumer wants to put in "other apparatus," and we find he only partially uses electric light, and uses (*as is generally the case*) gas in the long-hour part of his house—*i.e.*, the basement—we say our charge for "other uses" is 2d. and 1d. on the maximum demand system; but "if you will *wire your house throughout* and enter into a contract on our 'telephone' system, you can have all units at 1d."

Mr. Seabrook writes himself down as a veritable commercial tyrant.

There is only one criticism that we have to make of the circular-letter sent out to consumers adopting the "telephone" tariff system; and it is found in the clause of the letter which says: "Cooking and heating only cost 1d. per unit, at which price electricity is as cheap as gas for these purposes." The experience of householders who have tried both systems does not confirm the italicized words. Then Mr. Seabrook dilates on the importance of a pushing business-getting staff to keep in touch with consumers; and there is striking recognition in this connection of the proneness of electrical appliances to get out of repair, as "frequent reminders" are sent to consumers to keep their apparatus in proper order. The first words of the reminder are: "Consumers are earnestly requested to let us know if any of their electrical apparatus—such as fans, radiators, irons, ovens, kettles, &c.—are not in working order. Frequently the faults are such that we can put the apparatus in order free of charge, and where this is impossible we will quote a low price for the repair." Among other means of encouraging business is to loan appliances (we take it these are new) for a short period; and there is assurance that the resulting sales have been most gratifying. A few words are said as to the value resulting from effectively arranged show-rooms.

Then there is light upon a little ruse of Mr. Seabrook's for capturing custom. He likes to be in a position to "offer" hiring terms; but there is a preference for the hiring terms to end at the offer. The offer of the hiring terms is but the pathway for an attempt to induce the consumer to go on to hire-purchase. Mr. Seabrook is very frank in giving electrical appliances all possible certification as to the shortness of their careers. He says the "hire of apparatus is no good as a business deal, unless a very high rental can be obtained." On small apparatus it should be 50 per cent. per annum on capital value. Phew! Words speak loudly here. Then in connection with hire-purchase, there is a manifest desire to get possession of the cost of the articles as quickly as possible, inasmuch as he thinks the best basis is to handle 25 per cent. of the total price of the work in advance and before the work is commenced, and then for the balance to be paid off in eight quarterly instalments. Maintenance work is another desirable thing. It is found that Mr. Seabrook looks to cookers and radiators for the future big electricity business for domestic purposes; and, in emphasizing his hopefulness, he treads on the dangerous ground of "poisonous fumes." However, we will reproduce his optimistic words in this regard without further comment:

Cookers will also be more generally used than radiators, because the cost is as low as gas at 1d. a unit; and the enormous hygienic advantages which electricity possesses over gas, in addition to the absence of poisonous fumes, heat, and general nuisance, ensure that the future of electric cooking will be exceedingly great. Needless to say, none but the wealthy will buy electric-cookers outright, any more than people will buy gas-cookers; and we have got to make up our minds to adopt the same tactics as our gas competitors—in fact, as we know their struggles and difficulties in introducing gas-cooking some years ago, we can start out on a more favourable basis.

At the same time, "an electric cooker must do all that a gas-cooker will, and more quickly." What a pity the B.Th.U's. of a unit of electricity cannot be multiplied many times!

There have been some interesting remarks in the "Electrical Times" on the subject of "Meteorology and Lighting Bills." The managers of electrical undertakings, as gas suppliers know from the communications of consumers who revert to gas, experience complaints of the amount of the accounts from their patrons; but we have never yet heard of a gas undertaking that has suffered to such an extent in this way that it has been found necessary to have printed explanations and excuses ready for the grumbling consumers. Mr. W. G. Pickvance, of Wrexham, is a central station engineer who has adopted this course, in order to pacify consumers who will make comparison with the corresponding quarter of the previous year. This is inconvenient to the central station engineer, not only on account of differences in the meteorological conditions, but owing to the fact that the consumers themselves soon lose that happy electrical virtue of having only the necessary lights switched on in the rooms that are being used and the remainder of the house in darkness. But when complaints are made, this lapse from the path of electrical necessity is not referred to; but the meteorological conditions of the quarter are blamed. Mr. Pickvance states that he had an "extraordinary number" of consumers whose accounts for the December quarter of 1910 were "considerably" larger than in the same quarter of 1909; and he and members of his outside staff were subjected to the annoyance (it could hardly have been a pleasure) of personal complaints in the streets. So he prepared a few short explanatory notes, pointing out how dull the December quarter of 1910 was in comparison with that of 1909, and had them neatly printed on a card. When accosted in the streets, and the complaint commenced, Mr. Pickvance or his assistants whipped out one of the explanatory cards, and faced the grumbler with it. The card was as effective in stopping a torrent of words, as an electric shock is in producing a yell. Electricity, so runs the fantastic legend of electrical origin, is cheaper than gas. Still electricity consumers grumble to such a degree that printed answers are found necessary to cope with the complaints. It is something of which gas undertakings can boast, that the majority of their consumers are contented with the low price they pay for the large services rendered in lighting, cooking, and heating, and without the telephone system of charging.

RETIREMENT OF MR. WALTER W. HUTCHINSON.

WE regret to learn that, owing to ill-health, Mr. Walter W. Hutchinson has relinquished the position of Engineer, Manager, and Secretary of the Barnsley Gas Company, which he has held for the past seventeen years—having succeeded his late father, Mr. John Hutchinson, who was for forty-one years the Company's Secretary and Manager. It is rather more than half-a-century since Mr. Walter Hutchinson entered the service of the Company. Almost from the first, he displayed so keen an insight into all matters pertaining to the manufacture of gas that his future was assured. By dint of close and constant study, he passed from one stage to the other, until at length the Directors conferred upon him the position of assistant to his father, whom, as stated above, he eventually succeeded. During his tenure of the more responsible position, the Company's plant has been greatly increased. Mr. Hutchinson, it may be remembered, was for many years Hon. Secretary of the Manchester District Institution of Gas Engineers, of which he was President in 1890. He joined the British Association of Gas Managers in 1867, and passed successively into the Gas Institute and the present Institution.

Referring to the above-mentioned event, the "Barnsley Independent" last Saturday said: "Owing to continued ill-health, Mr. Walter W. Hutchinson retires from the position he has held so long and so faithfully as Engineer, Manager, and Secretary of the Barnsley Gas Company. This announcement will be received with regret—and especially that ill-health is responsible—by his many friends and the public in general, for Mr. Hutchinson's connection with the town, and with the Company he has served so assiduously, has earned for him the esteem and respect of everyone with whom he has come in contact. The name of Hutchinson is an honoured and familiar one in Barnsley; and the lengthy association of the family with the gas undertaking is very well known."

PERSONAL.

Mr. G. H. RICE, Assistant-Manager at the Truro Gas-Works, has just been appointed to a similar position at the Paignton Gas-Works.

Mr. J. W. M'LUSKY, whose elder brother is Engineer of the Perth Gas-Works, and who has been foreman at the Bridgwater (Somerset) Gas-Works for the past four years, has been appointed Manager of the Portrush Gas-Works.

After seventeen years' service with the Tonbridge Water-Works Company, in the capacity of Engineer, Secretary, and Manager, Mr. JAMES LEES has retired; and in the report presented by the Directors at the recent annual meeting, they said they felt sure the shareholders would join with them in expressing their appreciation of the energy he had always displayed during his administration of the affairs of the Company.

Consequent upon the relinquishment by Mr. Walter W. Hutchinson of the position of Engineer, Manager, and Secretary of the Barnsley Gas Company, to which some reference is made above, the Directors have appointed his eldest son, Mr. HAROLD HUTCHINSON, who for the past eleven years has been his Assistant, Engineer and Manager. The secretaryship has been conferred upon Mr. T. W. ROYSTONE, who has hitherto filled the position of Chief Clerk.

The employees at the Gas Street works of the Bolton Corporation assembled on Friday to testify their personal respect and esteem for the Superintendent, Mr. A. E. SAVILLE, who, as already announced in the "JOURNAL," is relinquishing the position on his appointment as Engineer, Manager, and Secretary of the Farnham Gas Company. The testimonial consisted of a beautiful silver rose-bowl and an umbrella. Alderman Webster, the Chairman of the Gas Committee, presided, and, after wishing Mr. Saville happiness in his new home, asked the Gas Engineer (Mr. W. J. Smith) to make the presentation. In complying with the request, Mr. Smith expressed his pleasure in doing so on behalf of the officials and the workmen. He said the gifts must be regarded less for their money value than as tokens of the respect in which Mr. Saville had been held during the nine years he had been at Bolton. It was a kind thought which prompted the men to contribute to the testimonial, and he hoped Mr. Saville would appreciate the sentiment. In acknowledging the presentation, Mr. Saville said the gifts would always remind him of the happy times he had had at Bolton. He thanked the donors sincerely, and wished them all much happiness in the future.

OBITUARY.

Colonel Porter, the Chairman of the Liverpool Corporation Water Committee, at last week's meeting, referred to the great loss the Committee had sustained through the death of Professor Sir RUPERT BOYCE. Sir Rupert, he said, was a man of extraordinary scientific ability and knowledge; and his reputation was not by any means confined to the city in which his work principally lay. His connection with the city commenced in 1897, when he was appointed to make bacteriological examinations of the Liverpool water supply. Prior to this, the Committee had only chemical

analyses of the water, and it was felt that, owing to the increasing importance of the science of bacteriology, an expert of acknowledged authority should be appointed to report upon the number and kind of bacteria present in the water supply from the different sources, and in the water as delivered to Liverpool. Since 1900, daily examinations of the water had been continued; and Professor Boyce had also made other valuable investigations into the purity of the water supplied to the city. He was sure they all greatly mourned his loss; and he proposed that a vote of condolence be sent from the Committee to members of his family. This was agreed to.

PROFIT-SHARING AND MUNICIPALITIES.

[COMMUNICATED.]

PROFIT-SHARING was started at Sir George Livesey's instigation in the South Metropolitan Gas Company in 1889—21 years ago. Four years later, the South Suburban Company followed suit. Although the system worked so well in these two cases that it has since been amplified and extended, yet no other gas company adopted it for seven years, when three more started at intervals. However, within the last three years 28 more companies have put into practice various schemes of profit-sharing; and most of these have gone further, and either encouraged or required their profit-sharing employees to become shareholders, and thus in some sense "co-partners," until at present more than one-half the capital of non-municipal gas undertakings is in profit-sharing companies. The total capital of these companies is over £47,000,000. About 19,600 employees share profits between them, which last year amounted to nearly £89,000. Altogether, the employees have received £686,000 in profits above their wages; and they hold nearly £600,000 of stock. The precise figures are given in a table in the annual report of the Labour Co-Partnership Association.* One municipality has inaugurated a system of profit-sharing; and there are not wanting signs that others have the matter under consideration.

It is the impossibility of gauging the value of a man's work before it is done which is one of the fundamental reasons for the claim that workers should share profits. Without this, there are no material reasons why the individual worker should do more than the minimum required to escape dismissal; though clearly there are as many moral reasons why the worker should give the utmost he is capable of, as that the employer should increase the reward if he finds that he is receiving more than his due in return for the wages he pays. True, the worker has the chance of rising to a superior position, though in general this is small, and after the attainment of a certain age almost negligible. But we are not concerned with the opportunity of one man rising among his fellows, but of all rising together; and how else is this to be attained unless a general improvement of capability is to be followed automatically by a rise in reward? By means of co-partnership, this automatic correspondence between the efficiency of labour and its reward can be ensured, along with friendly relations between Labour and Capital. It may be urged that in higher branches of work, and in the professions, the reward is fixed before the work is done. The answer to this is twofold. First, in many cases, as among lawyers, and men of business and finance, this is not the case, but reward follows very closely upon efficiency; and in many other cases, where pecuniary reward seems to be determined previous to the work being done, there is very clearly the reward of promotion and increased pay awaiting success, or in others the rewards of fame and honour—these two latter very frequently bringing pecuniary reward with them. But in other professions, as in the ministry of religion and in the teaching profession, where actual pecuniary reward and promotion are comparatively infrequent, there is great reward due to reaping where one has sown, as well as much variety of work and great human interest—three characteristics which machinery and specialization are driving out of the ordinary workman's life. The workman ceases to be a craftsman, or in any sense an artist; and his work tends to a dead-level of monotony. Yet, it is proved beyond shadow of doubt that there is still great saving to be obtained by efficiency. What incentive can be applied so as to ensure the acquirement of this efficiency among workers? Surely, it must be to bring him to the level of his employer, who devotes himself to the work because he will thereby reap enhanced reward.

In the gas company schemes, a portion of the profits is paid to the workers as a dividend on wages—that is, each man receives of the total profits allotted to labour a share calculated in proportion to his year's wages. When such schemes were first put into practice, it was usual to pay this dividend to the worker in cash; but this was found to do very little good, as the sum each man received was necessarily small, and was often spent without the workman being consciously the better off. It was with this feeling, engendered by their five years' experience, that, in 1894, the South Metropolitan Gas Company increased the rate of their bonus, provided that at least one-half was invested in the Company's stock. This has led to the employees owning shares to the value of over £400,000, out of a total profit received of, roughly, £506,000.

It is this capital-owning which is considered to have been the cause of the improvements noticed among the employees, who feel that the business in which they are employed is in part at least

their own; and therefore their interest is kindled in its conduct and success. Sir George Livesey assured the shareholders that all this profit paid to Labour had not decreased in the least the profits assigned to Capital. It was gained, he declared, from the quickened care and zeal of the workers themselves. He laid especial stress on the great opportunities which workers have of saving material and time. Besides this, capital-owning raises the worker in his own esteem; and this in itself tends to make him a better and more capable worker. Again, his interest in this business is still further increased.

But capital-owning has also another great effect. One of the most crushing burdens which many workers have had to face is the fear of poverty in old age. By co-partnership the business which keeps the worker during his time of activity is made to keep him also on his retirement; for the capital saved up will, if necessary, supply a pension. This benefit is not at all lessened by the national old-age pensions. Previously the thrift, care, and saving necessary to enable the worker to put by enough for a pension for himself and his wife, seemed altogether beyond his power; and, if exercised, it often tended to penuriousness and self-deprivation. The man denied himself the things that make life in any real sense, in order to prepare for an old age which would in consequence be empty, because he would have no resources for pleasure within himself. But now every penny saved does not go merely to stave off the workhouse or starvation temporarily, but is saved for actual future enjoyment. Saving now is no longer a drudgery, but can be a sane decision between the fulfilment of wants in the present and in the future. The workman, freed from the dark lowering cloud of an unprovided old age, will most certainly have far more chance of attaining efficiency and keeping his vitality during his working life.

These two propositions being accepted—(1) that the worker shall share in the profits, and (2) that this profit shall be accumulated as shares—it remains to consider how they can be applied in practice to municipal work, and more especially to municipal gas-works.

Profit-sharing is already practised in one municipal gas-works, as has been mentioned already; and the following are the conditions laid down.

No. 1.—ACTUAL SCHEME.

1.—That when the total cost of manufacture and distribution of gas shall be less than 10d. per 1000 cubic feet of gas sold, a bonus equal to one-fourth of the difference between that sum and the actual cost shall be divided among the workmen and clerks who have been employed in the Gas Department for not less than three months during the year in which the bonus has been earned.

2.—That in any year where special charges (such as main-laying operations) have been charged against revenue, instead of debiting same to capital account, the amount of such (correctly speaking) capital charges be deducted from the true manufacturing and distributing charges, in addition to the net cost of coal, rates and taxes, depreciation, and depreciation on cookers, &c., and that effect be also given to the profit and loss on gas-fittings.

[N.B.—The engineer does not receive a bonus.]

This is straightforward and simple; but it is only profit-sharing. The following is a suggested scheme for adding on capital-owning, and thus making the scheme much more allied to co-partnership. Shortly, the scheme proposes the formation of a Workmen's Investment Society, which in its corporate character shall receive the total dividends on wages, and, on the one hand, invest them in municipal stock, and, on the other, credit them to its members in proportion to the wages each one has earned.

No. 2.—SUGGESTED SCHEME.

1.—The employees shall form an Employees' Investment Society, registered under the Industrial and Provident Societies Act.

2.—The municipality shall fix a standard price for the gas, and agree to pay a yearly dividend on wages. The rate per cent. of this dividend shall rise as the cost of production falls, and *vice versa*, in accordance with a recognized scale.

3.—The amount of this bonus shall be calculated on the sum of the total wages during the year, together with the total accumulated bonuses of the workers; these being reckoned only up to the value of the wages earned in the last year, half year, or other period agreed upon.

4.—The Employees' Investment Society shall be credited by the municipality with this total sum and a minimum rate of interest guaranteed to it.

5.—The Investment Society shall credit each member with his respective amount, and shall annually add to each member's credit a share of the total dividend calculated in proportion to the sum of the member's wages for the year added to his accumulated "dividends."

6.—The Investment Society shall have power to allow members to withdraw the whole or part of their capital. It is recommended that no employee shall withdraw any part of his holding in such a manner as to reduce his holding to less than the value of his ordinary wages for one year, a half year, or other agreed-upon period; except that the total shall be paid to him six months after his leaving the works in case of dismissal or departure to other work, and he may at pleasure withdraw it in case of retirement due to old age.

7.—The bonus shall not be allotted by the Employees' Investment Society to any employee who has worked for less than three or other agreed-upon number of months during the year; but such sum credited to them shall be kept by it in a separate account, as a benefit fund, from which help may be given to members in case of need.

8.—The municipality shall keep a separate account of all sums credited to the Employees' Investment Fund, and shall have power to use the money to lend to individual workmen, or groups of workmen, for building houses for members of the Society, or for other such purposes.

* See "JOURNAL," Vol. CXIV., pp. 52, 180.

9.—In calculating the cost of production for the year, expenditure which would ordinarily be charged to capital shall be spread over a series of years.

It is almost needless to point out how many benefits, besides the pecuniary ones primarily intended, will certainly gradually accrue from the association of the workers into a corporate unity. The Employees' Society will have a Committee, to which certain discretionary powers may well be given with reference to such matters as paying-out retiring members, admitting fresh ones, making loans to members, and the use of the reserve which will gradually accumulate, partly, perhaps, by direct allocation, and partly by the sums paid on wages earned by men who have been employed less than three months. The employees having thus obtained a machinery for self-expression, many of those small matters which tend to friction can easily be set right by discussion between (say) the chairman of the Employees' Society, and the manager or engineer, as the case may be. Thus, good relations will be fostered, to the benefit of all concerned—employees, managing committee, ratepayers, and consumers.

If for any reason it is thought undesirable that the employees should form an association, then the same result as to capital holding can be attained by the municipality granting loan stock direct to the individual employees. In the case of a company, there is felt by some people to be an objection to creating a large number of small shareholders whose presence at general meetings would, they think, be of no advantage to themselves or to the other shareholders, and also they could not well spare the time; whereas the few responsible delegates of an Employees' Society would clearly have a defined function, and it is found in practice that they are able to fulfil it satisfactorily. In the case of a municipality, this difficulty does not occur. The advantages of

an Employees' Investment Society are mainly that it offers a centre and machinery for social work, provident and sick funds, and so on. In this case, the following rules are suggested.

No. 3.—SUGGESTED RULES.

- 1.—The municipality shall fix a standard price for the gas, and agree to pay a yearly dividend on wages. The rate per cent. of this dividend shall rise as the cost of production falls, and *vice versa*, in accordance with a recognized scale.
- 2.—The amount of bonus due to each employee shall be calculated in proportion to the sum of (a) his total wages during the past year, and (b) his accumulated bonuses; these being reckoned only up to the value of the wages earned by this employee during the past half year (or other period agreed upon).
- 3.—The municipality shall guarantee interest on further deposits from their workpeople at the current rate paid on municipal stock.
- 4.—The bonuses shall not be withdrawable; but the municipality shall have power to allow employees to withdraw the whole, or part, of their holding as it deems fit in the case of any individual application. In general, no employee shall withdraw any part of his holding in such a manner as to reduce his holding to less than the value of his ordinary wages for one year, a half year, or other period agreed upon; except that the total shall be paid to him six months after his leaving the works in case of dismissal or departure to other work, and he may at pleasure withdraw it in case of retirement due to old age.
- 5.—The bonus shall not be allotted to any employee who has worked for less than three months (or other period agreed upon) during the year; but such sum due shall be credited to a separate account, which can be used by the municipality for the general benefit of its employees from time to time, as it deems fit.
- 6.—In calculating the cost of production for the year, expenditure which would ordinarily be charged to capital shall be spread over a series of years.

EFFECTIVE GAS ILLUMINATION DEVICE AT NORWICH.



IN connection with the Coronation festivities and the King's visit to the exhibition of the Royal Agricultural Society at Norwich last Wednesday, the offices of the British Gaslight Company were illuminated with a very effective device which is shown in the accompanying illustration. It attracted a great deal of attention; the movement of the flames giving much pleasure to the crowds of sightseers. The following were the dimensions: The crown was 20 feet diameter; the word "Coronation," 3 ft. 6 in. letters; "G. R.," 6-feet letters; the motto, "Long May He Reign," 2-feet

letters. The whole was surrounded by a framework of star burners 55 ft. by 40 ft., surmounted by three flambeaux. The device was designed and erected under the supervision of Mr. W. H. Wayte, the Company's Outdoor Superintendent. The picture, for which we are indebted to Mr. Thomas Glover, the Company's Engineer and Manager, is interesting, as it shows the Company's offices behind the device, the church of St. Peter Mancroft to the right, and the other buildings surrounding the Market-Place.

Mr. C. R. Darling's Cantor Lectures on "Industrial Pyrometry."

—In the report of the Council of the Royal Society of Arts, reference is made to the above-named lectures, which were noticed in the "JOURNAL" at the time of their delivery. The Council say: "Mr. Darling gave a very full and clear account of the whole subject, including its history from the earliest attempts to measure high temperatures, and the first crude pyrometer of Wedgwood, down to the development of the very beautiful and accurate instruments which enable modern manufacturers to measure with certitude the precise degrees of temperature required for the manufacture of pottery, glass, iron, and steel, and for other processes in which extremely high temperatures are required. It is a point which may be noted with some interest that it is almost true to say that during very recent times the thermometric scale has been enlarged from a range extending merely from the solidification to the vaporization of water, to one reading from the absolute zero of temperature (-273° C.) up to, say, 1500° C.; that is to say, a scale of 100° C., from 0° to 100° , has been enlarged to a scale of nearly 2000° , from -273° C. to $+1500^{\circ}$ C. or thereabouts."

Projected International Smoke Abatement Exhibition.—Under the Auspices of the Coal Smoke Abatement Society, it is proposed to hold a Coal Smoke Abatement Exhibition at the Royal Agricultural Hall, Islington, from the 6th to the 18th of May, 1912. As the result of the preliminary announcement of the exhibition, we learn that much support has already been accorded to the undertaking. The exhibits will be divided into seven classes, the second of which will include those employed in domestic heating. Section B of this class will include gas fires and stoves, gas producers and generators, and heating and cooking appliances; while in Section B of the fourth class will be found suction-gas plants and gas and other engines for the generation of motive power. Conferences will be held in connection with the exhibition. In the first list of the Council are the names of Mr. James W. Helps and Dr. Samuel Rideal; and among the Vice-Presidents are Lord Rayleigh (the Chief Gas Examiner for the Metropolis) and Sir Oliver Lodge. The Organizing Manager is Mr. Frederick W. Bridges, of Balfour House, Finsbury Pavement, London, E.C.

ALKALI=WORKS CHIEF INSPECTOR'S REPORT.

THE Forty-Seventh Annual Report [for 1910] of the Chief Inspector under the Alkali Works Regulation Act, 1906, was issued last Wednesday. It is signed by Mr. W. S. Curphey, who early in the year succeeded Mr. R. Forbes Carpenter as Chief Inspector, on his resignation of the position on account of ill-health. Consequent upon this change, Mr. J. W. Young, B.A., B.Sc., who was previously resident in Manchester as a District Inspector, was appointed Inspector in Scotland, in succession to Mr. Curphey; and Mr. H. J. Bailey, F.I.C., of Pontypridd, was entrusted with the duties relinquished by Mr. Young. Mr. S. E. Linder, B.Sc., whose name has been frequently mentioned in the "JOURNAL" in connection with the important investigations initiated by Mr. Carpenter, has been retained by Mr. Curphey as his assistant.

In opening his first report in his new capacity, Mr. Curphey says he feels that his endeavours to continue the long series of interesting reports prepared by his predecessors call for forbearance. He then proceeds to state that the number of works registered on Dec. 31, 1910, was 1266. Of these, 70 only were works decomposing salt with evolution of muriatic acid, and so scheduled as alkali works; while the remainder—1196—carried on processes which were scheduled or were subject to registration under the Act of 1906. These numbers show a decrease of one alkali works, and an increase of four scheduled and registered works, compared with 1909—the net increase being three. There are also 168 works registered in Scotland; bringing up to 1434 the total number of works registered in the United Kingdom. The number of separate scheduled and registered processes under inspection last year was 1872, compared with 1857 and 1839 in the two preceding years. These figures show an increase of 15 compared with 1909. There is again a noticeable increase in the number of works manufacturing sulphate and muriate of ammonia; these accounting for seven out of the total net increase. The Inspectors paid 5868 visits to works, and carried out 6184 tests, compared with 5600 visits and 6252 tests in 1909. There was a decided fall in the acidity of the gases from all chimneys last year. It is satisfactory to find that no proceedings had to be taken against owners of registered works for infraction of any of the penal clauses of the Act, though in one instance serious warnings had to be given, which resulted in the owners taking satisfactory steps to prevent further undue escape of noxious gases. In two cases complaints were made against gas-works of causing offensive effluvia; and in both instances the sulphate of ammonia plant was regarded as a probable source. Independent local inquiry showed that in one case the source of annoyance was not associated with any part of the gas-works; while in the other every possible step had been taken to comply most fully with the requirements of the Act.

SULPHATE OF AMMONIA AND GAS-LIQUOR WORKS.

Mr. Curphey reports that the total number of processes of this class under inspection last year was 600—an increase of nine on the figures for the year 1909. Four of these were carried on in coke-oven works, and five dealt with the ammoniacal liquor from gas-works. Mr. Curphey remarks:

In many ways this is an important class of works. It is by far the most extensive of any, in respect of the number of works coming under inspection; and the operations are frequently associated with the evolution of a most offensive gas. It is of interest, also, as sulphate of ammonia has as possible competitors the various chemical products through which the nitrogen of the atmosphere is now being brought into useful service in increasing quantities by the different methods which applied science has recently developed. An additional claim for attention is the probable expansion of ammonia production, owing to the further erection of recovery plants connected with the manufacture of coke and fuel gas. Recent improvements in the design of sulphate of ammonia plant suitable even for small gas-works is likely to add to the total of sulphate of ammonia production by enabling many small or inconveniently situated works to produce sulphate more economically than heretofore; while the recovery of this substance from peat continues to receive energetic attention, and may prove a further source of production. While there are many uses to which ammonia may be put, some of which are not inconsiderable, the great outlet is, and is likely to remain, agriculture.

RECOVERY AND PRODUCTION OF AMMONIA.

Mr. Curphey gives the customary statistics (for which he acknowledges his indebtedness to manufacturers) in regard to the production of sulphate of ammonia in the United Kingdom. They are as follows (in tons):—

	1910.	1909.	1908.
Gas-works	167,820	164,276	165,218
Iron-works	20,139	20,228	18,131
Shale-works	59,113	57,048	53,628
Coke-oven works	92,665	82,886	64,227
Producer-gas and carbonizing works (bone and coal) . .	27,850	24,705	24,024
Total	367,587	349,143	325,228

These figures show an increase from all sources of supply, with the exception of that from iron-works, where the insignificant reduction of 89 tons has to be recorded. The net increase over 1909 was 18,444 tons. This was not so great as was the case between 1908 and 1909; but during 1910 prolonged strikes interfered seriously with the expansion which would otherwise have occurred from increased operations in coke-oven works. Nearly one-half the total production of sulphate of ammonia still comes from gas-works liquor. The small reduction noticeable between 1908 and 1909 has been replaced by an increase which brings the figure for 1910 well above that for 1908.

In the report for 1909, reference was made to the difficulties experienced in regard to the disposal of effluent liquors by their discharge into river courses. These difficulties continued last year; and they were an important factor in furthering the introduction of a new design of plant for recovering ammonia from coke-oven gases. By its use, any noxious gases associated with the production of sulphate of ammonia are retained in the fuel gases, and pass along with them to be consumed in the ordinary operations of the factory. A similar system of ammonia recovery was introduced into gas-works during the past year. In both systems, the whole volume of gas produced is passed through acid contained in a saturating vessel, and the discharge of an effluent liquor is avoided. But the conditions being different in the two classes of work, the recovery plant differs in detail. Mr. Curphey offers the following remarks on the system:—

In this method of working, any sulphuretted hydrogen present proceeds along with the crude coal gas to be dealt with in the purifying plant before the illuminating gas is distributed to the consumers. A further advantage incident to this method of working which has a claim on the attention of all makers of sulphate from ammoniacal liquor is the absence of the necessity for storage and transference of such liquor. This advantage is twofold. In the first place, a possible source of much offence is avoided (in the past justifiable complaints have been made of objectionable effluvia arising from ammoniacal liquor stored in tanks); and in the second place, opportunity for a tangible loss of ammonia is avoided. In the case of underground tanks, this loss may arise and continue without being readily recognized. It is certain to arise, through the diffusion of the ever-volatile ammonia, in the case of ammoniacal liquor tanks which have a ventilating communication with the atmosphere. Loss in this way will vary with the degree of exposure to the air, the strength of the liquor, the duration of storage, and from other influences. That it may be considerable will be appreciated when one so familiar with the subject as Mr. John T. Sheard, of Sheffield, has estimated that in 24 hours, and with a still atmosphere, this loss may amount to as much as 3 to 5 per cent. of the whole amount exposed.* This tendency of ammoniacal liquor to part with its ammonia requires to be considered in analytical work also. Without due precaution, low results may readily be obtained by loss of ammonia through diffusion in the short time required for a direct titration of the volatile ammonia in a sample of liquor.

No alteration is recorded in the methods of dealing with the waste gases from the treatment of ammoniacal liquor in gas-works. The oxide of iron purifier is the agent most widely used for preventing the escape of sulphuretted hydrogen. Mr. Curphey says the "heap" form of this kind of purifier has many advantages over the older forms of box or walled purifier. In some cases, the distributing area provided for the gases after leaving the pipe conveying them to the purifier, and before entering the oxide of iron, seems small. This tends to create unnecessary resistance to the passage of the gases, and to throw back-pressure on the saturator. On the other hand, too large an area in proportion to the volume of the gases to be treated tends to local action in the purifier. Reference was made in last year's report to the erection in the latter part of 1909 of plant for the elimination of sulphuretted hydrogen from crude coal gas, and the recovery of the sulphur as a bye-product, according to the patent specification of Herr Walther Feld, which has already been noticed in the "JOURNAL." Mr. Curphey says the process never got beyond the experimental stage; and its operation was discontinued before he had an opportunity of seeing it in action.

SULPHIDE WORKS.

Last year, 66 works were registered as sulphide works. The great majority of these are works in which sulphuretted hydrogen is used for the formation of metallic sulphides for sale or for industrial use, or else in the course of purifying acids from metallic impurities. The customary method—and Mr. Curphey says it is a satisfactory one—for dealing with any small excess of sulphuretted hydrogen is by absorption in purifiers charged with slaked lime. The use of the lime purifier is, however, not so suitable in the case of some works included in this class; and in one case an alternative to the method of combustion now practised was sought for. This led to some laboratory work on which Mr. Linder prepared a memorandum, which is given in full in the report. The results are of interest as showing the great influence on the products of oxidation which is exerted by the base used to bring about the alkaline condition necessary for the reoxidation of lower oxides of manganese suspended in water.

Mr. Curphey concludes with an expression of appreciation of the successful manner in which his colleagues discharged their duties during the year, and of the valuable work done by Mr. Linder in carrying out the duties of the department. He adds

* See lecture to the Manchester and District Junior Gas Association, on "The Chemical Control of Gas-Works," given in the "JOURNAL" for Feb. 7 last (p. 373).

that "the good understanding which has always prevailed between manufacturers and inspectors continues to be a valued aid in the efficient administration of the Act."

The report of the Chief Inspector is followed, as usual, by those of the District Inspectors, some extracts from which are given on pp. 55-57.

THE INSPECTION OF FACTORIES.

IN the last number of the "JOURNAL" we gave some extracts from the recently issued annual report of the Chief Inspector of Factories (Sir Arthur Whitelegge, M.D.); dealing more particularly with the reports of the District Superintending Inspectors. We now notice those of the Principal Lady Inspector (Miss Anderson), the Inspector for Dangerous Trades (Mr. W. S. Smith), and the Medical Inspector (Dr. Thomas M. Legge).

The report of the Principal Lady Inspector (Miss Anderson) contains extracts from reports made by the ladies acting under her supervision. Miss Paterson says:

Much work has been done during the year to secure improvement in ventilation, temperature, and lighting. I am more than ever convinced that the temperature must be put right first if ventilation is to be improved. Miss Perry writes on this subject that the necessity for artificial means of ventilation in laundries is constantly showing itself. Most laundries of any size have now artificial means of ventilation in at least the ironing and machine room, but not always well applied. Only in a few cases was the ventilation in ironing-rooms, where hand irons were used, found to be in any way satisfactory. Either from leakage or from incomplete combustion, the air in these rooms invariably shows much sign of free gas. The matter is one which needs careful consideration by laundry occupiers. The introduction of high-pressure gas recently has seemed to result in some improvement. But this method is still in the experimental stage; and it has its detractors as well as its supporters. There is no doubt that direct ventilation from machines is capable, if well carried out, of removing all cause of complaint. In a laundry attached to a large hospital in London, the work has been excellently done, and the air is completely free from gas. The gas hand-iron, however, presents its own difficulties—all the more that it is often under the control of someone who only imperfectly understands how to keep it in order. One or two defective irons can make things very unpleasant for a roomful of people.

Referring to producer gas, Miss Paterson says its use in the ironing-rooms of laundries is not common, and the effect of any leakage or defect in the plant may be so serious that one is not anxious to see its use extend. Its introduction into two large laundries in London gave rise to a good deal of sickness during the past year. Her attention was called to it by a doctor, and investigation showed that the effects had been serious. The gas was used for the irons and for the ironing-machines (except those heated by steam), and also for gas-stoves provided in the messroom. The women affected suffered all in much the same way—head-ache, palpitation, and in some cases loss of consciousness. Miss Paterson says there is an unpleasant "taste" in this gas which the workers dislike; and when its use was given up in both laundries, she has begged to see that it was not started again, in spite of its use having been the cause of a reduction of 50 per cent. in the amount charged for gas to the ironers. The introduction of gas containing so large a proportion of carbonic oxide into a room, and its distribution, it may be, to a hundred different points, involving its passing through pipes, joints, and taps, is a source of danger unless all the plant is kept in better order than in the average laundry. Another Lady Inspector says the general ventilation of laundries may be good, even where gas-irons are in use. From thirteen representative laundries, all using gas-irons, a number of air samples were taken. The highest proportion of carbon dioxide found in 32 samples was 11·6, and the lowest 5·4, parts per 10,000. These results are stated to be very satisfactory. In one laundry, producer gas is used for heating irons and ironing-machines; and here the workers appear to suffer from the effect of the fumes, leakages from defective joints and connections, and incomplete combustion of the gas. It is considered probable that a combination of both accounts for the fumes; and it is pointed out that if the use of this gas is to be continued, very good mechanical ventilation must be provided, and great attention paid to joints and connections.

The report of the Inspector for Dangerous Trades (Mr. W. S. Smith) contains some remarks on the subject of purifiers in gas-works. Owing to the occurrence of serious fires and explosions resulting in accidents from time to time to workmen engaged in emptying these vessels, he made inquiry as to the precautions taken in some of the gas-works in London and the immediate neighbourhood. As a result of his inquiries, he reports as follows:

In some works it is necessary to empty each purifier after a month's working; in others, the period may be two months or more. A special gang of men is usually constantly employed, on piecework rates, for this work. Care is required in handling the spent oxide, as it readily oxidizes on exposure to the air, and may by spontaneous combustion give rise to fire or explosion if the material contains residual coal gas or explosive mixtures of gas and air. For this reason, the purifiers are emptied as quickly as possible. . . . Special precautions are taken in some of the larger works to ventilate and free the purifiers from residual gas, either by blowing air for a few minutes through the purifier before

the cover is raised, or by exhausting the residual gas with an exhaust-pump. Where these or similar means are taken, it is usual to find that the men enter the purifier as soon as the cover is removed. In works where no special means exist for ventilating the boxes, a period of time is allowed to elapse before the men enter. As a rule, the removal of the cover takes from 15 minutes to an hour, according to the size of the box, its construction, and the type of lifting appliances. The men enter about half an hour afterwards. In a few works, the cover is lifted the previous evening; but some managers object to this practice, on the ground that the supervision may be less at night, and other unforeseen accidents may occur. In works where carburetted water gas is manufactured, greater danger is recognized at the purifiers used for this gas, owing to the high percentage of carbon monoxide present. It is the universal practice before emptying such purifiers either to blow air through for a number of hours, and in some cases to continue blowing while the men are at work within the box, or to remove the covers at least 24 hours before the men are allowed to enter.

The following other general precautions have been noted at different works: The purifiers are either in the open or in well-ventilated sheds or buildings; no lights are allowed, except electric torches or lamps; the work of emptying and recharging is always done during daylight; hose-pipes and a water supply are kept close at hand to extinguish out-breaks of fire; and the outlet and inlet connections of the boxes are usually water-luted, when work is necessary within the purifiers, to prevent accidental leakage through the valves. A hole is often made through successive layers of the oxide at one part of the box, before emptying operations are commenced, to facilitate the escape of any residual gas from pockets; and in some works, such holes are tested for gas by a gas-indicator. Pressure-gauges are fitted to many purifiers; and these serve to detect leakage of gas before the removal of the covers. Steam is blown through the purifiers in a few works, for an hour or more, before the boxes are shut off, in order to damp the material. To prevent sparking, the use of picks is often forbidden, either entirely, or near the sides of the boxes, or in the neighbourhood of the cast-iron standards which support the wood grids. All iron bolts and nuts used in the construction of the grids are covered over with wood; the men often wear copper foot-plates on their boots; and the oxide is riddled to remove stones.

Mr. Smith says the majority of gas managers are fully aware of the dangers at the purifying plant, and all take some of the above-named precautions. The men, as a rule, are conversant with the work, and understand the risk of fire, explosion, and gassing. Accidents appear to be few. At one works, with fifty purifiers, 300 boxes are emptied and recharged per annum, and there has never been an accident. It has been suggested that the risk would be reduced to a minimum if the purifiers were first blown out with an inert gas, such as ordinary furnace gas, and afterwards for a few minutes with air, before the covers are removed; but Mr. Smith has not heard of any works in which inert gas is so used. Some managers object to blowing air through the boxes, on account of the tendency to increase the oxidation of the spent material.

The report of the Medical Inspector (Dr. Thomas M. Legge) contains, under the heading of "Fumes and Gases," the following tabular statement of the number of cases of "gassing," or of accidents (sometimes fatal) immediately attributable to the state of unconsciousness induced thereby, and the nature of the fumes or gases giving rise to them, reported during the past year. Comparison is made with similar totals for two previous years. The principal figures relate to all cases—fatal and non-fatal; those in parentheses to fatal cases only.

Nature of Gas or Fumes.	1910.	1909.	1908.
Carbon monoxide.	53 ⁽⁹⁾	53 ⁽⁶⁾	55 ⁽²⁾
(a) Blast furnace.	19 ⁽⁷⁾	6	26 ⁽³⁾
(b) Power (suction, producer, Mond, Dowson)	25	25 ⁽⁴⁾	19 ⁽²⁾
(c) Coal	4	11 ⁽¹⁾	9
(d) Other	5 ⁽²⁾	1 ⁽¹⁾	1
Sulphuretted hydrogen	2	5 ⁽²⁾	8 ⁽¹⁾
Carbon dioxide	2 ⁽¹⁾	2 ⁽²⁾	4 ⁽³⁾
Chlorine	2	1	1
Nitrous fumes	11	12 ⁽²⁾	3 ⁽¹⁾
Dinitrobenzol	18	4	2
Benzol . . . . .	..	1 ⁽¹⁾	2
Other	4	4	3

While on the subject of "gassing," it may be mentioned that two cases are referred to by Mr. John Law (Blackburn) as having occurred to men engaged in cleaning out the scrubbers in gas-works. On investigation, it was found that a smoke-helmet, with air-bellows, was provided for use; but, the foreman being away on a holiday, the men did not trouble to put the helmets on. He also refers to risks to which men are exposed who have to clean out and renew oxide in purifiers, owing to possible accumulations of sulphuretted hydrogen. One death was alleged to have been due to this cause; and though there was no direct evidence at the inquest to confirm this, Mr. Law considers it desirable in such cases that chemical respirators be provided and worn.

Reverting to Dr. Legge's report, he says great difficulties present themselves in attempting to classify industrial poisons satisfactorily. Classification should take account of the relative toxicity of the compounds, and of the various processes in which they come to be used; and if it is not to lead to erroneous conclusions, it must be complete. Otherwise failure to mention any may lead to the assumption that those omitted are harmless.

The report of the Electrical Inspector (Mr. G. Scott Ram) does not call for notice here. It was dealt with in "Electricity Supply Memoranda" last week,

SPECIAL ROAD CLAUSES IN GAS ACTS.

By ARTHUR VALON.

FOR some years past local authorities charged with the duty of maintaining the public roads have made persistent endeavours to supersede the provisions as to the laying of mains contained in the Gas-Works Clauses Acts, by special clauses inserted in the Private Acts authorizing the operations of individual companies. It is somewhat remarkable that the authorities who are most insistent are, as a rule, those that are least affected by the operations of a gas company. If the restrictions upon the gas company were in reality ineffective and insufficient, and the powers of the road authority inadequate, it would be natural to expect that the road authority of the urban area within which the company supplied gas would be the first to feel the necessity of further powers, and the foremost in asking for them.

As a matter of fact, it has been comparatively rare for any extension of the provisions of the General Acts to be demanded by the authorities of the urban area within which the company supplies gas. Occasionally a rural district council took action; but the bulk of the applications have been made by the county councils in regard to main roads. That these authorities should take the lead is perhaps not surprising, in the absence of any serious deficiencies in the existing law. It is apparently a universal, and certainly within reasonable limits an admirable, characteristic of the British official to endeavour to increase the importance and authority of the body which he serves; and, added to this, there is a tendency, which seems inherent in the official mind, to regard a public body as an entity altogether independent of the electorate which appoints it. Perhaps it may be these two influences working together that lead to the attempts made to render as nearly absolute as possible the authority of particular bodies within their spheres of action, regardless of the rights of others within the same spheres, and sometimes without respect to the interests of the electorate represented.

To furnish the proper corrective to these aberrations is one of the functions of the representative body. But as the influence of the bureaucratic element is always stronger the wider the area from which the representatives are drawn, it is not difficult to see that arbitrary powers are less likely to be sought, in the first instance, by more purely local bodies than by the county councils. "In the first instance" is said advisedly, for the suggestibility of the human being, or the imitative instinct of mankind, whatever may be the correct term used by psychologists to denote a well-known phenomenon, is quite sufficient to ensure the widespread adoption of an idea with the prestige of such a body as the county councils behind it.

It would indeed be interesting to know how far the desire to amend the existing provisions arises from difficulties which a particular authority has experienced, and to what extent it has been occasioned by some organization or association to which such authorities or their officials may belong. The movement has gathered like a snowball; and at the present time corporations, district councils, and other public bodies, railway companies, and even private individuals, have all joined in the scramble for so-called protective clauses. To so absurd a pitch has it been carried, that in an Act passed last session consisting of 18 pages, 14 pages were occupied by clauses for the protection of four public authorities, two railway companies, and one private individual. Each had a separate set of clauses—in many cases dealing with the same matters in different terms and by different methods.

In a recent case in which the writer was engaged, the county council witnesses admitted that no difficulties had occurred with the gas company whose Bill was under discussion; but they were anxious to get new provisions inserted to serve as a precedent in other cases. Not a very conclusive reason for the insertion of special provisions in a Private Act! It was also admitted in the same case that the county council desired to have special clauses proposed by them inserted in all Bills promoted by gas-works; thus showing that what was asked for was looked upon as of universal application, and consequently should properly take the form of an amendment of the general law.

In 1903, thirty-six gas companies promoted Bills or Orders. Of this number, nine contained some special provisions in regard to roads; while twenty-seven left the general law unmodified. In 1910, of the twenty-five Bills and Orders promoted by gas companies, special road clauses were inserted in nineteen; and only six left the general law unaltered. Dealing with county councils only, in 1903 special clauses for their protection were included in six only of the thirty-six Acts and Orders; but in 1910 the proportion had increased to eighteen out of twenty-five. The decisions of the Parliamentary Committees, given after the case has been fully argued before them, are not the causes of this success. On the contrary, the decisions have not been at all encouraging to the county councils. The results have been attained by attacking the companies in detail.

Promoters of Private Bills, finding themselves faced with strong opposition to the main purposes of the Bill, often endeavour to concentrate their defence by compromising or giving way to opposition on points which seem to them of subordinate importance, without regard to the reasonableness or justice of the point itself. On the other hand, where a Bill is unopposed except upon details, promoters are generally willing to settle the matter by concession so as in order to avoid expense. This last consideration weighs very

heavily with a small company, to whom perhaps the concession of clauses will not mean any very serious immediate liability.

Now although it may be quite true that clauses inserted by agreement may be considered as a bargain between the opponents, and not as a precedent for their compulsory insertion by the Committee against the wishes of the promoters, it is not possible to ignore altogether that, for some reason or other, most of the Acts as passed have contained some or all of the clauses asked for. Such a consideration must have some weight with a Committee, and a weight which will increase with the number of Acts containing the provisions.

It therefore seems time for gas companies to consider whether they are willing to have the existing regulations as to the opening of roads and the laying of mains amended according to the ideas of the county councils, as embodied in the special clauses usually put forward on their behalf; for this is what it may come to. If all, or the overwhelming majority, of Acts contain the clauses, it will hardly be possible to resist the conclusion that they are recognized as reasonable, and should be applied to all companies and all roads by an amendment of the general law.

Let us consider what it is that the road authorities want, and how far their requirements are reasonable. The privilege of laying mains in public roads, and over public bridges, is given to authorized gas undertakings by section 6 of the Gas-Works Clauses Act, 1847, and in that, and the following clauses, are laid down the provisions which must be observed when the privilege is exercised, the liability of the company to make compensation for damage done, and the penalties that may be incurred by infringement of the provisions of the Act.

All work in public roads must be done under the superintendence of the road authority, after they have received three days' notice, and in accordance with a plan to be approved by them. Should the authority disapprove the plan, and propose another, then, failing agreement between the parties, the plan is to be decided by two Justices. It is generally sought by the road authority to substitute seven days for the statutory three days' notice, and to provide that the plan shall be sent to them 14 days before the work is to be begun. It is not improbable that difficulty may have been experienced by the authorities in dealing with notices of important work in the short space of three days; and as the officials of gas undertakings would not be likely to find any serious trouble in giving the longer notice, there seems no reason to object to it.

Other amendments are sometimes sought which specify the scale of the plan, and direct that it shall be accompanied by a section, and shall show the method by which it is proposed to carry out the work. It has already been decided by the Courts that, under the existing law, the plan specified must show the depth of the proposed main, and the mode in which the underground work is to be executed. Further directions would seem to be superfluous, and the reflection is suggested that either those who ask for more detailed directions are unaware of the decided cases, or are desirous of obtaining the insertion of some clause or other regardless of its utility, in order to show that their endeavours have not been entirely fruitless.

Some propositions indicate also that the provisions of the Gas-Works Clauses Acts themselves are not always known. It is quite a usual thing for a clause to be asked for giving the road authority power, when the road has been opened by the gas company, to reinstate the ground in case of delay or omission of the company to do so, charging the company with the cost—despite the fact that section 6 provides that the company shall make compensation for any damage, and section 12 gives power to the authority to do the necessary work at the expense of the gas company in case of their default.

There is no doubt that promoters will generally be willing to accede to the insertion of clauses which do not add to their liabilities, if by so doing opposition can be diminished or avoided. It is, however, desirable to prevent the insertion of superfluous provisions, if only to evade the possible argument that an apparently supererogatory clause must mean something beyond the general law or it would not have been inserted.

As well as the foregoing, there are other provisions generally demanded which are superfluous. A clause setting forth that the company is not to interfere with the structure of any bridge without the consent of the authority (such consent not to be unreasonably withheld), is already covered by the regulations providing that no work is to be undertaken except in accordance with the approved plan; while the provision that the company is to compensate the authority for any damage done, owing to the traffic being concentrated upon one part of the road during the time that the trench is open, would seem to be covered by clause 6 of the General Act, which states that compensation is to be made for any damage done. That such a clause should be sought for may possibly arise from an idea that whereas the onus of proof of damage under the General Act would rest upon the road authority, in the case of the special clause it might be taken to imply the probability of damage; thus involving the undertakers in the proverbial difficulty of proving a negative.

The Gas-Works Clauses Act deals with the whole question in such general terms as may be applied to all cases which may arise, and particular directions which may not be generally applicable are pointedly omitted. Parliament apparently thought that the road authority and the gas company could settle these matters between them as the need arose, and that in cases where disagreement occurred it could be fairly settled by reference to a

tribunal composed of two justices. It will probably be admitted that this procedure has, on the whole, worked very well, and that instances of serious disagreement between the gas company and the road authority are not at all common. The road authorities, or their officials, unfortunately, do not seem to be satisfied with this, and evidently desire that rigid conditions should be specified in the Act, regardless of their necessity in every case.

For instance, it is usual for a petition to ask that a minimum depth should be prescribed at which all mains should be laid; and this minimum depth is attempted to be fixed so that it is scarcely possible for it to be necessary to lay any main lower than this for the sake of safety, although quite possibly many mains might be laid at a shallower depth and still be safe. Although this is the most usual point upon which detailed directions are desired, sometimes a great deal more than this is asked; and in one case at least the Act contains an exact prescription of the method to be followed in opening and reinstating the road, even down to the direction that the company shall fill in, and properly ram to the satisfaction of the county surveyor, any trench or excavation made.

Then, following the usual trend of officialism, it is attempted to substitute for the principle of agreement between the authority and the company the right of the authority's officials to settle the matter themselves, as shown by the provision that the main is to be laid in such position in the road as may be directed by the surveyor. The same tendency is also seen in the request commonly made for a clause providing that the company shall keep their pipes in proper repair, and that any defect appearing shall forthwith be remedied on notice given by the authority—the company compensating the authority for any damage due to the defects. These matters are all dealt with in the General Act, but without, of course, any special discrimination in favour of the county council. It is difficult to see any object in the suggested addition, unless it be to exalt the apparent importance of the council's officials; for clause 24 of the 1847 Act puts a penalty of £5 per day upon the gas company for any escape after twenty-four hours' notice has been given to them in writing, while clause 29 provides that nothing is to prevent the undertakers from being indicted for a nuisance, or to any legal proceeding to which they may be liable in consequence of making or supplying gas.

Important as the foregoing matters may be to gas companies generally, it may possibly be considered that the alterations proposed in the existing practice are, in the main, more matters of procedure than of principle, and that where the proposed provisions are redundant they cannot very seriously affect a gas undertaking's position. The authorities, unfortunately, are not content merely to deal with such matters; they endeavour also to alter the present position of affairs to their own advantage by divesting themselves of liability which at present rests upon them, and transferring their responsibility for certain expenditure to the gas company. Thus it is usual to ask that when a road or bridge is altered, no matter to what cause such alteration may be due, the cost of altering the pipes and maintaining the supply should be paid by the gas undertakers; while if the presence of the pipes increases in any way the cost of the alteration, the undertakers are also to bear such increase in cost.

Whether or not such an arrangement would be as fair as that at present existing, it is a complete innovation on the current practice, which is that, whenever it is necessary to move or alter works lawfully constructed, the authority requiring such alteration shall meet the resulting expenditure. The same principle governs the relations of all bodies possessing the privilege of constructing works in or beneath the public roads. For instance, section 153 of the Public Health Act, 1875, states: "Where for any purpose of this Act any urban authority deems it necessary to raise, sink, or otherwise alter the situation of any water or gas pipes, mains, plugs, or other water-works or gas-works laid in or under any street . . . the expenses of or connected with any such alteration shall be paid by the urban authority."

It is not to be expected that the road authorities will view this question in exactly the same light as that in which it appears to a gas company. The authorities, charged with the maintenance of the roadway, are apt, quite naturally, to look upon themselves as owners of the highway, and to consider that all public companies who, in the course of carrying on their business, interfere with the roads should do so at their own risk, and without any right to compensation for any damage to their property arising from any otherwise lawful action on the part of the authority. Given the premises, such a claim would not appear on the face of it to be unreasonable. The authority is not, however, in exactly the position of owner. It is true that duties devolve upon them which usually fall to the lot of owners; but the privileges they possess are not the full privileges of ownership. One of their duties is to maintain the roads for public use—providing the cost by levying a rate on the occupiers of the district. The owners of wheeled vehicles using the roads do not necessarily pay anything towards their maintenance; and in some cases the heaviest wear on the roads—more particularly the main roads—is caused by vehicles not owned by ratepayers within the district.

It may be suggested that the use of the subsoil to accommodate pipes, wires, &c., is a use of the road to the public advantage, and just as legitimate as the use of the surface for traffic. So far as the gas company interfere with the surface of the roadway, they are bound to repair any damage, and so prevent any permanent depreciation of its value to those who use it for its original purpose as a means of communication. In like manner, when an altera-

tion of a road or bridge is undertaken to meet the increasing needs of the surface users, any damage occasioned to the underground users should form part of the cost of the alteration.

The last point in what appears to be the general programme of the council's legislative campaign is an attempt to abolish the right of compensation for damage to pipes which may be caused by the use of a steam-roller. So far as regards pipes laid at the present time, any such provision is unnecessary; the work must be done in such a way as to meet the conditions which exist. The use of steam-rollers is now universal, and risk of damage must be provided against. What is aimed at, of course, is to prevent any liability for damage to pipes which have been laid down before the introduction of steam-rollers. It is doubtless annoying not to be able to use the best method of repairing roadways without becoming liable for damage to pipes which have been laid in former days. But it should be remembered that the work has been done according to a plan approved by the authority; and it would be unfair to penalize the company for not providing against a contingency that could not reasonably be foreseen.

The position is not very dissimilar to that in which the authorities themselves are placed in regard to old bridges which are unfit to carry heavy loads. It may be inconvenient to owners of locomotives to be debarred from using such bridges; but if they do use them, and damage result, they will be liable to make compensation. It is also, the writer believes, not unheard of for claims for compensation to be made by the authorities themselves when the surface of a road has been seriously damaged by very heavy traffic for which it was unsuited.

In this parliamentary session, the demands of the road authorities have been resisted by two companies with complete success. The Tamworth Gas Company, and the Enfield Gas Company, not being content to accede to the demands of the County Councils, fought the matter out before Committee; and in neither case was any provision inserted in the Bills different from those contained in the general law, except in so far as the promoters themselves expressed their assent. In the case of Enfield, the Middlesex County Council asked for all the clauses to which reference has been made, and, in addition, others dealing with matters such as the price of gas supplied to the schools. The Company stated to the Committee that they did not object to:

- (a) Seven days' notice instead of three, for the purposes of section 8 of the Gas Works Clauses Act, 1847.
- (b) Plan required by section 9 of the General Act to be sent fourteen days before commencing work, except in cases of emergency and laying of consumers' services.
- (c) To limit the length of trench open at one time.
- (d) Council might repair road or bridge, if Company neglect, and charge the Company with cost of same.
- (e) Arbitration clause.

Clauses embodying these provisions were inserted; and the Committee rejected the rest, after a hearing which extended over two days, when the whole matter was very fully discussed.

It is to be hoped that these successes will encourage other companies to resist the unreasonable demands of the county councils. It is a pity that a question such as this, of general importance to all undertakings, should be settled by the action of individual companies acting alone. Sticks may be broken easily enough separately, which bound together in a bundle offer a much tougher problem. The whole matter adds another illustration to the many already existing of the need for an authoritative body fully representative of the gas industry to deal with such questions. May we not have long to wait for it.

The King on the London Water Supply.

On the return of Their Majesties the King and Queen after their visit to the City last Thursday, a halt was made at the New River Head in Rosebery Avenue, to admit of the presentation of an address from the Metropolitan Water Board. Mr. E. B. Barnard, the Chairman of the Board, presented the address, which set forth that it was at the New River Head that the citizens received centuries ago, at the hands of Sir Hugh Myddelton, and had ever since enjoyed, the bountiful supply of pure water which he was enabled to bring to them by means of the Royal sympathy and financial succour of King James the First. His Majesty's reply, which was handed to the Chairman, was as follows: "The Queen and I thank you very sincerely for your loyal and dutiful address, and for your prayers and good wishes. I am well aware of the extreme importance of the duties entrusted to the Metropolitan Water Board, and of the difficulties which have been successfully surmounted in ensuring to the population of London a continuance of that pure and abundant water supply upon which the health of the Metropolis largely depends. Dwellers in London are perhaps too ready to accept this great boon as a matter of course; and it is well that we should have an opportunity of acknowledging the great debt we all owe to you and to your predecessors, and, above all, to Sir Hugh Myddelton, for the enterprise and energy which have contributed to make the water supply of London the finest in the world."

The Late Mr. W. J. Jenkins.—The Council of the Society of British Gas Industries, at their meeting on Monday last week, passed a resolution expressing their regret at the death of their friend and member Mr. W. J. Jenkins, and their sincere sympathy with his firm and relatives in the great loss they have sustained.

THE INTERNATIONAL HYGIENE EXHIBITION AT DRESDEN.

THERE is this year being held at Dresden an exhibition which approaches in size and popularity the exhibitions at Shepherd's Bush with which the expression "White City" has become identified in recent years. It occupies an area of about 79 acres, mostly enclosed from the large park known as the royal "Grosser Garten," which is the largest and best wooded of the attractive public gardens in which Dresden abounds. The title of the exhibition seems liable to convey a wrong impression of the nature of the exhibits. Sanitary appliances form a quite inconsiderable section of the whole. Moreover, the national exhibits are of a purely scientific and statistical character; and the industrial sections are distinct and on a comparatively minor scale.

It seems desirable to take the opportunity of giving this explanation, because it falls within our knowledge that when an appeal was made a few months ago for subscriptions for the object of establishing an English section at the Exhibition, the impression was rife that it was mainly a matter of assisting British makers of sanitary appliances, &c., to display their wares, and that they might well be left to further their commercial interests without extraneous aid. As a fact, the National Pavilions at the Exhibition have no space at all devoted to commercial exhibits. They are concerned solely with the relation of hygiene in its broadest sense to the public weal, and include models, plans, specimens, and statistics relating to the provisions made by state and municipality for guarding the health of the people in matters such as water supply, lighting, town planning, the construction and ventilation of buildings, the disposal of sewage, hospitals and sanatoria, both permanent and temporary, the combating of epidemics, education of children, and the construction, lighting, and ventilation of schools, the control of food supplies, clothing, street cleansing, refuse disposal, and the provision of public baths and gymnasia. The Governments of the following countries have furnished exhibits on these lines for their respective pavilions: Austria, Brazil, China, France, Hungary, Italy, Japan, Russia, Spain, and Switzerland. Further, as the British Government refused to provide a national exhibit, a Committee (hastily formed a few months ago) have collected funds for the provision of an English pavilion and exhibits. Up to the time of writing, this pavilion has not been opened to the public; but its equipment appears to be in an advanced state, and is being rapidly pushed to completion. The English pavilion is to include, *inter alia*, sections relating to ventilation, heating, water supply, sewage disposal, bacteriology, industrial poisoning, rescue appliances, school and military hygiene, town planning and building, sanatoria, and cancer research. The chief exhibitors are the London County Council, the Metropolitan Asylums Board, the Lister Institute, the Rural Housing and Sanitary Society, and the Liverpool and London Schools of Tropical Medicine. The English section naturally, however, in the absence of Government aid, is not so large or so representative as the national sections of several other countries. Of the latter, Japan provides perhaps the most generally attractive and interesting, and France the most tastefully decorated, of the pavilions.

Apart from the national exhibits, there are many sections of great general interest. The historical section, which is accommodated in one of the largest of the buildings, contains exhibits of methods of heating and lighting and of water supply in the earlier times, in the middle ages, and at the present day. There is a section relating to industrial insurance; and in the sub-section on accident insurance, the Organization of Gas and Water Works of Germany contributes statistical information. It will be remembered that some particulars of the incidence of fatal and serious accidents on workers in gas-works were given in the "JOURNAL" a short time ago, from figures quoted and arranged by Dr. W. Leybold, of Hamburg, from the statistics of this organization. The whole of the gas and water works of Germany are compelled by law to pay the levies demanded by this organization, which is controlled by a Managing Committee appointed by the works managements. The disbursements are made, as required, on the authority of this Committee. Some idea of the magnitude of the operations of this accident insurance organization may be gathered from the facts that the amount paid in wages to workmen coming under its cognizance was, in the year 1909, 88,263,083 marks (about £4,326,600), that its available funds (including reserve) amounted in that year to 1,283,839 marks (about £62,930), and that it paid out in indemnities 896,729 marks (about £43,960). There are also given in the insurance section of the exhibition many statistics of an interesting character of the sick, invalidity, and old age insurance schemes which have been in operation in the German Empire for the last twenty-five years. A special monograph dealing with the subject has been prepared in view of the exhibits in relation thereto at the Dresden and Turin Exhibitions, and should prove of special interest at the present time in connection with the Bill which is before Parliament.

An exhibit by the Dresden Technical College includes a large collection of lamps and burners intended to show the gradual advance made in methods of lighting. It also includes diagrams showing the light emitted in a vertical plane by various modern sources of light, and the heat and carbonic acid evolved by them. These diagrams do not include (so far as we have observed) high-power gas-lamps, and convey the impression that the electric arc is without a rival where lights of high intensity are required.

Some tables and photographs prepared by Dr. Stockhausen display very clearly, however, the hygienic inferiority of the electric arc light due to its intense surface brightness and its large proportion of ultra-violet radiation. Diagrams supplied by the firm of Schott and Co., of Jena, show the general correspondence in composition of the light of the incandescent gas-burner with daylight. The German Welsbach Company have supplied some interesting sections of incandescent gas-burners.

There is a photometer-room equipped with a steel bar photometer and Hefner lamp, and a number of specimens of different types of incandescent burners and screens for use with them. There is also a small room equipped as a gas laboratory, with the more usual apparatus for the analysis of samples of gas—a Junkers calorimeter of the more recent type, in which the two thermometers are arranged at the same level, as in the Boys calorimeter. In the section of the exhibition devoted to heating and ventilation, the German Association of Gas and Water Engineers have a number of exhibits, including a model house for investigations on the effect of wind, steam-heating plant fired by gas, and various devices for avoiding down-draughts in the flues of gas-fires, &c. There are also other examples of gas heating and cooking apparatus, and a Junkers recording calorimeter. Drawings are exhibited of gas lighting, heating, and ventilating plant for churches, theatres, hospitals, and schools; several of these representing existing installations. The Corporation of Dresden show a diagrammatic model of the quantitative relations subsisting between the products obtained by carbonizing coal.

The industrial exhibits include a large display of the gas heating and cooking appliances manufactured at the workshops of the German Continental Gas Company at Dessau; and the apparatus for heating, &c., by gas, produced by the firms of Junkers and Co., of Dessau, G. Meurer, Friedrich Siemens, and the Eschbachs' Works, all of Dresden, and Houben Sohn, of Aix-la-Chapelle. There are some smaller displays of gas heating apparatus; and the Mannesmann and other steel tube makers have many exhibits of interest to gas and water engineers. A scheme which was at one time projected for a special exhibition on a large scale to be arranged jointly by the German Association of Gas and Water Engineers and the Central Organization for Promoting the Use of Gas, unfortunately did not come to fruition. There is also an almost complete absence of British firms among the exhibitors throughout the industrial sections of the exhibition.

There are some good displays of gas lighting in the grounds of the exhibition. A compressing plant by Messrs. Julius Pintsch, of Berlin, serves to supply high-pressure gas to a large number of lamps; and the German Welsbach Incandescent Gas-light Company have a large number of their lamps, both within the grounds and in the Lennestrasse outside the main entrance to the exhibition, lighted by the Pharos compressed-air low-pressure gas system. In another part of the grounds are several high-power petroleum incandescent lamps. There is in the power engine pavilion an 80-H.P. Deutz engine of the Diesel type, working with tar oil. The Swiss pavilion contains tables exhibited by the Swiss Association of Gas and Water Engineers, showing the development of the more important gas undertakings of the country during the thirty years ended in 1910. These indicate that the gas consumption of Switzerland has risen from 14,984,000 cubic metres in 1880 to 133,400,000 cubic metres (4,710,000,000 cubic feet) in 1910. The average consumption of gas per head of the population is 3550 cubic feet per annum.

There are very many exhibits relating to water supply, provided for the most part by municipal authorities. Curiously enough, there are comparatively few relating to the question—of great hygienic, as well as economical, importance—of the suppression of dust on roadways. From Baden, there are specimens of roadway treated with an emulsified tar, and sections of tarred-macadam and surface-tarred roads. In these sections, a thinner tar appears to have been used than the heavy tar which is now adopted by most English road surveyors; and it would seem probable that they would not have the requisite firmness to withstand heavy traffic in warm weather.

In regard to the remarks made earlier as to the English pavilion not yet being open to the public, it should be added that the formal opening took place on the afternoon of Thursday last. The British Minister Resident in Dresden, Mr. Arthur Grant-Duff, delivered an inaugural address, and declared the pavilion open. Dr. Armit, of the Lister Institute, who has been responsible for the arrangement of the exhibits, also spoke; and there were present representatives of the Canadian Government, Liverpool School of Tropical Medicine, and the Imperial Cancer Research Fund. In addition to the bodies already named as having contributed largely to the exhibits, the Birmingham Corporation deserve special notice for their views, diagrams, and models of schools, hospitals, model dwellings, &c.

The Metric System.—We have received from the Decimal Association, Finsbury Court, E.C., a pamphlet containing a summary of official reports on the metric system. It is to a large extent a reprint of one written anonymously in 1908; but as it is stated to have aided the movement for the general adoption of the system, the author now appends his name—Mr. John H. Twigg. The summaries are preceded by an explanation of the system, and diagrams showing a decimeter long divided into centimetres and millimetres, and a square and a cubic centimetre.

GERMAN ASSOCIATION OF GAS AND WATER ENGINEERS.

FIFTY-SECOND ANNUAL GENERAL MEETING AT DRESDEN, June 26 to 30.

[BY OUR SPECIAL REPRESENTATIVE.]

A REVIEW OF THE PROCEEDINGS.

THE Fifty-Second Annual General Meeting of the German Association of Gas and Water Engineers, which opened on Monday, the 26th ult., at Dresden, secured an exceptionally large attendance of members and friends, owing to the co-operation of a number of causes. In the first place, Dresden is always a popular city with visitors from other parts of Germany and Europe generally, owing to its pleasant situation and surroundings, the art treasures which it contains, and the air of unostentatious and evenly distributed prosperity and comfort which pervades it. Secondly, there is this year established in Dresden an exhibition which, though nominally and really of a one-sided character, covers a greater area than the Brussels Exhibition last year, and has its exhibits so well chosen, arranged, and displayed that it is drawing immense throngs from places far and near. Thirdly, and lastly, the meeting of the Association in 1910 was at Königsberg, which, by reason of distance from most parts of Germany, failed to attract many almost habitual visitors to these annual gatherings; and consequently interest revived with the greater vigour in last week's meeting. The attendance amounted to about 1050 persons, exclusive of the local and other specially honoured guests of the Association, but inclusive of nearly 200 ladies accompanying members. For these, a special programme of excursions, &c., had been arranged for the hours when the technical proceedings of the meeting were being carried on.

The customary reception and assembly of those attending the meeting took place on the evening of Monday, when the Town Council of Dresden entertained the members and guests of the Association in the large banquetting hall of the Exhibition. This hall allowed of the thousand odd persons present enjoying an excellent meal at tables which were not overcrowded, whereas the hall at the new Rathaus, where the Town Council ordinarily entertain, could not have seated so large a number in comfort. The chair was taken by Dr. Kretschmar, one of the Burgomasters of Dresden, who was supported by several members of the Town Council, and representatives of various bodies, technical and otherwise. Prominent at the high table were also Herr H. Prenger, the President of the Association and Manager of the gas, water, and electricity works of the City of Cologne, Dr. H. Bunte, the former Secretary of the Association, and now sole life or honorary member of the Council, and Herr F. Kördt, Vice-President, and Manager of the gas, water, and electricity works of Düsseldorf. After hunger and thirst had been well satisfied, the Burgomaster welcomed the Association to Dresden in the name of the city authorities. He referred to the fact that this was the fifth occasion on which the annual meeting had been held in Dresden, and that the numbers attending had now become so great that it was impossible for the reception to take place in the Rathaus. The increase was, however, in all other respects a source of great gratification to those concerned. Herr Prenger spoke in reply, and said it was always a special pleasure to the members of the Association to meet in so agreeable a town as Dresden, where they invariably received a hearty welcome. The toasts of the City of Dresden and of the Association were given and drunk in a hearty manner.

The sessions of the annual meeting opened on Tuesday, at 9 o'clock, in the large lecture hall of the Exhibition, Herr Prenger being in the chair, and supported by Professor H. Bunte, Dr. Karl Bunte, Herr Kördt, and the members of the Council of the Association. The Chairman having declared the meeting open, the Chief Burgomaster of Dresden, Geheimrat Dr. Beutler (who had been unable to attend the reception the previous evening), expressed the gratification of the city authorities at the visit of the Association. The visit was, he said, specially appropriate in the year of the Exhibition of Hygiene. The services rendered by water engineers in the improvement of hygienic conditions were so well known and recognized that it was needless to particularize them; but gas engineers also could claim to be performing equally great services in the same direction, by reason of their work in reducing the smoke and soot nuisance in large towns. The supply of gas over long distances was an urgent problem of the day, which promised as great benefits to the community as did the supply of electrical energy across country. In regard to water supply, it was a comparatively easy matter for large towns to tap a proper source, at a distance, of water suitable for drinking purposes. But the problem was a more difficult one for suburban districts and the more isolated industrial centres. It needed very serious attention. Naturally, it did not offer the prospects of profit which were presented by long-distance supplies of gas. Another reason why he welcomed heartily the gas engineers was that gas-works constituted a very important source of income to municipal authorities. In this respect, Herr Hasse, the Chairman of the Gas Committee, and Herr P. Göbel, the Manager of the Dresden Gas-Works, had done a great deal for the city, as doubtless had many of their colleagues, then present, for their own individual municipalities.

The President of the Association thanked Dr. Beutler for his

words, and said that Dresden had played an important rôle in the history of the gas industry, in that it was the first Corporation to possess its own gas-works. Herr Joh. Körting, of Düsseldorf, next spoke on behalf of the Association of German Engineers (Civil and Mechanical), from whom he brought greetings, as did also Dr. Strache, of Vienna, from the Austro-Hungarian Association of Gas and Water Engineers. The greetings of the Technical Colleges of the Kingdom of Saxony were conveyed by Professor Mollier. The President expressed the thanks of the Association for all these greetings. He then went on to say that this year the Association had decided to nominate as an honorary member one who had done notable service to hygiene—viz., Sir William Lindley, of Frankfort-on-the-Main—for his work in the interests of water supply, and for his labours as Chairman of the Committee on the International Standardization of Pipe-Threads. Sir William Lindley, in expressing his thanks for the distinction which the Association had conferred on him, remarked that it was now 33 years since he first read a paper before it, and that was also at a meeting held in Dresden. He hoped to be preserved to work for the Association for some years more. The President next announced that the Association had conferred the Pettenkofer Medallion of Honour on Herr F. Reese, of Dortmund, in recognition of his labours in compiling the water statistics of the Association, and on Herr Reichard, of Karlsruhe, for his work in the campaign against the smoke and soot nuisance in towns. Herr Reese, in acknowledging the honour bestowed upon him, said that he had been a member of the Association for 38 years past.

The President's Address.

The President, Herr Prenger, then proceeded to deliver an inaugural address, in which he reviewed the year's progress in the gas and water industries—taking as his basis the annual report of the Council of the Association, of which a *résumé* is given on another page of the "JOURNAL." Other points referred to, however, included a notice of the increase in the consumption of gas in Germany. The statistics compiled by the Association showed that there were made in the year 1909, 77,000 million cubic feet of gas, which was supplied to consumers representing 30,350,000 people. It was therefore apparent that at the present time one out of every two persons in Germany is a user of gas. The make of gas per head of the population was 2366 cubic feet. This, however, was far behind the corresponding figure for England. In Berlin, the increase in the number of gas consumers in one year alone was 28,455; while the total number of consumers supplied with electricity was only 30,946. Comparison of the prices paid for gas in different districts and countries showed that in general the charges prevailing in Germany were much too high. Gas must be cheaper. In order to attract the small consumer, the most economical apparatus for using gas for different purposes must be brought to his notice. It was a mistake which was in all probability still made by some gas undertakings to encourage the use of appliances which consumed a lot of gas in a manner which was to the disadvantage of the consumer. Gas continued to make new friends, though in some quarters there prevailed an impression to the contrary. Fresh discoveries and inventions were increasing its value day by day. A recent phase in the development of the gas industry was the supply of gas to distant places from large central gas-works. This method of supplying gas was the complement of the cross-country supply of electricity. Another great industrial development was that of the supply of gas at high pressure. There was no fear that an industry in which in Germany about £50,000,000 of capital was employed would be easily suppressed; but it must be remembered that to stand still was in reality to fall behind. The instances quoted, however, showed that the gas industry was not standing still, but was now advancing rapidly.

Two Papers on Coke.

The President, on the conclusion of his address, called upon Mr. E. Körting, the General Manager in Berlin of the Imperial Continental Gas Association, to read his paper upon "Gas Coke, from the Standpoints of the Commercial Man, the Accountant, and the Gas Engineer." An abstract translation of this paper is given elsewhere in to-day's "JOURNAL." Broadly, the author advocated the supply by gas-works of the best and driest coke producible, while its advantages were brought before the public by suitable advertisement. This was a means by which one of the most active competitors with gas coke in Germany—viz., brown-coal briquettes—had achieved their present popularity. There was a very brief discussion on the paper; and then the President called upon Herr Göhrum, the Manager of the Stuttgart Gas-Works, to proceed with his communication on "Recent Methods of Quenching Coke." This took the form of a lecture, in which Herr Göhrum drew the attention of members to a number of tables, diagrams, and views of plant which were thrown on the screen in rapid succession. Some of the tables showed the different proportions of water contained in coke from different

classes of coal when carbonized in different types of retort, &c., when quenched by hand or otherwise; but the figures were too indistinct for reading. They showed, however, the ill-effects on coke of certain types of coke-handling and quenching plant. The lecturer considered that every effort should be made to produce coke of uniform quality on gas-works, whatever the type of coal and method of quenching employed. It was not merely a question for the engineer which type of plant and method of quenching enabled him best to deal with the large quantities of coke discharged at once from many modern types of carbonizing plant. The commercial interests represented by the coke consumer were of paramount importance; and it was essential that the coke should not contain an excessively high proportion of water. On the other hand, the ordinary coke user found perfectly dry coke troublesome in cases where he had been accustomed to coke containing a normal proportion of water. The views of coke-quenching shown ranged from the most primitive method of hand-quenching, by throwing water from a bucket over the heap of glowing coke, to the large automatic coke-quenching towers which are now being installed by Messrs. A. Bleichert and Co. in connection with settings of coal carbonizing chambers. Benches of horizontal, inclined, and vertical retorts, with various forms of conveying troughs, in which the coke is quenched, extending in front of the bench, were shown, some including the extension of the trough on an incline to the breaking and screening plant.

The Illig coke-stifling, as distinct from quenching, plant was shown; and the method of receiving the discharged coke in a large vessel or barrow, which is then lowered into a tank, as used for quenching the coke at the Stuttgart Gas-Works, was also referred to. The more difficult problem of handling the considerable quantity of glowing coke liberated on a large carbonizing chamber being discharged, has been dealt with provisionally in a number of ways; and the hydraulic coke-quenching cars, the longitudinal trough, and the quenching-towers which have been introduced *inter alia* at Hamburg and Tegel (Berlin) were shown. It may be mentioned that, in connection with some settings of vertical retorts, Mr. E. Körting has introduced an automatic quenching device, by which the liberated coke, as it travels along the De Brouwer trough-conveyor, strikes levers which open taps on a water supply to sprinklers immediately above the trough. This arrangement secures adequate quenching, and does not oversaturate the coke, while it avoids all waste of water.

In the discussion on Herr Göhrum's communication, Professor H. Bunte said that the question of the moisture in coke produced and quenched in different ways might most advantageously be investigated thoroughly by the staff of the Instructional and Experimental Works of the Association. Coke was such an important bye-product that its quality ought nowhere to be disregarded. Mr. Körting emphasized this view, and referred to some of the figures in his own paper, and Herr Göhrum then replied, thanking the speakers for their suggestions and comments.

High-Pressure Distribution to a Distance.

The next communication was a very long paper by Dr. E. Blum, the Managing-Director of the Berlin-Anhalt Engineering Company ("Banag"), entitled "Long-Distance Gas-Mains: Their Use and Industrial Economy." The development of the long-distance transmission of gas under high-pressure from a central works is one of the most striking departures of the last decade in the gas industry in Germany. Quite recently it has been proceeding at a very rapid rate, and with most successful results. No doubt some of the small towns and outlying communities which have thus obtained a supply of gas would have otherwise been building independent gas-works; but, generally speaking, it may be said that the new system has reached a circle of people who would not otherwise have become gas consumers at all. A distinct gain to the industry at large has thus been achieved. In particular, the electricity supply undertakings which in the past have prospered through the cross country supply of current to outlying districts in Germany—by overhead high-tension conductors, which are not permitted under the Board of Trade regulations in this country—have met with a powerful check on their operations. Gas presents so many advantages over electricity, on account of its more varied uses and greater economy, that an outlying district which formerly would have arranged for a supply of current across country from a central electricity works, will now, for choice, obtain a supply of gas through a high-pressure main from the gas-works of the nearest town. Herr Blum's paper demonstrated ably and completely the greater economy of gas over electricity for a supply in such conditions, and especially in respect of capital expenditure. His paper evoked a lively discussion; there being one or two sponsors for electricity who demurred from his conclusions. But the latter were broadly supported by Herr Kordt, who is in charge of both the gas and the electricity departments of the Corporation of Düsseldorf.

The Experimental Works of the Association.

Professor H. Bunte next gave a short lecture on the work of the Instructional and Experimental Works of the Association. These works, it will be remembered, were established at Karlsruhe some few years ago by the German Association, partly from its ordinary accumulated funds and partly from special contributions; and reports have appeared from time to time in the pages of the "JOURNAL" showing the good work which has already been accomplished there under the general supervision of Professor Bunte. In his present lecture, the Professor sought to indicate

how the work was being continued and extended, and to show ways in which the Institution could be of direct assistance to gas-works. A great deal of his lecture covered ground which is dealt with in the report of the Committee of the Association on the Instructional and Experimental Gas-Works, of which report an abstract-translation will be given in the "JOURNAL" with the reports of the other Technical Committees of the Association; and the lecture itself was curtailed owing to the reading and discussion of Herr Blum's paper having occupied an undue amount of time. Professor Bunte pointed out that the example of the German Association in establishing its Instructional and Experimental Gas-Works at Karlsruhe had been followed elsewhere—viz., by the English gas engineers at Leeds, by the Swiss at Zürich, and by the Austrians at Vienna. The chief question dealt with at Karlsruhe continued to be the exhaustive investigation of different descriptions of gas coal. In the past year, a relatively large number of samples of English coal had been examined; and though the use of English coal was mainly confined to the gas-works on or near the main waterways of Germany, it should be remembered that 25 to 30 per cent. of the coal carbonized in Germany was English. Exhaustive studies had now been made, however, of 80 different gas coals of various origins; but these only represented a small proportion of those which were on the market. It was hoped, however, that the laboratory would soon be in a position to settle the relative economy of the different kinds generally available. The coal substance proper was very similar in all coals. The fact that gas of high illuminating power was no longer required had greatly enlarged the number of coals available for gas manufacture, and new kinds had thus become applicable and had needed investigation. A gas-works required coal which was of constantly good quality for its purpose—the essentials being, in addition to a large yield of gas, that the coke should be good, and that the calorific power of the gas should not be below 5200 calories per cubic metre (about 545 B.Th.U. per cubic foot). The proportion of ash in the coal was also important as affecting the yield of gas and the quality of the coke. Gas-works had now frequently to guarantee to supply coke having at least a certain specified calorific power; and this condition might not be fulfilled if the coal employed contained much ash. Broadly speaking, the English coal imported into Germany contained 7 per cent. of ash, whereas Westphalian coal contained 10 per cent., and Saar coal 12 per cent. It was of primary importance to gas-works to control effectively the supplies of their raw material, and to see that the deliveries did not differ substantially, as was frequently the case. The second direction in which the Experimental Gas-Works had done good service was in controlling the working of the gas-works' plant through visits of inspection and investigation by its staff, and in carrying out efficiency trials of plant on the spot. In this way great assistance could be given, especially to smaller works, which had not chemists of their own. The investigations of the visiting staff could well be extended to the efficiency of the steam-engines, boilers, gas-engines, &c., in use on the gas-works. Other work undertaken at Karlsruhe was in regard to the vitiation of air by gas lighting and heating plant, and the demonstration of the fact that the products of combustion of gas were not injurious to health as were the products of breathing.

The President having thanked Professor Bunte for his lecture, adjourned the proceedings to the following day (Wednesday).

The Dresden Gas-Works.

Alternative visits to two works had been arranged for the afternoon. Those who elected to see the Corporation gas-works, situated at Reick, on the outskirts of the city, were conveyed thither in special tram-cars, and on their arrival were divided into groups which were conducted round the works by different members of the technical staff. The most striking feature of the works is a comparatively new gasholder, in four lifts, having a capacity of 120,000 cubic metres (nearly $4\frac{1}{2}$ million cubic feet). This gasholder, like the two smaller and older holders on the works, is enclosed in a house, and is doubtless one of the largest of such enclosed gasholders in the world. The house in this instance is a plain substantial structure, cement-rendered, and, except for a lantern crowning the dome roof, is without any æsthetic relief. It must be a matter of fairly evenly divided opinion whether such a structure is preferable in appearance to a well-designed independent gasholder; and it is not clear whether this and other recent examples of enclosed gasholders in Germany have been so erected by way of compliance with obsolete local enactments or in deference to the views of architectural authorities. The old view that it was necessary in places where there is heavy frost in winter time to enclose a gasholder in a house, in order to reduce the risk from freezing of the water in the seals, cannot now be seriously entertained in districts where the winter is not more severe than in Dresden or Berlin. In the latter city, the Corporation erect gasholders in outlying works, such as Tegel, inside houses; whereas in the similarly outlying Mariendorf works of the Imperial Continental Gas Association, the holders stand out in the open. The difference in this case cannot clearly be due to any difference in the regulations of a State or local authority. Again, in Leipzig there is a comparatively modern gasholder of considerable size enclosed in a house; but a new gasholder now in course of erection near by is to be in the open. Whatever may have been the reason for its construction on the enclosed pattern, however, the new Dresden gasholder is a fine, massive structure.

There was not a great deal of other plant of very recent date

or novelty on the works. The bulk of the carbonizing plant consisted of settings of inclined retorts. There was a trial setting, however, of large carbonizing chambers with inclined bottoms, constructed to the design of Herr Göbel, the Manager of the Dresden Gas-Works, which attracted considerable attention. One chamber was discharged in the presence of the visitors. There are two doors or mouthpieces on the upper end of the chamber, which is charged through the uppermost. The lower is opened if the block of coke does not discharge itself cleanly when the door which forms the bottom end of the chamber is opened. Each chamber receives a charge of about 3 tons of coal. The coke discharged seemed well worked off; and the heats in the setting were good. There was naturally, with this isolated trial setting, no special provision for quenching and disposing of the large quantity of coke liberated when a chamber is discharged.

The visitors, on leaving the works, were regaled with coffee and other light refreshments provided by the Gas Committee, and then returned to the city in special tram-cars.

The alternative visit on this afternoon was by steamboat to the sewage-clarifying and treatment works of Dresden, in the suburb of Kaditz. The sewage from the greater part (the Altstadt, or old town) of Dresden, which lies on the opposite side of the River Elbe, is pumped through a large conduit beneath the river to this works, where it is clarified before discharge into the river.

The greater part of the members of the Association dined in small groups at the Exhibition, though a considerable number were to be seen in the more popular of the restaurants in other parts of the town.

Papers on Water Supply.

The second sitting for technical proceedings began at nine o'clock on Wednesday morning, with Herr Prenger again presiding. Six communications relating to water supply were read and discussed. The first was by Herr Herzberg, of Berlin, on "The Work of the Association for Water Supply and Sewage Disposal." He said the Association had been primarily instrumental in securing the establishment in Berlin of the Royal Experimental Institute for Water Supply and Sewage Disposal; and a Committee of fifteen members of the Association assisted in its management. The Association was supported by 61 large municipalities, of which the chief civic functionaries were among its members, as well as by the Association of German Engineers and the German Association of Gas and Water Engineers. The Association had between the years 1902-10 spent about £5300 on scientific investigations. After reference to work done at the Royal Institute and the published reports upon it, the speaker said that, the rooms of the Institute having proved too small for its work, the Prussian Government had this year set aside a sum of £30,000 for the erection of new laboratories, &c., for it at Daheim. A ministerial recommendation that local authorities should obtain the assistance of the Institute on questions concerning the construction and operation of water-works had, however, met with the opposition of the Association of German Engineers, the members of which believed that this implied competition of the Institute with practising civil engineers. The speaker, however, contended that the recommendation was only intended to apply to any small local authorities who had not the means to obtain a scheme for a proper water supply in the regular way.

The next communication was a very lengthy address or lecture delivered with great fluency by Dr. Gärtner, a Professor of Jena, on "The Present Position of the Question of Water Supply." After a lively discussion, in which Sir William Lindley joined, a paper was read by Herr F. Scheelhaase, of Frankfort-on-the-Maine, on "The Production of Artificial Underground Water from River Water." This paper also evoked a lively discussion. The next paper was by Herr R. Schroeder, of Hamburg, on "Modern Pumping-Engines for Water-Works." It was to have been followed by communications "On the Sterilization of Drinking Water by Ultra-Violet Rays," by Professor J. Courmont, of Lyons (of which a translation from the French original was laid before the meeting), and "On the Action of Ultra-Violet Rays on Bacteria," by Professor O. Bujwid, of Cracow; but the reading of these was postponed to the following morning.

The sitting concluded with the presentation by its Chairman—Herr Reese, of Dortmund—of the report of the Committee of the Association on "The Working of Water-Works." This report will be briefly dealt with along with the summaries of the reports of the other Technical Committees of the Association. Abstracts of the communications by Dr. Gärtner, Professor Scheelhaase, Professor J. Courmont, and Professor Bujwid, all of which excited exceptional interest at the meeting, will be given in an early issue of the "JOURNAL."

Excursions.

In the afternoon, two alternative visits to works had been arranged, each followed by a steamboat excursion on the Elbe. One party—and that the larger—were conveyed up-stream, in two of the "luxus" steamers of the Saxony-Bohemia Steamboat Company, as far as Königstein, in the so-called Saxon Switzerland. The steamers stopped *en route* for those who had previously gone by tramcar to the water-works of the Corporation at Hosterwitz, which is on the Elbe a short distance above Dresden. Owing to the late conclusion of the morning's proceedings, however, comparatively few members had time to interpose the visit to the water-works. Supper and refreshments were served on the steamers; and the return journey from Königstein was made with

illumination of the river banks at intervals, and salutes of guns and fireworks. Dresden was reached again about midnight. The other party were conveyed in a similar steamer down-stream to Meissen, where the Royal Porcelain Works are situated. Those who left the morning's proceedings in time paid a visit to the iron-works of the firm of Meurer, at Cossebaude, which was reached by special train; and the steamer for Meissen was joined at Gohlis, near by. The party returned to Dresden from Meissen by special train.

Distant Ignition of Street-Lamps.

The third, and last, sitting opened on Thursday morning, when the papers on the action of ultra-violet rays on water already mentioned were first taken—Professor Courmont being prevented by illness from presenting his in person. Then the remaining papers on gas were dealt with. Two of them related to the distance lighting of street gas-lamps. The first of these, by Herr Metzger, of Bromberg, detailed his experiences with pressure-wave distance lighters at the Bromberg Gas-Works, which supplies a district of somewhat unusually wide area relatively to the size of the town, which has a population of about 80,000. He had used concurrently both the "Bamag" and "Meteor" distance lighting apparatus, and could not give a decided preference to either. The system effected very considerable economies, and on the whole had given satisfaction, though there were some attendant disadvantages. It was intended, however, to extend it shortly to the whole of the street-lamps in Bromberg, to the number of about 1500. The other paper on the same subject was by Herr Kobbert, the Manager of the Königsberg Gas-Works. He had used the same two types of distant lighting apparatus as Herr Metzger; and while both had behaved well, the "Meteor" possessed certain advantages. These two papers, which are full of details of the installations and their working results, will be given in abstract in a subsequent issue of the "JOURNAL."

The Use of Tar in Diesel Engines.

The next communication was a paper by Dr. W. Allner, of Dessau, on "The Use of Tar for Driving Diesel Engines." This referred to the relative advantages in German conditions of petroleum or shale oil and tar as a fuel for engines of the Diesel type. The properties of coal tar derived from different coals under different carbonizing conditions were dealt with very fully; and, in this respect, the paper will prove useful also to those who are not directly concerned with tar as a fuel for Diesel engines. An abstract of the contents of this valuable paper is already in preparation.

Reports of the Technical Committees.

Then followed the presentation of the reports of the several Technical Committees of the Association by their respective Chairmen—viz., on the "Instructional and Experimental Gas-Works," by Dr. Karl Bunte, of Carlsruhe; "Photometry," by Dr. W. Leybold, of Hamburg; "Heating," by Dr. E. Schilling, of Munich; "Gas-Meters," by Herr C. Kohn, of Frankfort-on-the-Maine; "Gasholder Standardization," by Herr Niemann, of Dessau; "Electrolysis," by Sir William Lindley, of Frankfort-on-the-Maine; "Technical Instruction," by Herr W. von Oechelhaeuser, of Dessau; "Standard Screw-Threads," by Sir William Lindley; and the "Working of Gas-Works," by Herr Prenger, of Cologne. Abstracts of these reports will be given in an early issue.

Report and Private Business.

The report of the Council for the year was presented by the President. A summary of its contents is given on another page of this number. The accounts, including those of the Schiele Foundation and the Benevolent Fund of the Association, were next dealt with; and the meeting proceeded to the election of officers to take the place of those who retired and were not eligible for re-election. Herr Prenger, of Cologne, is succeeded as President of the Association by Herr F. Kordt, the Manager of the Corporation gas, water, and electricity works at Düsseldorf. It was decided to hold next year's general meeting at Munich. The members of the various Technical Committees for the ensuing year were also appointed. The sitting closed at a late hour in the afternoon.

The Banquet.

The banquet took place on Thursday evening, and was attended by over 1200 members and guests, who were seated at fourteen long tables and a high table in the large banqueting hall of the Exhibition. The time fixed was the comparatively early hour—to English ideas—of six o'clock. The first toast—that of the "Emperor of Germany and the King of Saxony" jointly—was given by Herr Prenger, who was in the chair. Herr Kordt, of Düsseldorf, the President-Elect, next proposed the toast of the "Inhabitants and Authorities of Dresden," who had received the Association so hospitably. It was acknowledged by Councillor Dr. Körner, who, in turn, proposed success to the "German Association of Gas and Water Engineers." Herr F. Reese, of Dortmund, next gave the toast of the "Local Festivities Committee," which was replied to by Herr Wahl, of Dresden, who then proceeded to give the toast of "The Ladies." These toasts were, according to German custom, interposed while the banquet was being served. Owing to the number of those assembled, and the large size and apparently bad acoustic properties of the hall, the speeches were followed by very few of those present. The toasts were nevertheless received with the customary enthusiasm. As soon as the

banquet was finished (about ten o'clock), a move was made to the adjacent concert hall, which had been prepared as a ball room, and here dancing continued until long after midnight.

Concluding Visits.

Commonly, the Friday of the week of the annual meeting is devoted to one whole-day excursion; but last Friday members had three alternatives offered them. The first was a visit to the Exhibition—for anything approaching a thorough inspection of which there had been no time on the previous days. The second was an excursion to Klügenberg-Colmnitz, and a visit to the valley where new water-works for Dresden are in course of construction. The third was a visit to the works of the well-known firm of Adolf Bleichert and Co. at Gohlis, a suburb of Leipzig. In this visit, between 30 and 40 members participated. Some particulars of the works, where 800 men are now employed, will be given subsequently. The close of the meeting, owing to the divergent schemes for the last day, was therefore a breaking-up of small parties; and members returned home at various times and from different points on Friday and Saturday. The weather was fairly good for most of the outdoor functions connected with the meeting, although on the Tuesday morning the downpour of rain was so heavy and continuous that the noise made by it seriously interfered with the hearing of the speeches, and the roof of the temporary lecture hall of the exhibition-type proved incapable of resisting penetration—even immediately above the Presidential chair. In other respects, however, the sittings have never been held more comfortably.

REPORT OF THE COUNCIL FOR THE YEAR 1910-11.

The following is a summary of the report which was presented at the meeting of the Association in Dresden last week.

The most important event in the year was the visit of eighty members of the Association to England as the guests of the Institution of Gas Engineers. The heartiest thanks of the Association are accorded to the Institution for the memorable hospitality which it dispensed on that occasion, and special thanks are given to Mr. Alexander Wilson and Mr. J. W. Helps, last and this year's Presidents of the Institution. There are also named, with gratitude, for the facilities given for the inspection of works and their cordial reception, the Gaslight and Coke Company and Mr. Corbet Woodall, the South Metropolitan Gas Company and Mr. Charles Carpenter, the Croydon Gas Company and Mr. J. W. Helps, the Edinburgh and Leith Corporations and Mr. W. R. Herring, and the Glasgow Corporation and Mr. Alexander Wilson. As a token of its gratitude and a memento of the visit, the Association is presenting to the Institution an artistically executed Chairman's hammer and block.

Another international function, which is recorded with pleasure, was a visit in May last to the Berlin, Hamburg, and other water-works in Germany of a number of Russian water engineers. In several Commissions also the Association has co-operated with the technical men of other countries. In the autumn of last year, the International Standard Screw-Threads Commission held a session in Paris, at which Sir William Lindley, on behalf of the Association and a number of other technical Institutions of Germany, and with the approval of those of England, Belgium, Switzerland, and Austria, brought forward the standard Whitworth threads which he had carefully prepared as suitable to displace the metric screw-threads which are still adopted in America and France. Though a final settlement has not yet been reached, the hope is expressed that a way has been found by which the metric threads, which are useless and inconvenient for European conditions, may be displaced by the more practical and more generally acceptable Whitworth threads.

The International Photometric Committee is to hold a session this month (July). Germany, as already reported, is content for the present to endeavour to settle the ratio subsisting between its own practical unit of light—the Hefner—and the international candle which has been mainly fixed from calculations. The technical Associations represented by the German members of the International Committee have obtained the assent of the Ministry of the Interior to a petition asking that the Imperial Physical-Technical Institute ("Reichsanstalt") shall set about the production of a unit of light which will be free from practical as well as theoretical objections. Other representations made by the Association to the State authorities were not, however, equally favourably received. Infractions on the part of the police authorities of Berlin of the ordinance made in November, 1907, by which gas and electricity were placed on equal terms in regard to the lighting of warehouses, having been reported—in some cases the removal of existing gas installations had been required—the attention of the Ministers of State was drawn by petition to the circumstance; but their answer was to the effect that, in the cases cited, the police authorities were at liberty to exercise their own particular judgment, and to decide accordingly. A petition to the President of Police in Berlin was thereupon presented jointly by this Association and the Association of German Electricians, in regard to certain prohibitions which he had made respecting the lighting of shop show windows and illuminated signs. As a result, the prohibitions were either withdrawn or suitably modified. A petition made by the Association to the Minister of the Interior in regard to a projected law respecting the transmission of high-tension electric currents, has

not yet been answered. The proposals for a new law regarding standardization drew attention to the disproportionately high fees for the testing and stamping of gas-meters, and a petition to the Bundesrat (Lower House) has been drawn up asking for a reduction of the fees. It is computed from the accounts of the standards office that the cost of testing and stamping would be covered by a fee of about 4d. per meter. Sufficient time has not yet elapsed for this petition to have been dealt with.

The Association has, jointly with the Industrial Union of German Gas-Works and the Organization for Promoting the Sale of Gas, raised a protest against an instruction of the Minister of Commerce and Industry, to the effect that oven coke should be used for the central heating plants in the hands of the State. The instruction contains a very unsatisfactory statement of the value of gas coke as compared with oven coke, and it is eminently desirable that it should not gain publicity. The last general meeting of the Association approved of two comprehensive statements being issued—one relating to the "Standard Conditions for Return Electric Currents," which was prepared by the Electrolysis Committee in co-operation with other technical bodies; and the other to the "Rules for the Installation of Gas" in relation to its sale and use. A number of prominent members of the Electrolysis Committee have since then issued a set of explanations of the Standard Conditions or "Rules for the Protection of Gas and Water Pipes from the injurious action of the current of continuous current electric tramways in which the rails are used as conductors." The rules have so far not raised any opposition, and tests made by the Electrolysis Committee on installations conforming with them have fully confirmed their appropriateness. The Installation Rules have been adopted in particular towns, and a reprint of them has had a sale of 1700 copies. The Association is at the present time engaged in the preparation of "Rules for the Installation of Water Supplies in Houses." The affiliated Associations are being consulted in regard to these rules; and it is hoped that they may be ready for presentation for approval at next year's general meeting. The Association has to thank Sir William Lindley for his activity in this matter.

The Association has furnished various exhibits in the scientific section of the International Hygiene Exhibition at Dresden this year. Unfortunately, a comprehensive representation of the gas industry, which it was at one time intended that the Association should make, in conjunction with the Central Organization for Promoting the Sale of Gas, was not ultimately arranged. The negotiations with the Exhibition authorities were conducted by the Central Organization, and that body failed to come to agreement with them. The result does not indicate that the Association was not keenly interested in the fruition of the scheme. It is hoped that a comprehensive presentation of the manifold applications of gas in the household and in industry will be arranged for the projected exhibition next year in Berlin relating to "Woman at Home and in a Vocation." The Association has also promised its support to the Book Trades Exhibition at Leipzig in 1913. By these means, it hopes to supplement the good work which the Central Organization has accomplished during the past year (which is the first year of its existence) in the direction of demonstrating the new methods in which gas may be applied with economy and convenience, and of proving that it is by no means old-fashioned. Much may be done in the same direction also through the Committee, which was first appointed at last year's general meeting, on the "Working of Gas-Works. One of the first matters for this Committee is to demonstrate from statistics the progress made by the whole gas industry apart from that of isolated members of it. The Committee have also to provide a uniform scheme of book-keeping for gas-works, without which it is impossible to make an exhaustive comparison of the economical results of different methods of working. While the Committee are only on the threshold of this work, the Instructional Committee will inform this year's meeting that their purpose has now been fulfilled. It has organized the training of gas engineers. The gas foremen's and fitters' schools have demonstrated, in the last few years, that their work is being conducted on successful lines, and will now go on automatically. It is proposed to dissolve this Committee, to which the Association is much indebted for the work accomplished.

In regard to other Technical Committees, the report of that on the Instructional and Experimental Works of the Association shows that the work is developing successfully. The Heating Committee have settled a number of important matters—such as the standardization of gas heating-stoves, the preparation of a memorial on the use of gas coke for central heating plants, and the rules relating to the installation of gas supplies in houses, already referred to. There are no similar matters imminent; and this Committee therefore proposes that it should be dissolved until such time as important questions may again arise with which it can deal. The Gas-Meter Committee, on the other hand, is engaged in work which will occupy them well for a further term. They are dealing with the testing of dry meters, the standardization of meter unions, oil-gas meters, and the trustworthiness of gas-meters under high pressures. A new matter which has been referred to the Committees on the Working of Gas and Water Works is the study of the movement of mains in the soil.

The thirty-first volume of the gas statistics compiled by the Association relates to the year 1909 (or 1909-10) and 296 works or undertakings, as against 287 in the preceding volume. A general increase in the quantity of gas made is shown, though the increase falls somewhat short of that shown the preceding year. Of the

works appearing in the two consecutive years' reports, 125 show an increase not exceeding 5 per cent., 65 between 5 and 10 per cent., and 19 from 10 to 28 per cent. Forty-one works have had a decrease, though in only three cases does it exceed 5 per cent.; and in 37 works there has been practically no change in the make of gas. An attempt, foreshadowed in last year's report, to prepare more detailed statistics, for publication to members at intervals of five years, has not been attended with success in the first instance, because the figures supplied from different works clearly rested on different bases, and it would have been misleading to have taken them for comparative purposes. It is hoped in later years, when perhaps methods of administration and of book-keeping have become unified for gas undertakings, that it will be possible to prepare detailed statistics for comparison of the working of German gas undertakings.

The number of members of all classes has increased by 27 during the year, and now is 1134, of which four are honorary members, 217 associates, and the remainder ordinary members. Ten members were lost through death during the year.

The reports sent in by eight affiliated District Associations are next quoted in full. The Mark (Brandenburg) Association of Gas, Water, and Electrical Engineers held its thirty-second annual meeting in Berlin in April last under the chairmanship of Herr Pfudel. The meeting extended over three days, and several interesting papers were read. The Mid-Rhenish Gas and Water Engineers' Association held its forty-seventh annual meeting at Gmünd (in Swabia) in September last, under the chairmanship of Herr Frahm, of Baden-Baden. The membership numbers 271. The Association of Gas and Water Engineers of Silesia and Lausitz held its forty-second annual meeting at Zabrze in August last, under the chairmanship of Herr Goerisch, of Schweidnitz. It has 163 members. The Association of Gas, Electrical, and Water Engineers of the Rhine District and Westphalia held two meetings—one at Trèves in September, and one in January last. The Association numbered at the close of the year 371 members of all classes. The Bavarian Association of Gas and Water Engineers held its twenty-sixth annual meeting at Coburg in May, under the chairmanship of Herr Terhaerst, the Manager of the Nuremberg Gas-Works. This Association has a membership of 171. The Baltic Association of Gas and Water Engineers suffered the loss during the year of its Chairman, Herr Gellendien, of Elbing. It held its thirty-eighth annual meeting at Königsberg on June 20, 1910. It comprises 163 members. The Association of Gas and Water Engineers of Saxony and Thuringia held its fifty-eighth annual general meeting during May last at Leipzig, under the chairmanship of Herr Martin, Manager of the Erfurt Gas-Works. The number of members of this Association is now 183. The Lower Saxony Association of Gas and Water Engineers held its twelfth annual meeting in September last at Flensburg; Herr Hase, the Manager of the Lübeck Gas-Works, being in the chair. This, the youngest of the District Associations, has a membership of 161. At all the meetings mentioned numerous technical papers were read and discussed, and usually a visit to works concluded the proceedings.

The report of the parent Association next gives a list of the contributors to its special fund for scientific purposes, and states the present position of the Schiele foundation, from which grants are made from time to time to enable selected students to make tours of study. The Committee charged with the administration of the funds of this foundation appeal this year for subscriptions to supplement them. The Benevolent Fund of the Association received contributions to the amount of about £300 in the course of the year; and distributed to 32 cases about £488. The capital of the fund is invested to the amount of about £5350.

The President and three members of the Advisory Committee of the Association retire from office, and are not eligible for re-election this year. The report is signed by Herr H. Prenger, as President, and Herr F. Kordt, of Düsseldorf, and Herr H. Ries, of Munich, as Vice-Presidents, and countersigned by Dr. Karl Bunte, the General Secretary of the Association.

Presentation to Mr. and Mrs. W. E. Price.—An interesting ceremony took place at the works of the Hampton Court Gas Company last Tuesday, when a presentation was made to Mr. W. E. Price, the Engineer and Manager, and Mrs. Price, on the occasion of their silver wedding. It took the form of a silver salver suitably engraved, which had been subscribed for by the whole of the staff and employees. The works were tastefully decorated for the occasion, and upwards of a hundred of the officials and men were present to congratulate the recipients. Mr. W. C. Lamb, the Secretary of the Company, who presided, said that when it became known that Mr. and Mrs. Price were about to complete 25 years of married life, a few of the staff took the matter into consideration, and he was proud to say the whole of them and the employees signified their assent to become associated in the movement. Mr. C. Douglas, the foreman, and the oldest employee of the Company (having been with them nearly sixty years), made the presentation; the salver being accompanied by an album containing the signatures of the subscribers. Mr. Price expressed his heartfelt thanks to all who had so thoughtfully remembered the occasion. He remarked that he was the second generation who had occupied the post of Engineer and Manager to the Company; his father, who was still in good health, having filled the position from 1851 to 1887. Mrs. Price also suitably responded.

CARBURETTED WATER GAS STATISTICS.

M. PH. DELAHAYE has long been interested in the compilation of statistics relating to the gas industry, and in particular of those concerning the production of carburetted water gas. In 1905, he presented a collection of such figures to the Société Technique du Gaz en France; and they were referred to in the "JOURNAL" at the time [Vol. XC., p. 953]. To this year's meeting of the Society he communicated another valuable compilation, which serves as a supplement to the previous one.

His tables are made up from official sources, both from England and the United States; and they have, therefore, already been available to, and noticed by, those interested in the subject. In France it is a very different matter; for there, carburetted water gas is practically prohibited and prohibitive; and discussions frequently occur among medical and other societies as to the hygienic and other aspects of such gas. The clear and concise tabulated facts and figures given by M. Delahaye are, therefore, of great use and value to those having to combat erroneous and prejudiced views. His recent paper covers some thirty pages. We give here but the briefest outline of it—referring readers to the paper itself for the full figures and details.

The author divides his matter into five departments, considering: 1. The units of material used in the manufacture of carburetted water gas. 2. The increase of consumption in the United States and England. 3. The effect of carburetted water gas on the gas industry. 4. Accidents during 1906-10 in the State of Massachusetts, due to coal gas, mixed gas, and blue gas. 5. General observations on the causes of anæmia of town dwellers.

Under the first heading, figures are taken from the paper read by Mr. W. R. Herring before the International Congress held at Glasgow in 1901, and from the working results of the water-gas plant at the Geneva Gas-Works. [M. Des Gouttes' paper dealing with this was given in the "JOURNAL" for June 20, p. 927.]

To show the increase in the consumption of the two gases in the United States, the following (among other) figures are given:—

	1905.		1907.
	Cubic Metres.	Per Cent.	Cubic Metres. Per Cent.
Coal gas . . .	1,132,718,023	34.3	1,534,951,175 36.7
Water gas . . .	2,167,536,688	65.6	2,649,769,156 63.3
Total . . .	3,300,254,711	99.9	4,184,720,331 100.0

The increase in the consumption of coal gas is, it is said, largely due to the utilization of gas from coke-ovens.

A great number of figures are given in regard to the gas production in Great Britain from 1900 up to 1909, from which the following results may be quoted:—

	1900.		1909.	
	Cubic Feet.		Cubic Feet.	Increase.
Coal gas . . .	139,899,350,000	169,922,206,000	21 per cent.	
Water gas . . .	12,108,451,000	23,625,188,000	95 „ „	

Upon the third point—as to the effect of carburetted water gas upon gas production generally—the author observes that its development in England during the last ten years, together with the unanimity regarding it among European gas engineers, is sufficient proof of its usefulness and advantages. But not to rely merely upon a general proposition, he takes the English gas figures of 1909, and by calculation, ascertains the effect of the 23,625,188,000 cubic feet of water gas produced in that year. His conclusions are that the use of carburetted water gas resulted: (1) In diminishing by 12 per cent. the amount of coal to be bought; and (2) in reducing by 14 per cent. the quantity of coke to be sold.

Five tables taken from the official annual reports of Massachusetts, U.S.A., are given in the paper, recording the number of accidents due to gas in various forms. The figures cover about two millions of people and fifty-two towns during four consecutive years. The only legitimate conclusion to be drawn from them, the author remarks, is that the exploitation of gas is accompanied by neither more nor fewer accidents than any other kind of industrial undertaking. The following figures may be excerpted for the year 1909 in regard to mixed gas:—

Gas sold	238,827,820 cubic metres
Total number of accidents . . .	39
Accidents per 100,000 inhabitants .	2.38
„ „ million cubic metres.	0.163

The corresponding figures for carburetted water gas are:

Gas sold	19,008,080 cubic metres
Total number of accidents . . .	1
Accidents per 100,000 inhabitants .	0.60
„ „ million cubic metres.	0.05

Lastly, the corresponding figures for coal gas are:

Gas sold	12,611,480 cubic metres
Total number of accidents . . .	3
Accidents per 100,000 inhabitants .	1.78
„ „ million cubic metres.	0.23

Under the fifth, and last, heading the author quotes from a paper by M. Albert Lévy presented to the Société des Ingénieurs Civils in January, 1907, to show the variety of causes of atmospheric pollution, and the anæmic condition of people that may be consequent upon it. Among these causes are processes of combustion and human respiration, which latter may itself result in producing toxicity of the air. Academic treatises seize on the production of carbon monoxide, among the poisons known and unknown, and frequently contain arguments of a fallacious kind, attributing to one source what may be really due to many others.

A PROVINCIAL GAS ILLUMINATION SCHEME.

What was Done at Burton-on-Trent.

In connection with the Coronation festivities, an extensive scheme of gas illumination was carried out at the Burton-on-Trent Town Hall, particulars of which (together with some photographs taken last Tuesday night) have been sent to us by Mr. R. S. Ramsden, the Assistant Gas Manager, under whose supervision the work was done. The excellent effect which was produced will be seen from the illustrations.

The building, it may be remarked, is about 240 feet long, 70 feet wide, and 45 feet high to the roof, with a tower some 85 feet high; one side, one end, and part of the other end being seen from the

roadway. The scheme consisted in outlining the main features of the building with $\frac{3}{4}$ -inch wrought-iron tubing, fitted with star-jet burners at 4-inch centres. About 50 gross of 10-hole burners, and about 6 gross of 6-hole burners, were used. Arranged in the panels of the outlining were about a score of pierced copper tube devices, in the form of stars, crowns, mottoes, and heads of the King and Queen; while over the main entrance was a fine coloured crystal device with loyal greetings, surrounding a semi-circular piece of white opal glass, on which were painted the borough arms—the whole being lit up from the back by naked gas-jets. With the exception of two brackets for carrying this crystal device, neither the brickwork nor the stonework of the Town Hall was interfered with. On a part of the building rather lower than the rest, gaslit fairy lamps (red, white, and blue) were employed; and on the gable end, among other devices, were the letters



THE GAS ILLUMINATIONS ROUND THE MUNICIPAL BUILDINGS AT BURTON-UPON-TRENT.

"G.R." formed by the Hersey or Hella "Bushlight" indestructible mantles, mounted on a frame of wrought-iron piping.

A 9-inch gas-main passes the Town Hall; and from this the following services were taken to supply the outlining and devices: An 8-inch service, with fourteen 2-inch and one $1\frac{1}{2}$ -inch branches. A 6-inch service, with three 2-inch and twelve $1\frac{1}{2}$ -inch branches. A 6-inch service, with one 2 $\frac{1}{2}$ -inch, three 2-inch, and four $1\frac{1}{2}$ -inch branches. A 3-inch service, with 2-inch and $1\frac{1}{2}$ -inch branches. Each branch had a full-way tap on it. Even with services of this capacity, the pressure was reduced from 30-10ths to about 7-10ths when all the lights were on. Mr. Ramsden estimates the consumption of gas at about 60,000 cubic feet per hour.

On Coronation day itself, less gas was sent out than on the Thursday of the preceding week; while the Friday's consumption

showed an increase, owing to the illuminations being on for a longer time, and to gas being used for business purposes at the same time.

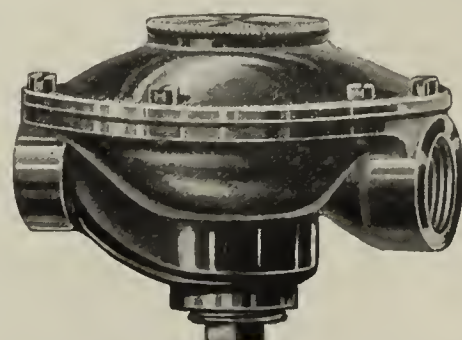
After experiencing a strong wind on the Thursday night, and drenching rain on the Saturday night, Mr. Ramsden says it seems that the ten-hole star-jet burners keep alight in the wind much better than devices of pierced copper tube. Brass burners appear to light up better in the wet than steatite ones, besides being cheaper and giving just as pretty an effect. The crystal device over the main entrance was bought in 1897, and has been altered and brought up to date for each festive occasion since. This is the first time that star-jet outlining has been used in conjunction with it; and the latter certainly makes it look paler by comparison than it used to seem when it shone alone in its glory.

THE FOSTER DIAPHRAGM GAS-GOVERNOR.

For the purpose of automatically regulating the supply so that only gas at correct pressure is delivered, the Foster diaphragm type gas-governor has been introduced by the Foster Engineering Company, Limited, of Morden Road, Wimbledon. The simple design is the result of much careful experiment, and has proved to be efficient and reliable. Its small size permits of the governor being fixed in the most confined spaces; but accurate working demands that it be in an upright position.

In pointing out that the governor was designed to regulate within close limits under a wide variation in pressure and a constantly changing consumption, the makers say that these limits are exceptional they think will be agreed when it is stated that the inlet pressure varied from 4 inches to 90 inches of water—the consumption ranging from that of a small burner to full output at low pressure. To secure accurate regulation, they found it necessary to adopt balanced valves controlled by leather diaphragms. The balanced diaphragm type, it is claimed, proves invaluable where extra

high pressure is in vogue. It maintains a very level pressure to the service, even though the primary pressure heavily fluctuates. It has also the advantage of being equally serviceable at all pressures, so that it can be used with existing



The Foster Diaphragm Gas-Governor.

low-pressure systems contemplating increases, as no alteration whatever is required to the governor should any change be made in the pressure. The governor is being used in connection with the high-pressure system at the Crystal Palace Festival of Empire, where it is understood that it is giving every satisfaction.

THE INVENTION, DEVELOPMENT, AND PRESENT POSITION OF THE DESSAU VERTICAL RETORT.

[COMMUNICATED.]

IV.

THE first, second, and third articles of this series [see Vol. CXIII., pp. 150, 292, 519] brought the story of the invention, development, and progress of the Dessau vertical retort system up to the spring of 1908. The broad conclusion reached at the close of the third article was that extended trials on a working scale of 4 and 5 metre vertical retorts showed an average make of about 13,340 cubic feet of gas per ton of coal, which gas had a gross calorific power averaging 557 B.Th.U. per cubic foot.

The pronounced success of the Dessau vertical retort system, which had been achieved before the close of the year 1907, resulted in numerous attempts being made to devise systems which should compete with it in regard to the results obtainable. Some of these systems were unblushing imitations, and the more vigorous of them were suppressed by actions for infringement being instituted by the Dessau Vertical Gas-Retort Company in the Patent Courts of Germany and Austria. The grounds on which the decisions of the Courts were based will be referred to in a subsequent article. Apart, however, from the vertical retort plants which differed in no essential respect from that invented by Dr. Bueb, there were coming into being a class of vertical retorts worked on a somewhat different system, though for the most part embodying some of the features which were inherent to the Dessau vertical retort. These systems differed from the Dessau in that the vertical retorts were not charged and discharged intermittently, but coal was passed into, and coke withdrawn from, them more or less continuously.

CONTINUOUS VERTICAL RETORTS.

The problem of the continuous carbonization of coal has always been an attractive one to inventors; but the difficulties of obtaining sound joints between the carbonizer and the feeding and discharging devices, and of obtaining coke of good quality, proved insurmountable to all the earlier inventors, and have only lately been in some measure met. A truly continuous system of carbonization, in which the material undergoing carbonization is always moving forwards, however slowly, is almost certainly doomed to lead to the production of a small and friable coke, especially when the cross section of the vessel through which the material is passing increases from the anterior to the posterior end. Real consolidation of the coking material is then out of the question. A bond between the particles is no sooner made than it is broken by the movement of the material. The trouble arising from this cause has been lessened by the adoption of a semi-continuous method of working, by which the coking material is allowed to rest for a short time undisturbed, so that it may to a certain extent become consolidated before it is pushed forward and rubbed against adjacent portions of itself and the sides of the retort. Disintegration of the coke is thereby reduced; but the firmness of the coke made by the intermittent system followed in ordinary gas-retorts, in coke-ovens, and more particularly in the Dessau vertical retort, cannot possibly be secured by any system of continuous or semi-continuous carbonization. The coke produced in continuous carbonizers may, with certain grades of coal, approach more nearly in quality than with others to that produced in retorts and ovens charged intermittently; but it can never be quite so good.

The coke, moreover, in some, at least, of the continuous or semi-continuous systems, is further deteriorated by the excessive quantity of water which it acquires from the water-seal with which the lower mouthpiece or coke receiver is provided. The coke thus produced commonly contains from 10 to 12 per cent. of moisture, as independent published analyses testify. This being so, it is immaterial to the question of the quality of the coke to discuss whether more or less water is used in quenching it. Even when quenching is nominally dispensed with altogether, coke containing upwards of 12 per cent. of water results*—proof positive that its character is such that it is greedy of water, and will obtain it even when a free supply is withheld. Coke with such phenomenal

absorptive power for water is obviously not of the firm, non-friable, impervious description which is desirable. What proportion of water would it contain if it were quenched in the ordinary way, or stored in the open in wet weather?

Passing on to the relative merits as gas-making plant of the continuous or semi-continuous systems and of the intermittent or Dessau system of vertical retorts, it may be useful to quote published figures for a representative type of the former, and compare them with those already substantiated for Dessau vertical retorts. The comparison is made on the basis of the corrected make of gas per ton of coal and of the gross calorific power of the gas. The figures given in Table IV. refer to trials of different descriptions of coal in the installation of Glover-West vertical retorts (continuous or semi-continuous) at the St. Helens Gas-Works. They are in all cases vouched for by Dr. Harold G. Colman; and the references to the pages of the "JOURNAL" from which they are quoted are given.

It will be seen that in these special trials of coals containing, on an average, the low proportion of 4·93 per cent. of ash, the make of gas per ton of coal was 12,283 cubic feet, as compared with the 13,341 cubic feet per ton achieved in installations of Dessau vertical retorts. Those who dislike the conclusion to which this comparison obviously leads may perhaps allege that it is unfair because the Dessau retorts have been worked with steaming, and the volume of gas made includes not merely the coal gas resulting from the carbonization of the coal, but also a proportion of water gas produced from the steam. The objection would be material were the quality of the gas made on the Dessau system much lower than that of the Glover-West retort gas. The gas made in the Dessau retorts had a gross calorific power averaging 557 B.Th.U., or 140·4 calories, per cubic foot; whereas the corresponding figure for the gas made in the Glover-West retorts was 581 B.Th.U., or 146·4 calories, per cubic foot. The Dessau retort system therefore affords 1058 cubic feet more gas per ton, while its calorific power, though lower by 6 calories per cubic foot, is appreciably higher than the mean for the gas now supplied in London. [The gross calorific power of the gas supplied the first quarter of this year by the Gaslight and Coke Company averaged 137·8 calories; * by the South Metropolitan Gas Company, 145·3 calories; and by the Commercial Gas Company, 139 calories. But the quantity supplied by the first-named Company greatly exceeds that supplied by the others.] Hence it will be seen that for the requirements of London—which, in the matter of the quality of gas, will be those of the rest of England a year or two later—the Dessau system of retorts furnishes gas of the desired quality, with a make of 1058 cubic feet per ton in advance of that furnished by one of the best of the rival contemporary systems of vertical retorts.

THE SUNDERLAND INSTALLATION.

If the gas manager is perchance still bound, in regard to the quality of gas supplied, by statutory provisions which have not as yet been amended to bring them into accord with modern practice, he can fulfil his obligations by carbonizing in Dessau vertical retorts as well as, or better than, by other systems of carbonization. The guarantees given by the Dessau Vertical Gas-Retort Syndicate in regard to the installation of sixty 4-metre vertical retorts at the Aÿres Quay works at Sunderland were substantiated in a trial run of the bench which was supervised by Mr. Charles Dru Drury, the Engineer of the Sunderland Gas Company. The run was made on Jan. 6 to 8, 1910, and, without steaming, a make of 12,028 cubic feet of gas per ton of (Holmside) Durham coal was obtained. The gas had a gross calorific power of 635·4 B.Th.U., or 160 calories, per cubic foot. The make per ton is 255 cubic feet less than the mean make in the trials of Glover-West retorts quoted in Table IV.; but the calorific power is 54·5 B.Th.U., or 13·6 calories, higher.

The working results obtained with the Sunderland installation

* Compare Table IV., column 7.

* Vide "JOURNAL," for May 23, p. 511.

TABLE IV.—Gas-Making Trials in Glover-West Vertical Retorts.

Date. 1909.	Reference in "JOURNAL."	Duration of Trial. Days.	Description of Coal.	Percentage in Coal of		Moisture in Coke. Per Cent.	Cubic Feet of Gas per Ton of Coal.	Gross Calorific Power of Gas, B.Th.U. per Cubic Foot.
				Moisture.	Ash.			
May 20 to 24.	Vol. CVI., p. 636	4	{ Washed Orrell Nuts }	3 95	6·94	4·0	11,448	588·8
July	" CVII., p. 166	(?) 3	{ Durham (Thornley) }	1 08	3·24	9·5	13,102	573·6
September	" CVIII., p. 42	(?) 3	{ Yorkshire Silkstone (Barrow) }	1·64	5·95	12·5	12,435	584·9
"	" " "	(?) 3½	{ Wigan (Arley Mine) }	1·39	3·58	12·05	12,145	576·2
Mean				2·015	4·93	9·5	12,282	580·9

since it was handed over by the Vertical Gas-Retort Syndicate in January last year were given by Mr. Drury in the paper he read at the annual meeting of the Institution of Gas Engineers in Glasgow; and they speak for themselves. These results must not, however, be regarded as representing the utmost of which the Dessau system of vertical retorts is capable; for a remarkable improvement in the design of the Dessau setting was being perfected in Berlin while the Sunderland installation was being erected and brought into use. This improvement, which gives even better carbonizing results than those previously obtained from Dessau settings, was the outcome of numerous trials extending over some years at the Dessau and Mariendorf gas-works; and the manner in which it was achieved is worthy of the attention of any gas engineers who may have been fascinated by the specious stories circulated from time to time as to the advantages of carbonizing in larger and larger units. That real advance does not lie in this direction will be realized from a study of the considerations the outcome of which was the 1910 model of Dessau retorts.

LARGE V. SMALL CARBONIZING UNITS.

In the course of the discussion on various papers on vertical retorts and large carbonizing ovens presented at the annual meeting of the German Association of Gas and Water Engineers in June, 1908, Dr. Bueb, the inventor of the Dessau system of vertical retorts, expressed himself (*inter alia*) as follows:—

Practical experience with the vertical retort had taught that it was a great mistake suddenly to enlarge its capacity. All sorts of unforeseen evils ensued, which could only be overcome with difficulty or with the sacrifice of other advantages. Since the present pattern of vertical retort had been brought out, further trials had been made both by the German Continental Gas Company and by the Imperial Continental Gas Association, under Mr. Körting's guidance. The object of these trials was to increase the capacity of the retorts. They were not yet completed, and it would only be possible to give a trustworthy report on them in the course of a year. It could, however, be stated now that no economically improved result was attained by increasing the size of the charge. The trials which were being carried out at Mariendorf and Dessau with two different sizes of retorts proved that as the capacity of the retort was enlarged, the fuel consumed in heating it showed a relative increase. The speaker would therefore warn his hearers not to pin great faith on the enlargement of the carbonizing chambers. The figures now published for the working on a large scale at Zürich and Mariendorf might, in the speaker's view, be taken as the practical limit of what was attainable. If the retorts were enlarged, the figures would not be improved, but probably deteriorated. It should be remembered that three years ago no gas engineer considered that such figures could be obtained on a large scale of working.*

It will be seen from these remarks of Dr. Bueb that an increase in the size of vertical retorts had already been tried three years ago in connection with the Dessau setting, and had been found to constitute a serious disadvantage. Hence, as a result of experience gained thus early, the Dessau Vertical Retort Company had abandoned the idea of enlarging vertical retorts—an idea with which less experienced designers of vertical retort-settings are still toying. It was not, however, until the close of the year 1909 that it was announced that the Dessau Company had taken a very definite step in the opposite direction, and had made extended trials of a setting of small retorts with satisfactory results. The 5-metre Dessau vertical retorts had hitherto generally been arranged twelve in a setting—i.e., one row of six retorts at the back of another row of six. The new retorts were made of rather smaller cross section by curtailing the longer axis so that three could be placed in a row from front to back of the setting, and six were arranged in each row. By this means, eighteen retorts were disposed in a setting which covered the same ground space as the former setting of twelve; and though the charge per retort was smaller, the amount of coal carbonized per setting was considerably increased. Thus one of the new settings of eighteen vertical retorts carbonized 391 cwt. of coal per 24 hours, against 275 cwt. for the former setting of twelve, though the charge per retort was reduced from about 1280 to 1065 lbs. The three retorts in a row from back to front in the new setting have their doors mounted on a common axle shaft, so that they are discharged and recharged as a single unit, with the result that a great saving in labour is effected.

In respect of labour and manipulation, the new Dessau setting may be regarded as consisting of units each taking a charge of 28½ cwt. of coal; though in regard to heating and rapidity of carbonization it comprises units each containing only 9½ cwt. of coal. This happy combination of the advantages in respect of labour-saving possessed by large retorts and chambers with the superior carbonizing qualities of small retorts, appears to be shared by no other type of setting; and it may be regarded as one of the greatest advances made in recent years in the design of carbonizing plant. It was at the Mariendorf works (in Berlin) of the Imperial Continental Gas Association that this advance was made under the direction of Mr. Edward Körting, who described the new setting early in 1910.† He quoted at the same time the results of an efficiency trial of it, conducted two months earlier by Dr. K. Bunte and Mr. Sentke on behalf of the German Association's Experimental and Instructional Gas-Works.‡ The results obtained in this efficiency trial may appropriately be set side by side with the mean results obtained by Dr. Colman in the four

trials of the Glover-West continuous vertical retort installation at St. Helens already referred to. The comparative figures are set out in Table V.

TABLE V.—Comparative Results of Trial Runs of Dessau and Glover-West Settings.

	Dessau.	Glover-West.
Number of retorts in setting	18	8
Length of retorts feet	16'4	20
Descriptions of coal carbonized	Silesian	See Table IV
Mean percentage of ash in coal carbonized	4'28	4'93
Mean percentage of moisture in coal carbonized	2'91	2'01
Weight of coal carbonized per retort per 24 hours cwt.	21½	46½*
Weight of coal carbonized per setting per 24 hours cwt.	391	373½*
Make of gas per ton of coal carbonized cubic feet	13,430	12,282
Make of gas per setting per 24 hours cubic feet	262,898	213,800*
Gross calorific power of gas made B.Th.U. per cubic foot	542'6	580'9
Dry coke used as fuel in heating the setting—		
Per cent. by weight of coal carbonized	11'8	12'49
Pounds per 1000 cubic feet of gas made	20'02	21'00
Mean percentage of ash in coke used as fuel	12'4	7'64
Dry coke, minus ash, used as fuel in heating the setting—		
Per cent. by weight of coal carbonized	10'34	11'54
Pounds per 1000 cubic feet of gas made	17'54	19'39

* These figures for the Glover-West setting refer only to the trial made with washed Orrell nuts. The time taken was not stated in Dr. Colman's reports on the other trials.

It will be seen from this table that from coal containing about the same proportions of ash and moisture the new Dessau setting produces 1150 cubic feet more gas per ton of coal carbonized than the Glover-West setting, and that the only offset which the latter presents is that the gas made by it averages 38'3 B.Th.U., or 9'6 calories, more in calorific power. The gas produced in the Dessau setting has, however, as nearly as may be, the same calorific power as the gas supplied Jan.-March in London by the Gaslight and Coke Company (*vide supra*). Apart from this lower calorific power of the gas made, all is in favour of the Dessau setting. This setting does more work in 24 hours, and the expenditure of fuel is appreciably lower. The comparison supplies ample evidence in support of Dr. Bueb's statement, made three years ago and quoted above, to the effect that increase in the size of vertical retorts is a step in the wrong direction. The eighteen retorts in the Dessau setting, which covers about the same ground space as the Glover-West setting, clearly produce more gas in 24 hours than the eight retorts of the latter, and afford a considerably greater make per ton of coal carbonized; while the fuel consumed in heating the setting is appreciably lower.

(To be concluded.)

DESSAU RETORTS v. "FULL" HORIZONTALS.

By A CARBONIZING ENGINEER.

IN considering the claims of vertical retorts, it is surely a mistake to compare the results obtained from this modern system of carbonization with those obtained from small charges of coal in horizontal retorts. Those engineers who have altered their method of working from six-hour charges to those of twelve hour, well know that the change has made an astonishing difference in their results both in the make of gas per ton, the B.Th.U. obtained per ton, the quality of the coke, the yield of ammonia, and the quality (and sometimes the quantity) of the tar produced. To these improvements must also be added a notable saving in labour.

Present users of horizontal retorts worked with small charges must first carefully consider to what extent they could improve their results by extending the duration of the charge, before jumping to the conclusion that vertical retorts would effect an improvement unobtainable by horizontal retorts. This was the impression received by the writer on reading Mr. Dru Drury's admirable Gas Institution paper on the Dessau vertical retorts at Sunderland. No fault could be found with the paper itself, which was indeed a model of what a technical paper should be; but it is noticeable throughout that the results from the verticals are all being compared with those from small charges in horizontal retorts. Mr. Drury shows how great is the improvement comparing one system with the other; but it is a fact that full charges in horizontal retorts would in most respects show an equally substantial improvement over those obtained with small charges.

The personal factor, too, must not be forgotten. Any engineer adopting vertical retorts and who thereby does, to some extent, stake his reputation on a choice of a new process—and as such vertical retorts must still be considered—naturally gives his undivided attention to the working of the installation. And there is no doubt the new system receives far more close and careful supervision than the old horizontal retorts had ever received. This sort of thing greatly adds to the efficiency of the particular plant or process. It is also fairly certain that those engineers who have during the past year or so changed their system of small

* See "JOURNAL," Vol. CIII., p. 777.

† *Ibid.* Vol. CIX., p. 96.

‡ *Ibid.*, Vol. CIX., p. 27.

charges to those of long duration have, as a consequence, paid more attention to the retort-house, with the result that some of the improvement effected is due to extraneous causes.

To deal in some detail with the working results obtained from vertical retorts at the Ayres Quay works at Sunderland, as compared with those obtained from horizontal retorts at the same Company's Hendon works, as published by Mr. Drury, it must be at once acknowledged that very considerable improvement is shown in the case of the verticals. The make of gas per ton with the verticals is 12,647 of 15.52-candle power (No. 2 "Metropolitan" burner) and 590 (gross) B.Th.U. calorific power, as compared with 10,638 cubic feet of 18.22-candle power and 611 (gross) B.Th.U. with the horizontals. This shows a large increase in the make; but there is a considerable drop in the candle power, which must still be considered in these days of illuminating power standards, though the calorific power shows but a small reduction. Had the same coal been carbonized in full horizontal retorts to give 15.5-candle power gas, it is more than probable that the result would have been only a little short of that yielded by the verticals. But it is fairly evident that the Dessau vertical retort yields a good quality of heating gas, and better than any horizontal retort. There is no doubt that in a good many works fully-charged horizontal retorts are giving yields of 12,500 cubic feet per ton of 15½-candle power gas (No. 2 "Metropolitan" burner) from second-class Durham coal, of a quality no better than that used at Sunderland; and it must be remembered that, in the case of the Dessau verticals, about 1000 cubic feet is due to the admission of steam, which in itself must obviously increase the charges for fuel in the settings and in the boilers.

It is, of course, very convenient, and probably economical, to make a little water gas in this way; but it is not made for nothing. Again, of the extra make of 2000 cubic feet of gas per ton from the verticals, 368 cubic feet is due to air admitted for the revivification of the oxide. Too much should not be made of the question of a high fuel account, as on the new Dessau setting, with three rows of retorts, this item is very materially reduced. The tar made in the verticals—11.40 gallons per ton of coal—is high as compared with that obtained from horizontals even with full charges. There is also a good yield of ammonia, which in the case of the verticals was 28.66 lbs. of sulphate per ton of coal, as against 24.07 lbs. with the horizontals. Such an improvement might well be expected to result from adopting full charges in horizontal retorts, instead of six-hour charges.

Coming now to the question of the quality of the coke made, Mr. Drury states that the "coke from the verticals is distinctly denser and heavier than that from horizontals—the former, bulk for bulk, weighing about 25 per cent. more than the latter, and approaching much more nearly the quality of good oven-coke." The same statement, except as regards the weight, about which nothing definite is known to the writer, could be made concerning the quality of the coke from full charges in horizontals. A full charge gives an entirely different form of coke to that produced in a small charge; and where due regard is paid to the drop of the coke from the retort, to prevent undue breakage, the size, shape, and density of the coke are very similar to that produced in vertical retorts, and bear a fairly close resemblance to that from coke-ovens. Again, in the matter of the percentage of breeze, coke from fully-charged horizontals is found to make very much less than that made with small charges. The comparison would be equally as good as that shown by Mr. Drury in his paper in comparing the verticals with small charges in horizontal retorts. The tar, too, is much thinner with large charges, and of a specific gravity of about 1.140, as against 1.113 produced by verticals, as mentioned by Mr. Drury, and 1.200 or more produced by the small charges in horizontals. There is, also, no more than an average of 2½ or 3 per cent. of water in the tar, while the free carbon is very light, and the percentage of pitch low.

There is one direction in which there appears to be room for much improvement in the Dessau vertical retort; that is in the matter of pressure in the retort. That there should be as much as 4 or 5 inches of pressure during the first hour or so, when the make of gas is at its highest point, and when the quality is at its best, is a serious disadvantage. A retort is a porous vessel, and in its natural condition is full of cracks through which gas can and does readily pass at anything above atmospheric pressure, or rather the pressure in the setting. When working with full retorts, it is found necessary to use two ascension pipes to relieve the pressure in the retort during the first hour. If it is necessary with horizontal retorts it is surely much more necessary with intermittent vertical retorts, in which there is less space for the exit of the gas, and the whole charge is to some extent compressed by its own weight. The results would surely be much improved were this drawback removed. Is it not possible to provide a gas outlet at the bottom of the retort even at the expense of some structural difficulties?

There is one other point with the Dessau vertical retort, in the matter of heating, which hardly seems to coincide with theoretical considerations. The retort being tapered, it is obvious that the bottom part must contain considerably more coal than the top. Being an intermittent process, the bulky mass of coal at the bottom is only heated for the same period as the lesser thickness of coal at the top. This difficulty is to some extent overcome by heating the bottom part of the retort to a much higher temperature (to the extent of some 700° or 800° Fahr.) than the top. The difference in the temperature may not be so great as that stated; but the system of heating is in any case a graduated one, in which

the variation between the temperature at the bottom and the top of the retort is considerable. The system, therefore, resolves itself into one in which the coal at the bottom and that at the top are carbonized at totally different temperatures. There is a correct temperature at which coal should be carbonized—varying to a small extent with different coals; but it cannot be right to carbonize one part of the charge at (say) 1500° Fahr., and another part at 2300° Fahr. It would at any rate appear that the coal at the top would not be completely freed of its volatile contents, while the coal at the bottom (and in any case that on the outside of the charge) would be carbonized hours before the retort was discharged. This system of graduated heating, which in the case of continuously worked verticals is essentially scientific, appears to be totally inconsistent with the complete carbonization of any intermittent charge.

Summarizing, therefore, the respective advantages and disadvantages of the Dessau verticals and the fully-charged horizontals, there is no doubt that the former derives some benefit from the fact that the bulk of the gas does pass up the cool core of the charge, and thereby neither the gases nor liquid products are split up to any extent. In the horizontal—full though it may be to all intents and purposes—the gas being light and the charge dropping ever so slightly, even if only to the extent of ¼ inch or ½ inch (which is inevitable), the bulk of the gas must obviously pass along the top of the retort and be split up to a greater or less extent. This fact may possibly account for the superiority of the Dessau vertical retort as the producer of a good heating gas containing a high yield of tar of good quality and, perhaps, more ammonia as compared with the fully charged horizontal retort. There is, however, no reason to believe that the actual make of gas per ton is any greater. The coke may be a little larger, harder, and denser than that produced in the latter, owing to the absence of a long drop in the case of the verticals, the absence of machinery to break it during the discharge, and the extra compression it receives in the retort as a result of supporting its own weight. From all accounts the wear and tear should be materially less with Dessau verticals than with horizontals; and the writer attributes this to the entire absence of machinery, to the fact that the retort standing on end is supporting its own weight and being tapered is particularly stable, and lastly, owing to the superiority of the producers used for heating the vertical retorts being deep and so constructed as to give gas of uniform quality.

In this latter respect the same advantages should be experienced by users of vertical retorts as that mentioned by Mr. Wilson in his Presidential Address, as the result of his experience with outside producers in his horizontal retort installations. In the case of horizontal retort-settings heated by single or double furnaces placed underneath, the producers are generally not scientifically adapted for giving gas of uniform quality, resulting in flame in the combustion chamber and local heating from the insufficient or excessive amount of secondary air required for burning producer gas with varying content of carbon monoxide. This is chiefly due to the use of furnaces too shallow in depth, and which entirely depend on regular filling and on the proper leveling of the coke for the production of gas of good quality. And even then, owing to the variation of the depth, the quality is continually altering. In the opinion of the writer, the comparative inferiority of the furnaces used in horizontal retort-settings is largely responsible for the excessive wear and tear of retorts and combustion chambers.

On the question of labour, there is little doubt that Dessau retorts will be operated at about half the cost of an up-to-date installation of horizontals. Taking the figure for the latter at 6d. per ton, that for the verticals should not exceed 3d. The advantage in this respect is, however, fully counteracted by the heavier annual capital and sinking fund charges in the case of Dessau settings. The balance of advantages is probably on the side of the Dessau system, but not to an extent which would warrant its wholesale adoption in place of horizontals worked on up-to-date principles.

VERTICALS.

By R. W. E.

THE abundance of valuable and exhaustive information given in the papers written by the four members, Messrs. Dru Drury, Newbigging, Leather, and Holmes-Hunt, for the recent Institution meeting, deserves and I believe obtains the hearty thanks of all engineers who at this moment are seeking the particular vertical which will best suit their "corner."

Mr. Allen struck the true note when he asked for more facts and figures—not because the writers had withheld any valuable information, but because what was submitted was of such an excellent nature that one felt compelled to seek for additional particulars, not only in corroboration but to qualify or amplify the details in making comparisons with the two descriptions of verticals, and also against horizontals.

The first point which appeals, and certainly calls for modification in future installations, is the capital cost. Intermittent and continuous at Sunderland and Manchester respectively are given at about £180 per ton. That this cost is at least 75 per cent. more than horizontals with machinery there appears but little doubt. Therefore, if verticals are to make headway, the various

makers must cut down their costs; and doubtless they will readily do so when more contracts are forthcoming, and competition lights-up more fiercely.

The second point is undoubtedly the huge saving in wages. Sunderland costs appear about twice as high as Manchester; but there was some light thrown upon this by Mr. Charles Hunt, who explained that in the new settings of eighteen the wages worked out at about one-half those at Sunderland, and Mr. Hunt doubtless took his usual method of erring well on the safe side. It may, therefore, be taken that with both intermittent and continuous, the wages will ultimately be less than 4d. per ton. This in itself is enough to make one throb with eagerness, and call for immediate extensions (assuming they are likely to be required in the near future) and to reap this great saving. Some works are still in the region of 2s.; and where this is the case, the economy will be substantial.

The next point is the make of gas per ton, which is higher than the best horizontals. But it is difficult to make close comparisons, having regard to the various qualities and descriptions of coals carbonized in different parts of the country. Then, again, fuel is an important matter. But we have a wide difference between intermittent and continuous—the latter showing a considerable saving. Manchester fuel is given as slightly over 10 lbs.; and Mr. Drury rightly paid tribute to this point in his reply.

Residuals all show improvements, particularly in the liquid description (tar being better in quality). The quality of coke is important; and it will be necessary to investigate this point more closely when making a selection between intermittent and continuous. The former appears to yield a denser coke, which would probably not be welcome in large residential districts. The recovery in residuals ought to be very substantial, and cannot be neglected—especially in these days of good markets for tar and sulphate.

Renewals and upkeep we are unable to ascertain from British experience; but one would be inclined to assume that these should be well below horizontals. Excepting this and capital expenditure, all other points show very favourable improvements over horizontals; and in the case of wages and make per ton, as well as liquid residuals, the increases are highly attractive.

There is no doubt but that many converts have already been made, and others will follow. Meanwhile, those who are fortunate enough to be in a position to take early advantage of verticals will, it is hoped, give their experience in due course, and so enable us to make comparison with the valuable information which was so generously and ungrudgingly given by the four gentlemen mentioned, and to whom everyone is grateful.

SHALE-RETORTS AND CONTINUOUS VERTICALS: A COMPARISON.

[COMMUNICATED.]

A GOOD deal of similarity exists between the successful shale-retort and the continuous vertical retort; and it is a matter for surprise that gas engineers have been so long developing their retorts on the lines of those used with such satisfactory results in the shale industry. This article is written for the purpose of making a comparison of some of the essential features of the shale-retort and the vertical gas-retort. With the shale, as used in the Scottish oil-works, not more than some 16 per cent. is of any value whatever—the remainder being entirely ash. No visitor to Edinburgh can have failed to have noticed the enormous artificial mountains of shale-ash, amounting to millions of tons, standing out conspicuously against the horizon. These huge heaps constitute the waste from the shale-oil industry, and have entirely baffled all attempts to find some purpose to which this useless material could be put.

The shale-retort settings are entirely uncovered, and in this respect are similar to coke-oven installations. There certainly appears to be no need for any covering (especially as very little labour is required to operate them); and by this means considerable capital cost is saved. Above each vertical shale-retort is placed a hopper which has an open top and is continually being replenished with supplies of shale acting as a funnel for filling the retort beneath it. The hopper is invariably kept nearly full, and is directly connected to the top of the retort without the interposition of any valve, cock, or slide. As fast as the ash is removed from the bottom, so does the shale slide down the funnel into the retort. The gas outlet pipe is placed at a point just below the hopper and at the top of the retort. In spite of the hopper having no valve either at top or bottom, no gas escapes nor is air admitted through the shale in the hopper. The reason of this is that a level gauge is maintained in the top of each retort; and, besides, should a little air be admitted, it would not be a serious matter, as will become apparent when it is explained that the gas from the shale, after its contents of light spirit have been extracted by washing, is used to heat the retorts.

The retorts are 50 feet or more in length. They are circular in shape, tapering from a diameter of about 20 inches at the top to some 36 inches at the bottom. They are constructed partly of bricks and partly of cast iron, and are found to last at least twelve years or more with very few, if any, repairs. The bottom part of the retort is built of firebricks for about one-third of its height; and the remaining two-thirds at the top is formed of cast iron.

The retorts are heated partly by the gas from the shale and partly by producer gas; it being found that the gas from the shale is hardly sufficient in quantity to provide the full heat required. A retort of the size mentioned will carbonize some 4 tons of shale per diem, while a ton of shale will produce some 22,000 cubic feet of non-luminous gas of about 150 B.Th.U.

The gas is admitted to the combustion chamber situated at the bottom of the retorts, around which it travels, finally leaving the setting at the top. The result is that the heat varies from a comparatively bright heat at the bottom—say, 1800° Fahr.—to a dull heat (almost black) at the top. In this way, the shale is gradually distilled, firstly with a dull heat and lastly with a bright heat.

At the bottom of the retort is a circular ledge projecting on the inside; and it is on this ledge that the charge is supported. Fitted to the bottom of the retort is an iron chamber in which the distilled shale-ash is stored awaiting removal. In this chamber is fitted a vertical shaft, on which is placed an arm at a point on a level with the circular ledge to which allusion has already been made. The shaft is continually, and slowly, revolved by ratchet motion operated by a long connecting rod extending the full length of the retort beds, and worked by the crank of an engine. By this means, the arm slowly revolves round the ledge, thereby sweeping off pieces of the shale-ash. These pieces fall into the chamber at the bottom of the retort, and are removed at convenient periods through sliding-doors. Steam is admitted at the bottom of the retort, to quench the ash before removal; and it also has the effect of increasing the make of gas by converting the shale-coke to water gas and also augments the production of ammonia. This latter bye-product is produced to the extent of 40 lbs. to 50 lbs. of sulphate of ammonia per ton of shale. Other bye-products are tar (generally used for the heating of the boilers), light motor spirit, light oils, lubricating oils, paraffin and paraffin wax (used for candle-making), and coke from the distillation of the oil. This coke is almost entirely composed of carbon.

The labour required for operating the retorts is extremely small. It is found that one man at the top of the retorts is capable of filling the coal hoppers for an installation distilling 120 tons of shale per diem, while another man at the bottom attends to the removal of the ash. In this way, two men during the daytime and two men at night (or four in all) are able to do the entire work for a plant of 120 tons daily capacity.

Having briefly explained the nature of the retorts in which the shale is distilled and the process in general use, it will be seen that very little difference exists between them and the continuous vertical gas-retort settings. With the latter, although it is the custom to maintain a level gauge in the retort, it is thought necessary to provide some form of valve by means of which the coal in the main hopper above each retort is divided from the retort itself. The reason of this is obvious. With the gas-retort it is equally important to prevent air from being drawn in through the coal as it is to ensure that no gas is lost in the same direction; while in the shale process the quantity and quality of gas, as in the coke-oven industry, is a minor consideration. The retorts in each case are tapered; but those used for shale are much longer and of greater bulk.

In the matter of coke-extraction, the method used to withdraw the shale ash would hardly be applicable to the vertical gas-retort, as the probability is that the quality of the coke would be seriously impaired owing to breakage. In the case of the shale ash this is, of course, of no consequence. In the question of coke extraction, a good deal of ingenuity has been displayed in both the Woodall-Duckham and the Glover-West plants. It is a matter which must have given the inventors much trouble, and it would certainly appear highly desirable that the coke should be comparatively cool by the time it reaches the coke-extractor. The storage-chambers and doors provided for retaining the shale-ash until sufficient has accumulated for removal are also identical with those adopted by the two previously mentioned systems of continuous vertical retorts.

In the matter of heating the retorts, it would appear that, while the shale process is admirably adapted for being conducted with a low fuel account, owing to the fact that the retorts are of great height and are each heated to a considerable variation of temperature, the vertical gas-retorts, by reason of the heat of carbonization, are not nearly so well accommodated in this respect. It is, however, by no means the usual practice in the shale-retort settings to heat the secondary air. The exceptionally long life of the shale-retorts, though the heat at which they are used is by no means so great as with gas-retorts, leads one to anticipate to some extent the same favourable feature in the case of the latter; and it would seem to be reasonable to suppose that a retort standing on end like a column should be more durable, and retain its shape for a longer period, than a horizontally placed retort depending mainly on transverse walls for its support.

In the shale-retorts, it is the custom to admit sufficient steam at the bottom of the retort to convert to water gas the whole of the coke remaining from the distillation. This coke, however, exists in the shale to only a very small proportion; and it, therefore, requires but little steam for this purpose. It is noteworthy that sufficient ammonia is produced per ton of shale to make from 40 lbs. to 50 lbs. of sulphate of ammonia—a figure which is about twice the amount produced in gas-works. Is this due to the presence of more nitrogen in the shale, or to the gradual increase in the heat of distillation? The last-mentioned reason would appear to be the more feasible. The conditions, in fact, in a shale-retort should be almost ideal for the production of a

large amount of ammonia. One of the features of the Glover-West plant is that the upper part of the retort is maintained at a lower heat, owing to the waste gases being conducted round this part of the retort before leaving the setting. This fact should render this system a favourable one for the production of a good yield of ammonia.

In this connection, it is noticed that Mr. Newbigging, in his paper on Glover-West verticals, gave figures in his "Summary of Tests," which as far as the particular Lancashire and Derbyshire coals used in the tests are concerned, support this contention. These two coals give an average of 37.6 gallons of 10-oz. liquor per ton of coal—a very large yield. This high figure was not, however, maintained in the case of one test with a Yorkshire coal, which gave as low a yield of ammonia as the others were high.

In the matter of labour costs, the two processes are analogous—the common feature of both being an exceptionally low account. In other directions the two processes are hardly comparable; but sufficient has been stated to show that much similarity exists between what has been common practice for many years in the shale industry and a system which has only during the past few years been introduced with success into the gas industry.

OBSERVATIONS ON GAS COKE FROM THE STANDPOINTS OF THE COMMERCIAL MAN, THE ACCOUNTANT, AND THE GAS ENGINEER.

By Mr. E. KÖRTING, of Berlin.

[Abstract Translation of a Paper read at the Meeting of the German Association at Dresden.]

It behoves the careful family man and business man from time to time to discontinue his work, in order to review his performances with a view to checking their efficiency. In the last ten years, gas engineers have aimed at many things and have achieved a great deal. Manual labour has to-day been so far displaced by machinery, not only in the retort-house, but in the coal and coke yards, that little more remains to be done in this direction. For instance, since retort-house wages have receded from over 3½d. per 1000 cubic feet of gas made with direct-fired settings and hand labour to 0.6d. with settings of eighteen vertical retorts, it must be recognized that a remarkable revolution has been accomplished. Further, 20 per cent. more gas, of approximately the same calorific power, is being obtained from a given quantity of coal, while the tar and ammonia have been improved both in quality and in quantity. These achievements afford compensation for the increase in the price of coal and in wages. Moreover, in another important item of expenditure in gas manufacture—viz., cost of repairs—there has been a not inconsiderable diminution. The Mariendorf vertical retort-settings have now been in action for approximately four years, and not a single hole has developed in the retorts, nor have they become deformed to any appreciable extent. Moreover, the De Brouwer conveying trough, considering the work it has to do, entails very little expenditure on repairs.

Interest in gas coke, the most important bye-product of the gas-works, has, however, been strongly affected by the changed conditions. Twenty to forty years ago, the scientific era of gas manufacture began with the classic work of Bunte and Schilling on producer settings. The capability of the gas engineer was for a long time judged as being inversely proportional to the consumption of fuel in his settings. When the author was working at the Hanover Gas-Works at the end of the seventies, the Munich settings, with 10 per cent. fuel consumption, were regarded as the climax in the way of retort-settings. Klönne and Hasse-Didier endeavoured, with more or less success, to achieve the same results. How do these old settings stand relatively to present-day conditions? The author has endeavoured by careful investigation to find an answer to this question, with the following result.

The Hasse-Didier settings, which earlier required 12 per cent., now need 16 to 18 per cent. of fuel for heating the retorts, while the inclined settings, which likewise were reckoned to consume 12 per cent. of fuel, now on the average require fully 16 per cent. Similar results are reported from other places. What is the reason? In the first place, the old methods of computation were not quite unobjectionable, and no gas manager would now prescribe a maximum of 10 per cent. fuel consumption to his assistants. Our methods of working have also greatly changed. A larger make of gas is obtained per ton of coal, by the employment of higher heats and longer periods of carbonization. Dr. Bueb has taught us to fill our retorts much fuller; and the technical advantages incident thereto have resulted in a considerable diminution of labour, but at the same time an increase in the cost of fuel. We arrive, therefore, at the disagreeable conclusion that fuel consumption is worse than it was in former years. This does not, however, apply to the latest types of setting. With the settings of 18 vertical retorts, the author has ascertained exactly that with Silesian coal 11½ per cent., or, taking account of the settings on low fire and the burning-out of scurf from the retorts, 12½ per cent., of fuel is consumed, which is probably not more than was required by any one of the earlier types of settings. The increased yield in gas and bye-products may, therefore, be regarded as a net

gain. In any case, it appears extremely important that we should be quite clear how we are working with our settings, and what means are available to control them. We know obviously how much coke we have sold, because we know how much money has been received from the sale of coke; but in regard to the real quantity of coke sold, we are only incompletely informed. Thus, if we sell by weight, the whole quantity of water contained in the coke is reckoned; and that may rise to 20 per cent. and more. If, on the other hand, we sell by measure, and convert the measure into weight by calculation, the density and size of the coke plays an important part, and great want of exactness is unavoidable. Neither do we know how much coke we produce. Analysis teaches us that the usual descriptions of coal yield in the crucible an amount of coke varying between about 60 per cent. with Silesian, and about 70 per cent. with Ruhr coal; while the yield of coke in vertical retorts or large chambers is certainly higher than in the crucible, as the carbon of the decomposed hydrocarbons is added in this case. Assuming that, with the aid of numerous analyses, exact figures for the yield of coke are available, there remains still the question whether the coke produced is to be reckoned as free from water, or whether a certain proportion of water is to be allowed for in the coke sold, and in the latter case what the percentage of water allowed shall be. It would obviously be possible also to calculate the coke for sale, whether containing much or little water, into the corresponding weight of coke free from water. There is no fixed starting-point for determining the fuel consumption in settings. Where the coke is used cold, it can be weighed, but naturally its moisture is weighed with it. On the other hand, hot coke is more or less completely insusceptible of control in this manner.

Clearly the unknown quantities are predominant. How can useful results be arrived at? Let us take the case of the old gas manager with his 10 per cent. of fuel consumption. If he added to it the figures for the coke sold, he obtained naturally a correspondingly low production of coke. The author's father adopted another method. He took the make of coke as fixed and unalterable—viz., at 70 per cent. of the weight of the coal, which corresponds on the average, with Westphalian coal, fairly exactly to absolutely dry coke. The difference between the coke produced and the coke sold was then the amount consumed in heating the settings. But as the coke always contained water, and was not sold in the dry state, the fuel consumption necessarily worked out low, and was the lower the wetter and smaller the coke. There are still great differences in the methods of calculation employed in modern gas-works, as the extremely divergent figures for the yields of coke indicate. The results from a few towns may be quoted in illustration. The coke produced from Silesian and Saar coal is as follows: Munich, 66 per cent. by weight, Nuremberg, 77 per cent.; from English coal, Copenhagen 76 per cent., Königsberg 66 per cent.; and from Ruhr coal, Cologne 75 per cent., Elberfeld 70 per cent. Breslau, which works with Silesian coal only, and should therefore have one of the lowest productions, stands, with 73 per cent. by weight, far in front of Berlin, which gasifies a preponderance of English coal, and attains only to some 71 per cent. yield of coke. These figures agree so little that they are almost useless for comparative purposes; and as the production of coke and the amount used as fuel generally are calculated together, the fuel consumption must also be regarded as very questionable. If, for instance, adopting the author's father's method, the production of Copenhagen and Königsberg were taken at 70 per cent. of water-free coke, the former place would use 9 per cent., and the latter 19 per cent., of fuel, which are quite improbable figures. In these circumstances, it appears to the author out of the question to calculate the fuel consumption. Instead, it should be established every year by a sufficient number of practical trials how much coke the settings consume in normal working, either by weighing and determining the water in the coke when the furnaces are charged with cold coke, or, when they are charged with hot coke, by the following method: The coke from the whole of the retorts of one setting is drawn, and as much as is required is used for charging the furnace, and the rest laid aside and weighed cold. The rest of the settings are charged with cold coke; and the production of coke in them is determined in the usual manner. This trial, extended over several days between two periods of clinking, gives the coke consumed in percentage of the coke produced. The coke used as fuel needs only to be multiplied by the figure for the production of coke in order to give the ratio of the fuel consumption to the coal carbonized. The figure thus obtained applies for normal working. Small discrepancies in the figure for the production do not seriously affect this method of calculation. Allowance must be made by exact determination once a month for the coke consumption in heating-up fresh settings, in burning-out the retorts, &c. This generally amounts to 1 to 1.5 per cent. The value so found must be introduced into the calculation. With modern scientifically controlled settings, such as the vertical retort settings, in which the draught, position of the damper, temperature, &c., scarcely fluctuate, the results are naturally very uniform. The high proportion of ash in certain coals may cause a difference.

In order critically to examine the figures for coke production, it is important first to obtain an impression of the requirements of the coal business. At the end of the last and the beginning of the present century, the production of gas coke increased much more rapidly than the population; and there was a big depression in prices. In time, this was changed by the diminution of the amount of coke brought on to the market, owing to its use for

water-gas production and by steaming in vertical retorts, while the quality was improved. The net prices obtained for coke and breeze in Berlin have been as follows:—

1903	13s. 6d. per metric ton.
1904	14 0 " " "
1905	15 0 " " "
1906	15 0 " " "
1907	17 6 " " "
1908	21 0 " " "
1909	25 0 " " "
1910	18 0 " " "
1911 less than	16 0 " " "

For the moment the prices unfortunately are again depressed; but this is chiefly due to the mild winter. What can be done to avoid low prices for coke? In the first place, active propaganda or advertisement is necessary; and all that there is to learn must be ascertained regarding competing fuels. Why is oven coke, which is so much dearer per unit of heat, sometimes preferred, and why have brown coal briquettes become popular? The value of gas coke itself, its value for central heating plants, and coke-stoves for the heating of rooms must be brought before the notice of the public very clearly. In Germany, this is an important matter for the Central Organization for Promoting the Sale of Gas to take up. The English have had an original idea in this direction. The coke is put up at the gas-works in large paper bags containing 28 lbs., and taken for sale into the lower quarters of the town. Many thousand tons have thus been disposed of by the London Gas Companies. In Berlin for some years the gas-works have sold to a few large merchants, who were in a position to pay for the coke on receipt. They sold to the small merchants on credit. Now, rightly or wrongly, the customers of the latter formed the view that they were cheated as to weight or measure, and many of them sought to buy direct from the gas-works. The coke merchant, seeing his living endangered, started underbidding the companies, with the result that he worked at a loss; but the market prices were so depressed that the gas-works became also injuriously affected. It then occurred to the large firm of Stinnes, who were then renewing their arrangements with the Westphalian Coal Syndicate, to establish a powerful selling organization for the whole of Germany. By manipulating prices and amalgamating local firms, it has endeavoured to secure a controlling influence in Berlin, and so far, not without some success. Consequently, the position of the small merchant has become worse. He must either go under or join concerns with more capital. When he does the latter, the larger merchant becomes superfluous, as the new amalgamations are in a position to treat directly with the gas-works with advantage.

These new associations must certainly join with the gas-works in an active propaganda to further the sale of coke, and to recover the confidence of the public. The gas-works must, moreover, have regard to the quality of the coke. It must avoid carbonizing coal containing an excessive amount of ash, or must mix carefully coal containing much ash with coal containing but little, in order to produce coke with a low content of ash. Professor Bunte at one time advocated the sale of coke being based on the amount of ash it contained. Secondly, the gas-works must avoid selling water instead of coke. [A letter from a consumer is quoted at the close of the paper to show how important this is.] That is to say, if it is sold by weight, a certain measure must also be guaranteed. If the coke has been soaked with water, the number of bushels guaranteed per truck load will weigh (say) 10 per cent. more than the weight at which they should be actually reckoned. In other words, the 10 per cent. of water is not paid for. But what will the merchant do? He will in most cases regard the 10 per cent. of water as a bonus to him, and thus accomplish what the gas-works endeavoured to avoid. There is nothing for it but that the gas-works should actually sell dry coke, though naturally the retailer will be displeased thereby. Actually the author has lately had a number of complaints from retailers on this score—the coke is too light they say. But that matters not, the gas-works should serve the interests of the public, not of the merchant.

Obviously also when large coke is sold, it should be as clean and large as possible; and, similarly, broken coke should be of good and uniform size. Further, the coke should approach as closely as possible in character to the more highly valued oven coke. This is proved by the great popularity of the coke from vertical retorts, which is keenly competing with oven coke for use in central heating plants. On this account, the author's Company have kept all their vertical retorts at work throughout the year,

so as to be able to give their customers about 50 per cent. of vertical retort coke. Owing to its greater density, a rather smaller volume for a given weight can be guaranteed without difficulty. But this has not proved necessary, for reasons which will appear. With active propaganda, and a moderate development in the amount of gas made, it should be possible to secure good prices for gas coke in the future.

We are now in a position to develop the principles on which the quantities of coke sold and produced should be reckoned. If coke is sold so that the public do not receive too little—i.e., if we correct the weight by the measure in such a manner that only a small percentage of water (say, at the most, 5 per cent.) is sold with the coke as such, we are able to assume the figures thus arrived at to be directly the figures of coke sold. Thus, if a truck containing coke with 15 per cent. of water weighs 11 tons, only 10 tons are reckoned as sold, and the purchaser obtains 9½ tons of absolutely dry coke. By adding to the fuel consumption ascertained by regular trials the figures for the coke sold obtained in this manner, we obtain the figure for the coke produced, which will be always higher than the mean of the yield determined by the crucible test from the different kinds of coal used. The figure thus obtained shows how much moisture has been sold as coke, and whether the necessary care in this respect has been exercised.

Now, as to the technical means which are available for the production of coke as large in size and as free from water as possible. The two requirements are intimately related. If the hot coke is suddenly drowned in water, the large pieces split up. On this account, the author regards the principle of the De Brouwer trough as faulty. The practical solution appears to be obtained by the submerging appliance of Herr Göhrum, which need not be referred to further, as he is describing it in his own paper at the meeting. [See report of proceedings at the meeting on p. 25 of to-day's "JOURNAL."] This, however, scarcely comes into account in regard to settings of 18 vertical retorts, as there it is a question of handling large quantities of coke in a short time, representing a ton of coal per minute, and the cloud of steam in front of the oven would be too great an inconvenience.

On the other hand, the De Brouwer trough, in conjunction with inclined shoots beneath the settings, is mechanically an ideal solution. The large quantity of coke is gently drawn away and conveyed into the open. It is then only necessary to get rid of the harmful excess of water, which is done in the following way. The accumulation of water in the rising trough is avoided by providing sufficiently large holes for it to flow away. The quenching is done as sparingly as possible by means of sprays operated by the slabs of coke, and the large lumps even retain a hot core. The conveying trough takes the coke directly into large trucks, of which a row stands ready in front of the retort-house, and so overlap one another that no coke can fall down between them. This arrangement is shown in fig. 1. The coke is left in these trucks for half an hour, so that by the heat left in it a great part of the moisture is dissipated, while any risk of the store of coke being fired from the hot cores is avoided. After this drying and cooling, the coke is raised by the lift and sorted through the shuttle-screen S, shown in fig. 2, into the different sections of the high receiver. This is important, because the small coke contains the most water, and would wet and injure the large pieces if it were not separated from them. At the same time care must be taken that the coke never drops from a height into the receiver. To ensure this, an inclined plane is placed opposite the end of the shuttle screen S, and this soon fills with coke. On opening one of the slides (marked 1, 2, 3 in fig. 2) in the trough, a second is brought into the first position, and then a third, and so on.

The other extreme is represented by Arrol-Foulis drawing machines with horizontal retorts. In these, the coke is first broken up by rakes, and falls in small pieces on to a shoot on the stage level, and thence into a truck on the ground level, where it is quenched by sprinklers. The vertical retort coke produced and handled by the first method has a weight of 10 tons per truck of given volume, whereas the mishandled coke from the horizontal retorts weighs 11·7 tons per truck.

The author's views may be summarized as follows: It is necessary for us (1) to produce coke of better and better quality; (2) to market it in a commercial way; (3) to ascertain exactly our own working results; and (4) to agree as to the basis on which practically useful comparable figures can be arrived at.

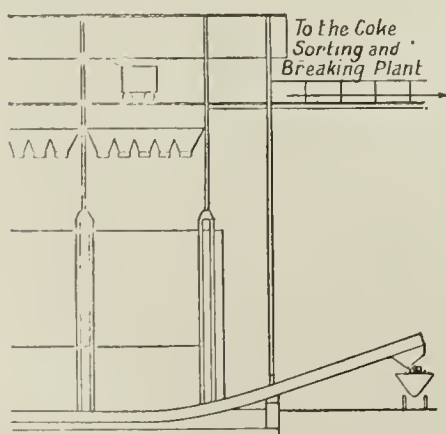


Fig. 1.

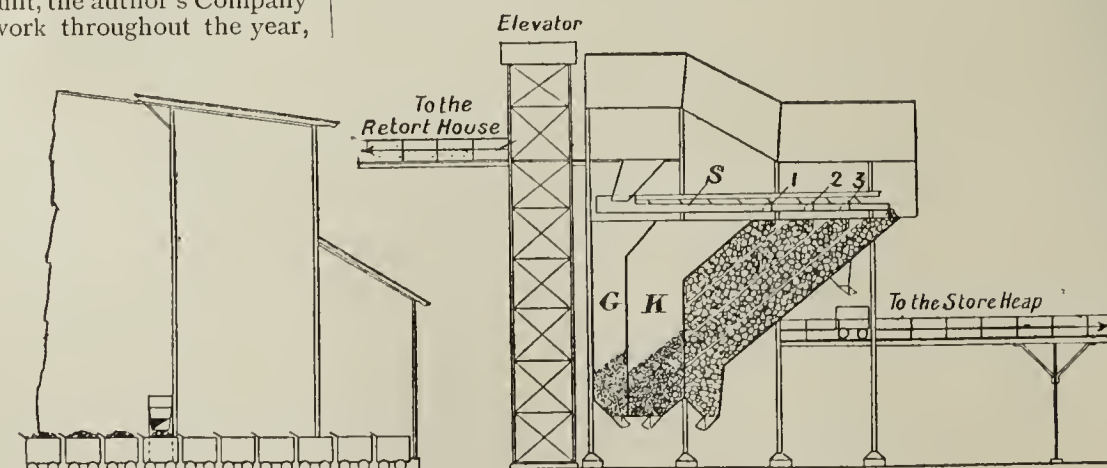


Fig. 2.

EXTENSIONS AT STOCKPORT GAS-WORKS.

Coal and Coke Handling Plant.

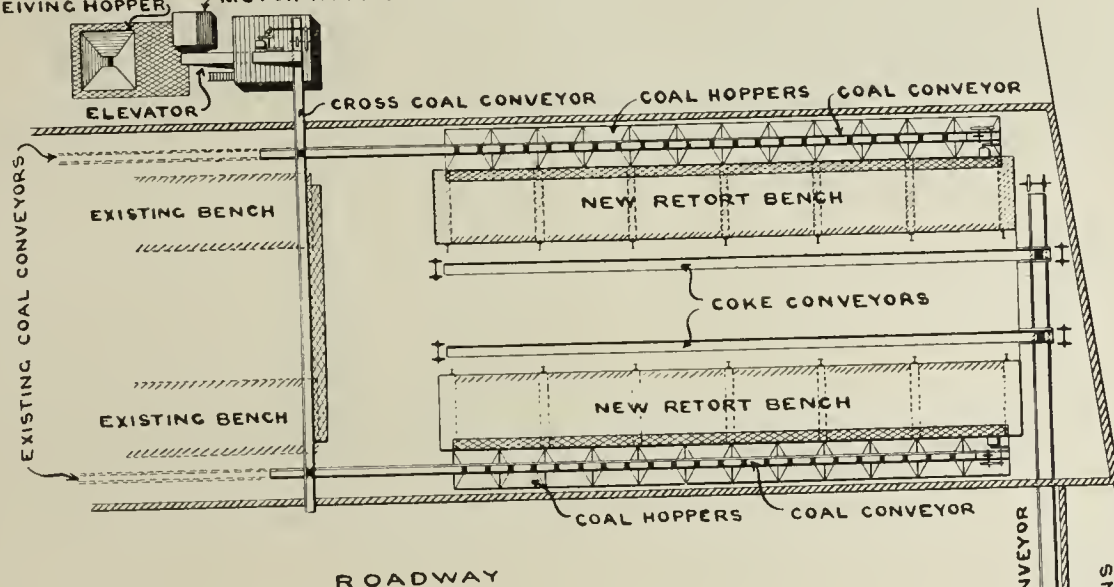
The following particulars of some extensions to the coal and coke handling plant at the Stockport Corporation Gas-Works have been sent to us by the Contractors for the work, Messrs. Robert Dempster and Sons, Limited, of Elland.

The extensions to the retort-house at the works which have recently been completed comprise a somewhat interesting com-

ing longitudinal conveyors—a necessary platform being provided alongside this cross conveyor, from which access is obtained by means of short ladders.

Two new longitudinal conveyors, arranged to deliver coal on either side of the house, are also provided on the charging side of the two lines of retorts; the length of these new longitudinal conveyors being 120 feet each. The construction of the conveyors is exactly similar to that of the cross coal conveyor; the trough being arranged, however, with two slide-doors to each bed of retorts, so as to efficiently supply the whole length of the storage hoppers. The longitudinal conveyors are supported on the top of the hoppers on cast-iron stools. The driving gear, which is

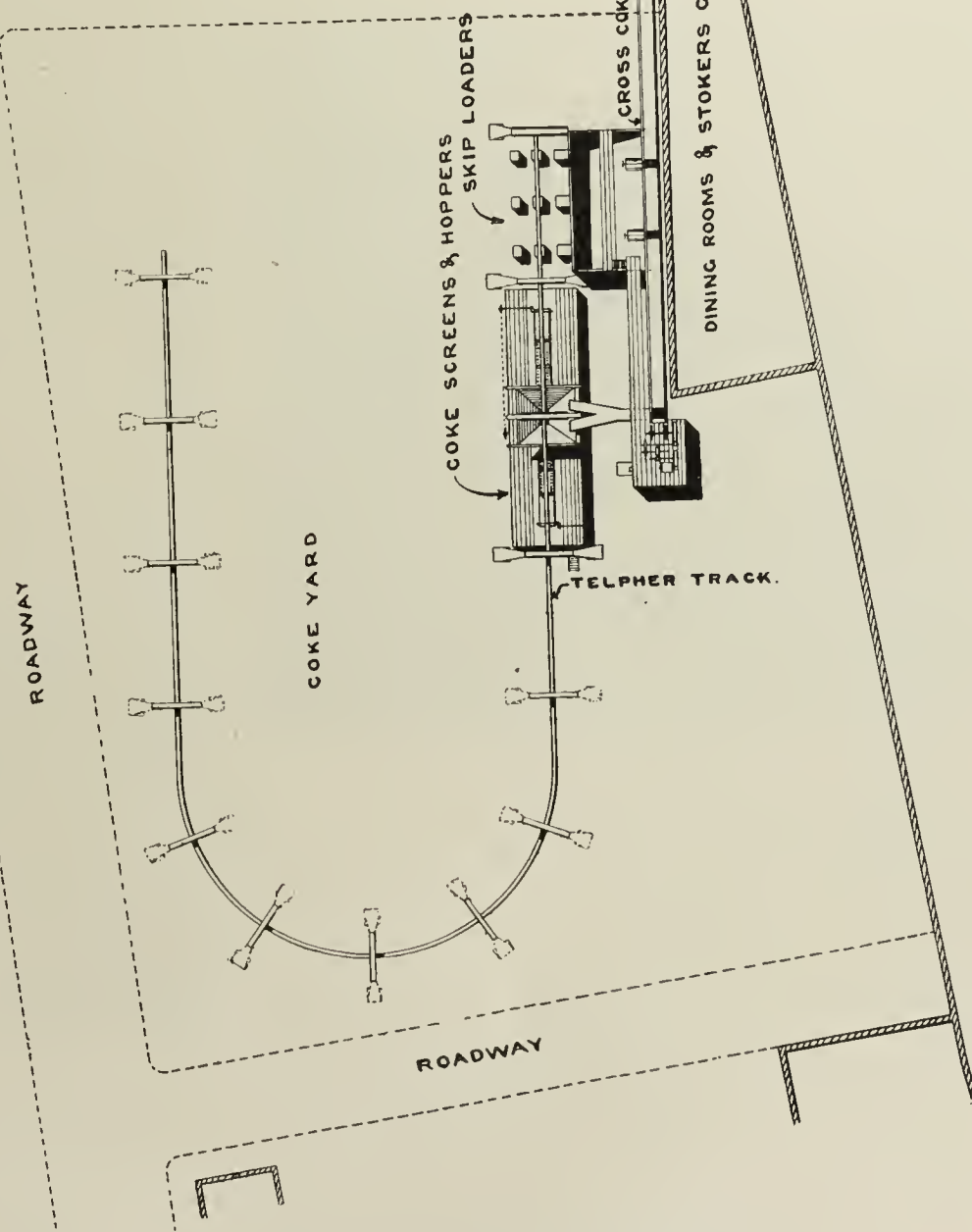
COAL RECEIVING HOPPER. MOTOR HOUSE.



bination of up-to-date plant; and the general arrangement of the scheme reflects considerable credit on Mr. S. Meunier, the Engineer and Manager—especially with regard to the adoption of a telpher scheme under very great difficulties, and using the same in combination with the ordinary coke-conveyor for dealing with the coke from the house, screening, and storing same. Additions were made to the retort-bench, and six new arches of inclines were added at each side of the house—a total of twelve settings, arranged with twelve retorts in each, in three rows of four; making a total of 144 new retorts.

Coal Plant.

This plant consists of first an underground receiving hopper outside, at about the centre of the retort-house, having a capacity of some 8 tons, and receiving coal discharged direct from carts. At the bottom of the hopper is fixed a reciprocating tray feed, from which the coal is fed into a two-roll coal-breaker. From the breaker the coal is delivered into the boot of a standard elevator of the closed-case type—the elevator at 54 ft. 6 in. centres and 2 ft. wide. The elevator consists of Leys' No. 600 bushed chain, with 16-inch cast malleable buckets attached, being operated by sprocket wheels 2 feet in diameter. At the head of the elevator a shoot is arranged for delivering on to a cross conveyor running across the house in between the roof principals. This cross conveyor, about 78 feet centres, is of the push-plate type. The trough, 16 inches wide, is constructed of 6-inch by 2½-inch channels, with ¼-inch bottom plate and 2½-inch by 2½-inch steel return angles. The chains are Leys' 600 bushed type, fitted complete with skidders and push plates 1 ft. 3 in. wide; the whole being operated by sprocket wheels 2 feet in diameter. Slide-doors fitted in the trough bottom deliver coal on to two new longitudinal conveyors; and the doors are arranged so that this cross conveyor can also deliver coal on to the two exist-



Plan of the Stockport Gas-Works Coal Plant and Coke-Yard.

situated at the end of the house, consists in each case of steel gearing, driven by separate motors; the necessary tension gear being fitted to the whole of the coal-conveyors for adjusting same.

Coke Plant.

The new coke plant consists of two sets of scraper coke-conveyors, which are arranged in front of the benches; the coke being



General View (from the Road) of the Coke-Handling Installation.

discharged from the retorts into a trough, in which the coke-conveyor is fixed. The trough, 2 ft. 6 in. wide, formed of rolled steel channels, with steel bottom plate, and cast-iron renewable bottom and side plates, is sunk to about the level of the stage floor. The chain is 18-inch pitch, and the steel rakes, with cast-iron rubbing shoes, are bolted on at 3-feet pitch. The chains are covered in front of the retorts by steel plates supported on cast-iron brackets bolted to the existing floor-joists; and the return chain, carried close up under the floor, is arranged to return on suitable angles slung from the floor-joists. The driving gear is fixed at the end of the house. It consists of the usual steel gear; each conveyor being driven by a separate motor. Tension gears are fixed at the opposite end of the conveyors. These tension gears are of the automatic weighted type.



View Looking along the Cross Coke-Conveyor from the Retort-House.

The two hot-coke conveyors are arranged to deliver the coke on to a similar cross conveyor, fitted at the end of the house; the cross conveyor being exactly similar in design to the longitudinal conveyors running in front of the benches. The cross conveyor, however, after leaving the house, is carried up on an incline, and the trough and return angles are carried on suitable steel framework with the necessary trestles, &c., so as to discharge coke into a set of coke-bunkers situated at a distance of 50 feet from the retort-house wall. Suitable slide-doors are arranged in the bottom of the trough on the inclined portion of the conveyor, so that the coke can be discharged down to the ground without passing to the coke-bunkers, if required. The coke-conveyor is further extended past the coke-bunkers and is provided with an inclined shoot for delivering the coke direct to the hopper above the set of rotary screens.

The coke-bunkers nearest the retort-house have a capacity of 40 tons of coke. They are fitted with three sets of automatic skip-filling gear for automatically filling the skips of the electric telpher. They are arranged at one side of the telpher track; so that the telpher skip can be lowered direct into the automatic skip-filling arrangement.

The automatic skip-filling gear consists of a set of guides arranged in front of the slide-doors at the bottom of the coke-bunkers; and in between these guides is fitted a suitable platform, which is arranged to be raised and lowered according to the weight resting on the platform. The platform is connected by wire ropes

passing over suitable guide-pulleys; the wire ropes being attached at the other end to two series of adjustable weights, so arranged that, when the telpher skip is lowered on to the platform, the weight of the skip is sufficient to depress the platform a matter of about 18 inches. This movement of the platform automatically opens the slide-doors of the coke-bunker—the doors being connected to the platform gear by suitable cranks and sprocket wheels. Immediately this movement is attained, the skip is held in position by another set of weights coming into operation on the rope-gear. The discharge of coke then takes place into the skip; and when a predetermined weight has been discharged into the skip (in this instance, it is about one ton of coke), the added weight of the coke presses down the platform a further 18 inches and lifts up the second set of weight gear. This further movement automatically closes the door of the bunker, and prevents any further flow of coke. On the skip being lifted from the platform, the platform itself returns to its original position without operating the door, which is held fast by a pawl and ratchet gear—the platform being thus ready for receiving the next skip. This arrangement of automatic doors does away with all question of an attendant at this position.

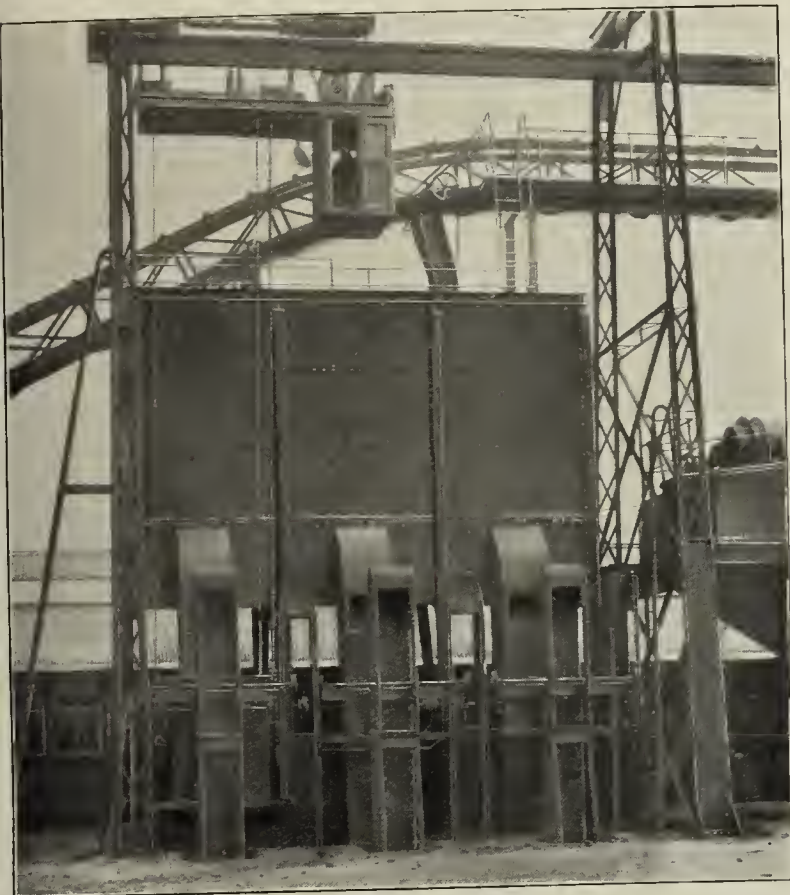
Just beyond the coke-bunker and immediately under the telpher track is fixed a coke-screening plant and hoppers. This plant consists of a receiving hopper fixed over the top of two rotary screens, which are 14 feet long by 2 ft. 6 in. in diameter. They are formed of two sets of perforated plates, with slide-doors for discharging all the coke into any hopper as desired. The rotary screens are driven, by cast-steel bevel gears, from a countershaft by means of a chain and chain wheel. The coke from the small receiving hopper is automatically delivered into either one of the screens by a reciprocating tray feed, which is adjustable.



Revolving Coke-Screens and Hoppers for Filling Carts, also Showing the Shoot from the Cross Coke-Conveyor delivering to the Overhead Hopper.

These rotary screens are fixed on the framework immediately above the coke-receiving hopper. Of a capacity of some 40 tons of coke of various sizes, the hopper is about 45 feet long by 12 feet wide. It is provided with division plates and sliding discharge doors, which are operated from the ground level by means of a chain and chain wheel. The coke can be delivered in sizes as required from the hoppers direct into carts.

The coke, as already mentioned, is delivered into the bunkers by means of the cross coke conveyor or direct into the hopper over the coke-screens. The coke which has been delivered into the bunkers is discharged by means of the telpher, and either deposited into the hopper over the screens or into the yard; or, if



Front View of the Coke-Bunkers, showing the Telpher Skip lowered ready for filling and the Cross Coke-Conveyor passing over the Bunkers.

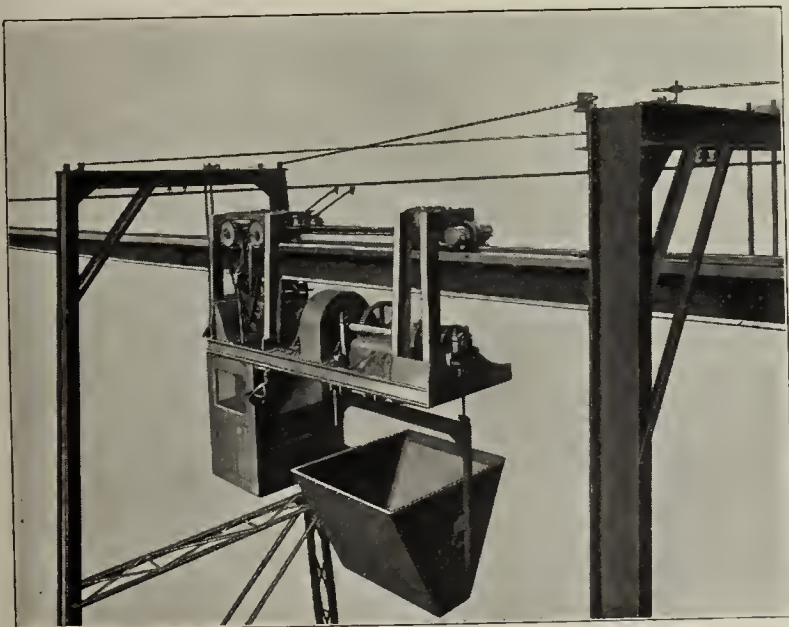
necessary, it is taken by the telpher from the stacking yard back to the hopper over the screens.

The telpher track, U-shaped, is extended over the whole area of the coke yard. The height of the track above the ground is 35 feet. It is of Dempster and Sons' new design. The track consists of 15-inch by 5-inch joist, on the top of which is mounted 7-inch by 2½-inch channel, with renewable bulb-rail fitted on top of the channel itself. Two overhead trolley wires of figure 8 section are attached to the top of the trestles, and from these the telpher collects its current. The whole of the trestles are cross-tied by means of tie-rods; and the ends of the track are provided with track-stops to prevent over-running on the part of the telpher driver.

Over the area of the ground under the telpher track about 2000 tons of coke can be stacked by means of the telpher, without trimming or other labour being required. The electric telpher is one of Messrs. Brooke and Dempsters' new patent machines, of the swivelling bogie type, with parallel hoist shaft, on to which the hoist ropes of the telpher coil direct. The machine is fitted with two Siemens crane type motors, one for hoisting and the other for travelling. The machine is capable of lifting a gross load of 30 cwt. at a speed of about 70 feet per minute, and travelling fully loaded at a speed of about 500 feet per minute.

The machine is fitted with interlocking gear to prevent mistakes in operation, and, generally speaking, it seems as near "fool-proof" as possible.

A good feature about the telpher seems to be that the coke is handled practically without breakage, as the skip can be lowered almost on to the heap before tipping—the tipping being done by the telpher driver by means of balance cord from the driver's cabin; this operation being done no matter what height the skip may be.



Detail View (from above) of the Electric Telpher and Skip.

The chief (and most important) feature appears to be that the coke is dealt with entirely by one man—the telpher driver, because as he lowers his skip down in the skip-guides of the automatic skip-filling device, as explained, the skip automatically operates the doors, fills the skip, closes the doors, and then the load is hoisted for delivery direct into the screen receiving hopper, or carried round and discharged on to the storage ground.

There should be very little wear and tear on this type of plant, seeing that the only wearing part is the telpher itself, which practically does not come in contact with any of the coke and grit.

The telpher appears to be exceptionally simple in its operation; and the combination of the coke-conveyor from the house and the telpher for dealing with the coke outside, provides a somewhat novel but very efficient arrangement. The coke is dealt with very economically; the method of distribution being exceptionally efficient.

The general scheme was arranged by Mr. Meunier; and it is evident that a considerable amount of preliminary designing must have been necessary to arrange such an efficient combination of up-to-date plant to so satisfactorily handle the coke and coal under somewhat difficult conditions.

MUNICIPAL ELECTRICAL ENGINEERS AND COMPETITION BY GAS.

At the Annual Convention of the Incorporated Municipal Electrical Association at Brighton last week, a discussion took place upon Street and Shop Front Lighting.

Mr. A. H. SEABROOK (Chief Electrical Engineer to the Marylebone Borough Council) opened the subject of shop-front lighting. He said there was no time to go over the whole of the aspects of this problem; and he would confine himself to one which was becoming very serious—viz., the competition of high-pressure gas with electricity for shop-front lighting. In West Ham some years ago, they attempted to deal with this proposition by an inclusive hiring scheme of £2 1s. per quarter per lamp of 500 watts capacity. As a matter of fact, they made a rod for their own backs, because the gas company had since been doing the same thing all over London, with the additional trouble that they had been cutting prices. There had been a good deal of discussion as to whether the prices which the gas companies were charging were remunerative; but this had nothing to do with them. If electric supply authorities were to get business, they would have to do very much the same thing as the gas companies did. He knew that on the basis of £2 1s. per quarter, including current, maintenance, supply of lamps, and depreciation in two years, it was a remunerative business, except for the first two years—there was nothing in it till they had written-off the lamps. After this, however, there was a very handsome surplus indeed. Some time ago, he went round London to see how some districts were being affected by high-pressure gas for outside shop lighting. He went along the Barking Road, which takes in the poorer districts of West and East Ham. He was very interested to see the results there, because East Ham also had an inclusive system of so much per quarter per lamp—the charge being somewhat less than in West Ham. In the West Ham portion of the Barking Road, not a single high-pressure gas-lamp had been put up since he left there some two years ago. In East Ham, however, the whole way along, there were rows and rows of high-pressure gas-lamps. In one case in West Ham, a large grocer, in spite of his (the speaker's) "oily tongue," had been induced by the gas company to put up a large number of high-pressure gas-lamps, and had only given a corner of his shop for a few flame arc lamps, on the inclusive arc lamp scheme. But to his great satisfaction, upon his visiting the place the other day, he found that, owing to the "cart-wheel grease" which his successor (Mr. Couzens) must have applied, these lamps had disappeared, and now the grocer had arc lamps altogether. Turning over in his mind the reason why the municipality supplying lamps on this system at a high rate should get more business than an adjoining one where the tariff was lower—the same gas company being in both areas—the only conclusion he could come to was that the one had an efficient business-getting department and the other had not. They might cut their prices to ridiculously low figures; but it was much more expensive to do this than to employ an efficient business-getting department to look after the consumers and maintain prices. They could undoubtedly maintain prices by having a proper business-getting department. With regard to the prices to be charged for a lamp scheme such as the one he had already referred to, each district must suit its own local conditions. A sum of £2 1s. per quarter per lamp was all right for West Ham. In Marylebone, they had to charge considerably higher. There, they had fortunately not yet been subjected to much competition in this direction; but they were preparing for it. So far they had not found it necessary to hire-out lamps at Marylebone, as most of the shop-keepers were prepared to pay for them. He thought the following figures would be interesting as compared with gas figures. At 3½d. per unit, it was possible to supply a series of four arc lamps, giving a total of 10,000 to 11,000 candle power, at a cost to the shop-keeper of 2d. per hour per lamp, or a total cost per year for 900 burning hours of £30—i.e., £7 10s. per lamp, inclusive of everything except hire of the installation and wiring. To give the same amount of light,

it would be necessary to install at least ten high-pressure gas-lamps, which, at 30s. per quarter, would give a total cost of £60 per annum. The gas people in London generally averaged about 30s. per quarter per high-pressure gas-lamp. Sometimes it was 25s., or even 20s.; but usually it was 30s. for a 1000-candle power lamp. Even adding the installation and wiring to the £30 for the electric lamps, this still beat high-pressure gas slightly in cost. A most useful lamp had recently been put upon the market—viz., a 4½-ampere direct-current flame lamp—which would enable them to considerably cut their costs and put in a flame arc lamp of more nearly the equivalent candle power of the gas-lamps. These new lamps gave a candle power of, roughly, 1200. At 3½d. per unit, they could be trimmed, supplied with current and carbons, maintained, and kept clean at a total cost not exceeding 1·35d. per hour, which meant £5 per 1200-candle power lamp for a use of 900 hours per annum, against £6 for 1000 total candle power of high-pressure gas. Mr. Haydn Harrison was going to follow him on the question of street lighting; and he wanted to nip in the bud straight away one of his ideas. Mr. Harrison had evidently in mind the joint arrangement between the gas and electric light companies in connection with the Borough of Holborn lighting; and he believed he intended to suggest that electric undertakings should keep up their shop and private lighting prices by a similar co-operation. He (the speaker) was absolutely against anything of this sort. He preferred to keep his opponent where he could see him. He had no sympathy with the sloppy, imbecile amiability with which a lot of people were inclined to regard their opponents. The gas industry was better organized than the electricity supply industry; from the commercial point of view, they were the superiors of electrical engineers. They might as well speak straight out, because there was no question about it. The gas companies' business-getting departments were superior; and electrical engineers were not sufficiently equal with their competitors to be able to play fast and loose and give them an inch in any way. They were going to get all they could; and in the present position it was safer to keep them at arm's length.

Mr. HAYDN HARRISON said the question of competition with gas for street lighting was getting very interesting in the matter of cost. His experience had shown him that, providing conditions were equal at the start—i.e., if a town were being laid out with electric lighting and gas lighting, mains were being provided for both, and everything was in the *ab initio* stage—there was not the slightest doubt (and he did not think that even the gas people could find anything to support an argument to the contrary) electric light could give an equally good light in the streets at a much lower cost. But, of course, the conditions which they all had to face were quite different. In nearly every town where an electric undertaking had been installed during the past few years, the streets were lighted by gas, and had been lighted by gas for a very considerable time. In most cases, the street lighting had been carried out by the gas department or the gas company without any competition. They therefore had their own prices for a number of years, and they had paid off practically every pennyworth of capital in connection with it. The result was that they now had no interest and sinking fund to allot to any particular mains. On the other hand, where the electric light had been installed, in the great majority of cases loans had been refused, and the work had to be carried on out of revenue, and the whole cost was being repaid in five years. In spite of this, however, they had still been able to put in prices for the same lighting equal to those for gas. In Marylebone, but for this, they could have 50 per cent. better illumination than at present for the same charge. He then explained the details of the Westminster and Holborn lighting contracts [which have already been given at length in our columns]; pointing out that in the former only 70 arc lamps were changed over, owing to the Electric Lighting Companies unfortunately being able to agree upon their prices. In Holborn, the Council were willing to pay a price which would be remunerative both to the Gas and Electric Light Companies; and the point he argued was that lighting was practically a monopoly, in that there were only two parties to the arrangement. They knew of a lot of cases where the competition was between six, seven, or eight people; and they were able to make arrangements by which they, at any rate, made a reasonable profit. Mr. Seabrook said he would have nothing to do with any such arrangement. Was the competition to continue on the basis that the one who had the most money could last the longest? In his opinion, the work available was such that it would be to the interests of both parties to make some arrangement by which they could each do the particular part for which they were specially suited, at prices which were remunerative. He thought this was the reasonable way of looking at it. In connection with the Holborn lighting, where the Gas Company had worked in conjunction with the Electric Light Companies, it had been found that the gas managers were sound business men, doing the very best they could for their shareholders. They were perfectly straightforward; and why they should be so afraid of them, and try to hold them at arm's length, he did not know. He thought that it was a distinct sign of fear on their part more than anything else.

Mr. J. R. DICK urged the Council of the Association to take some action in regard to the attitude of the Local Government Board on the matter of loans for street lighting. At Brighton, some street electric lighting fittings had been in use for sixteen or seventeen years; and he had no doubt they would last for thirty years. He urged that, wherever a gas company were asked to tender, the electric lighting department or company should also

be invited to send in a price, in order that the district might get the very best, whichever was shown to be so.

Mr. A. C. CRAMB (Chief Electrical Engineer at Croydon) was in general agreement with Mr. Seabrook. The question of high-pressure gas for outside private shops was getting a very serious matter in London and the surrounding districts. He recently took the opportunity of inspecting certain thoroughfares; and in some roads where there had been a considerable number of arc lamps until a short time ago, there were now solid rows of high-pressure gas-lamps—the arc lamps having now been swept away. The reason why the high-pressure gas-lamp should be such a formidable competitor for this class of lighting was interesting. The gas companies in London, where they had attempted the thing on a large scale, liked to put in their compressor somewhere near the middle of a long street, and lay a special high-pressure main right through. The pipes were then run up outside the shops to the lanterns; and the result was that the whole of the installation was practically outside the shops, and under the control of the gas company. They went to a shop-keeper and said: "We will give you so much candle power per annum at so much cost." They generally tempted him with £5 per 1000-candle power lamp. They told the shop-keeper that he would have no trouble with mantles, no bother with lamps going out, and that they would take all the responsibility off his shoulders and guarantee the light. He asked them to put themselves in the position of the ordinary shop-keeper—especially one who had been using arc lamps which he had bought himself, and had to trim and repair in the ordinary way. The feeling of the average user of arc lamps for outside shop lighting was that they were very fine lights when they were new; but, after two or three months, there were troubles with carbons and all sorts of things. The lamps wanted new carbons just in the middle of the busy part of the trade of the evening; and they were always going wrong. This was the general feeling. Therefore, when the gas agent came along and offered to take all these troubles and worries off his shoulders, and give a good light for a fixed amount per annum, the shop-keeper jumped at it; and he would clearly be a fool if he did not. What had the electrical authorities done in this matter? In most cases, absolutely nothing of this character at all. Even in Brighton, they were ignorant of the fact altogether; and he sincerely hoped that Mr. Christie would have a big high-pressure gas installation put down soon in competition with him. He recently had to go into this class of competition; and he went round and interviewed the shop-keepers to find out exactly what the position was. He was told in every case that, if the electric light people would supply the lamps, clean, repair, and maintain them, and take the worry off their shoulders, the shop-keepers would have electric light, as they preferred it to high-pressure gas. He lost several for this reason; and he knew that, if only they had powers to wire premises, they could keep every one of these consumers. In the London district alone, they had lost several thousand pounds' worth of business, which was going into the gas companies' pockets. If they had proper hiring and wiring powers, they need not be afraid of gas competition—especially if they had a proper sales department to look after the consumers. By these methods, they could keep their business; and he would go further, and say that it was possible, light for light, to get another £1 per lamp per annum for electric lamps as against gas, if they had a proper business organization. Gas companies were not making a big profit on this outside lighting; but they just wanted to knock the arc lamps out, and they were going as near rock-bottom as they could. Electric supply undertakings could not do it if they had to employ contractors, and pay them their 10 per cent. profit. The gas companies had cut out this profit, and they had a proper organization in which this work was done more or less in connection with street lighting. Most electric supply undertakings had fairly large street lighting departments; and they should be able to maintain and look after these outside shop lamps in the same way, but not if they were going to bring in the contractor. They could employ him to fit up the installation in special instances; but here was a case of rock-bottom competition, and they had to take out every halfpenny of expense they could. They could hold their own by adopting gas company methods; but the main difficulty was the absence of powers to do it. Almost every morning they found propositions at their offices; and they asked themselves what were they going to do. But they had no powers, and practically had to pass the business on to the gas company. This proposition might satisfy some; but it did not satisfy him, and he did not think it ought to satisfy anyone of them.

Councillor CROWTHER (Sheffield) regretted that there was very little street electric lighting in Sheffield, which was mainly due to the cheap price of gas. The tramway drivers, however, were asking for electric lighting to be installed, as it gave a better light, and enabled them to more easily avoid accidents. In all cities where gas was dearer than at Sheffield, the question of street lighting ought to be seriously taken in hand; but this could only be done by reducing the cost to the lowest possible point. The gas companies in the competition with electricity were certainly doing this—in fact, in some cases they were keeping the charge so low that there was no profit in the business. He strongly supported the view that all electric supply undertakings should have wiring powers.

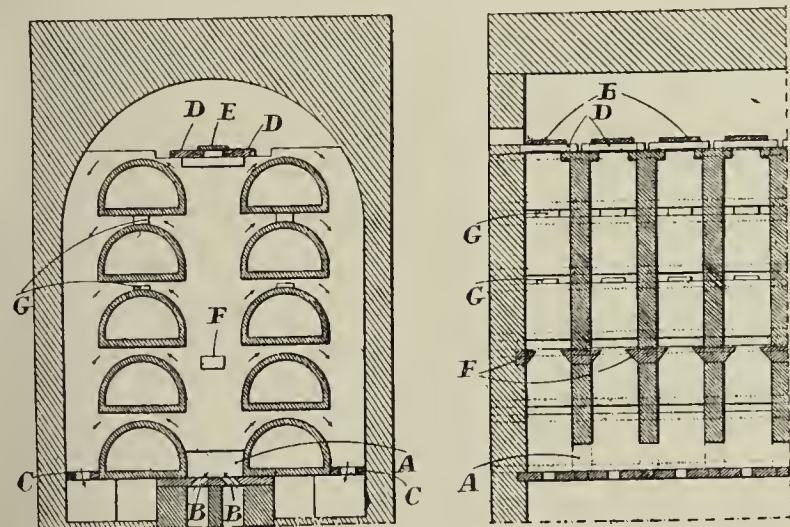
Mr. SEABROOK, in the course of a brief reply, said he thought that to co-operate with the gas companies was a bigger sign of fear than keeping them at arm's length—the attitude that he would prefer to adopt.

HEATING HORIZONTAL RETORT-SETTINGS.

A patent has been taken out for France by M. Pierre-Jacques Picard for improvements in the method of heating horizontal retorts. The following particulars of the invention are translated from the French specification.

In settings which contain two vertical rows of retorts, heated by a central line of nozzles, the flames are usually distributed very irregularly. The vacant space between the retorts favours a rapid ascent of the gas and air; and the temperature is higher in the upper than in the lower part of the setting. Nearly all the combustion gases pass between the arch and the two upper retorts; the result being that the quantity of gas produced in the lower retorts is considerably less than in those above. The setting consequently does not furnish the maximum yield of gas; and, moreover, the upper retorts wear out more rapidly than the others. The temperatures of the different retorts can be altered as required by changing the proportion of the gases passing above the upper ones. For this purpose, dampers are placed between the latter and the arch of the setting, so that the size of the passage for the gas can be regulated.

The accompanying diagrams show a retort-setting constructed according to the invention.



It will be seen that the inner portion of the setting is divided into several compartments, communicating with each other through openings A. The retorts are placed in two vertical rows, and extend over the entire length of the setting. The heating gas and the hot air to promote combustion are introduced through openings B, which are parallel with the longitudinal axis of the setting. The course of the hot gases is indicated by the arrows; and they flow out through the openings C.

The invention consists in fixing dampers D above the two highest retorts, in the middle of the setting as shown, and resting upon the walls. Above the dampers is a horizontal plate E, which prevents the passage of the gases between the dampers. These are worked from the outside by means of rods (not shown in the illustrations) running through openings in the wall of the setting.

It is advantageous to have along the axis of the setting refractory brackets F supported by the walls, and on a level with one of the lower rows of retorts. They cause a thorough mixing of the gas and hot air, and thus stimulate combustion. Pieces of refractory material G, increasing in thickness from one line of retorts to another, are placed between the top of certain retorts and the bottom of the one immediately above. By means of these pieces, suitable dimensions can be given to the section of the passage for the gas between the different retorts.

The invention is not confined to the design represented in the illustrations. For instance, instead of dampers, fixed pieces, of sizes adapted for average conditions of working, can be utilized to decrease the section of the passage for the gas at the upper part of the setting.

The "Pharos" High-Pressure Light.—In the last number of the "JOURNAL," we gave some particulars of installations of high-pressure lighting by the "Pharos" system, which has been introduced by the Auer Company of Berlin. We are informed by the Welsbach Light Company, Limited, of Gray's Inn Road, King's Cross, W.C., that they have been appointed by the Auer Company sole agents for the light in the United Kingdom.

London and Southern District Junior Association.—Mr. F. W. Goodenough, Controller of the Gaslight and Coke Company's Gas Sales Department, has, as Hon. Secretary and Treasurer of the Gas Companies' Joint Exhibit Committee, kindly invited the members of the Association to the Coronation Exhibition, at Shepherd's Bush, and to tea at the Garden Club. Saturday next is the date fixed for the visit; and it is proposed that the members should assemble at 4 p.m. at the gas companies' exhibit (which is situated in the Industrial Section, Building 14, at the immediate right-hand side of the entrance to the Court of Honour); and then they will proceed to tea, at which Mr. Goodenough will preside.

CORRESPONDENCE.

[We are not responsible for opinions expressed by Correspondents.]

A Few Words with the Kendal Health Committee.

SIR,—Many thanks for the copy of your "JOURNAL," containing your criticism of my leaflet on "Fresh Air and Ventilation." If you will read the leaflet carefully, you will see that my object is not in any way to discourage the use of gas, but only to point out the necessity for additional ventilation when burning gas, over and above what is required when electric lights are being used, or even no lights at all. Immediately after writing the leaflet, I installed a gas-cooker in my house for the first time in my life.

As to the accuracy of my paragraphs, I believe the substance of every statement can be found in Notter and Firth's last edition of "The Principles and Practice of Hygiene." Moreover, the entire leaflet was submitted to, and heartily endorsed by, the Medical Officers of Health of three of our largest provincial cities, as well as by the County Medical Officer of Health of Westmorland, and the Medical Chairman of the Westmorland Public Health Committee.

WM. RUSHTON PARKER, M.D.,
Chairman of the Kendal Health Committee.

Kendal, June 28, 1911.

[We are pleased to learn that the object of Dr. Rushton Parker, Chairman of the Health Committee of the Kendal Corporation, "is not in any way to discourage the use of gas." It is a pity that the circular of which we made complaint last week did not indicate to the burgesses of Kendal, in a transparent manner, its exact purpose. Now as to the accuracy of the paragraphs of the circular which were reproduced in our editorial columns last week. Let it be clearly understood we do not care any more for what Messrs. Notter and Firth have to say on the subject in their last edition of the "Principles and Practice of Hygiene," nor of the endorsement of the Medical Officers of Health of three of the largest provincial cities in the country, nor of that of the Medical Officer of Health of Westmorland, nor again of that of the Medical Chairman of the Westmorland Public Health Committee, than we do of the opinions of the ladies who have contributed to the literature of the subject in the columns of the "Girl's Own Paper" and one or two other popular magazines for ladies, and who have refused afterwards to substantiate their statements. We have at hand the views of men of considerable eminence; we have the results of actual scientific tests; we have at command the experience of more than a hundred years with the use of gas in the homes of the people; and we have (it is claimed) an average amount of common sense. Now, then, we put last week a plain question to the Kendal Corporation Health Committee, or to its Chairman (Dr. Parker), based upon the statement in the circular: "When gas is lit, it takes some of the best part out of the air, and gives out a great deal of poison," and upon the use of the plural "poisons" in a succeeding paragraph. We asked the Health Committee or Dr. Parker to take a set of given conditions—say, an incandescent burner—and tell us in volumetric terms what is meant by "a great deal," and by names what is meant by "poisons." We ask him not to tell us what Notter and Firth say, or the Medical Officers of Health of three large provincial cities and of Westmorland, but to let us have a definite reply from off his own bat to the objectionable statement appearing in a circular for which he (we are pleased to see) takes, in the foregoing letter, full responsibility. If there is any use made of this circular, by quotation or otherwise elsewhere than in Kendal, the candid acknowledgment of authorship may prove very useful.—ED. J.G.L.]

Uses of High-Pressure Gas for Industrial Purposes.

SIR,—I beg to offer a few remarks in reply to Mr. Alfred Mansfield's letter appearing in your issue of June 27.

I regret that there has been a misunderstanding. I now know that the Mr. Mansfield referred to by Mr. Leather in Glasgow is not the Mr. Mansfield who called on me in Birmingham. I particularly stated in my reply to Mr. Leather that I had been in communication with "a Mr. Mansfield, of Birkenhead."

Mr. Mansfield states that I endeavoured to crystallize the results of my experiments into definite statements of fact. If Mr. Mansfield will be good enough to re-read the opening paragraphs of my paper, he will realize that my attitude towards the subject is not in agreement with his statement.

I can hardly think the criticism in the last paragraph of Mr. Alfred Mansfield's letter is intended to be taken seriously. Assuming that it is meant seriously, Mr. Mansfield will be relieved to learn that all volumes of gas mentioned in my paper are reduced to a pressure of 20-10ths water-gauge.

In accordance with the suggestion made during the discussion of the paper in Glasgow, I hope to add considerably to the information the paper contains, before the "Transactions" are made up, and I will take the opportunity of replying fully to the points raised in the discussion.

High-Pressure Gas Laboratory, Birmingham,
June 28, 1911.

E. W. SMITH.

SIR,—Scarcity of time prevented me commenting upon the two contributions by Mr. E. W. Smith to the Institution meeting, and consequently I shall be glad if he will explain, through the medium of the Press, some of his statements, by giving further information on the

points I raise, because my practical experiences do not confirm his conclusions. The actual user or customer of gas is not the least person I have to study when supplying gas in the city and suburbs of Glasgow; and so I should like to know why, in the report of the Gas-Heating Research Committee, by Mr. Smith, "It should be possible to have a burner and nipple so adjustable that it will give a flame with a given consumption which is so well aerated that it will light-back at either 5-10ths or 30-10ths pressures, and at the same time, by cutting-down the aeration, give a luminous flame. Only the burner and nipple which are capable of such a range have a right to claim the capability of being used between these pressures." I have always considered it altogether wrong to have a gas-fire burner so adjustable that it would light-back at any one or two pressures, such as is put upon the supply entering most consumers' houses to-day. The gas-fire of the future must not on any account—with fair usage such as it is likely to get in daily use—light-back at all. Many a fire is in position, lying idle, that would be more often in use but for the fact that "the horrid thing" will not burn right every time when required. The consumer requires a simple method of controlling his fire; and the very best way is to regulate it by the tap on the supply-pipe. It is so simple that a child can work it. Nevertheless it is really necessary that the burner, which embraces the injector, should, under all useful control, give uniform flames, and without producing any unpleasant noise. My experience does not coincide with much that is stated in the portion of the report which comes soon after my quotation. But I may be wrong.

Then, passing on to the tests of burners, Mr. Smith would greatly oblige by defining what he considers a "correct flame." Figures do not assist one in this matter when the results of aeration differ so greatly that the correct bunsen flame of burner "B" was represented by "0.2912," and "C" by "0.3083;" and yet burner "A," with an objectionable noisy flame, gave "0.2969" as its figure. The action of a steam-injector cannot be compared with that of a gas-injector. The case is not at all parallel in effect as I understand it.

Coming to Mr. Smith's paper on "The Uses of High-Pressure Gas for Industrial Heating Purposes," I am constrained to differ from him over the comparative tests given in the paper. Test No. 1, with high-pressure gas for water-heating, is shown to yield an efficiency of 92 per cent. From the data given, I can only make it 62 per cent. to the nearest round figure. In test No. 2, using low-pressure gas, the efficiency is about 16 per cent. too low. I may be wrong, but I shall be glad if Mr. Smith will show me where I have gone astray. In matters of gas efficiency and economy one has to be exceedingly careful, when making comparative tests or trials, to see that "other things" are the same. This Mr. Smith has overlooked; for in the one case the water was raised from 15° C. to 100° C., and in the other from 12° C. to 99° C. Further, one sample of gas is measured at 15 inches mercury, and the other at 25-10ths water-column pressure. Surely such tests cannot be said to be "parallel tests." I have, as nearly as is necessary, corrected to 20-10ths inch pressure; but I cannot duly allow for errors due to temperature differences. I would suggest to Mr. Smith that comparisons of this sort necessitate that the water temperature should be confined to some degree short of boiling; for it is practically impossible, when making tests on the value of a fuel, to determine accurately the boiling-point of water, as I think he must be aware. I would suggest 70° C., or 150° Fahr., as a maximum temperature to which to raise the water.

The following tests were made with low-pressure coal gas some years ago; and although I have many higher results, I have chosen two that represent the same quality of gas, and one of a poorer quality than Mr. Smith used. I believe they will suffice to show that Mr. Smith's high-pressure test of barely 62 per cent. efficiency can easily be passed by low-pressure gas:—

Date, 1904.	Rate Per Hour.	Time to Raise 1 Litre 100° F.	Corrected Cub. Ft. Used.	Total Heat Utilized.	Total Net Heating Value of Gas.	Heat Utilized.
	Cub. Ft.	Min. Sec.		B.Th.U.	B.Th.U.	Per Cent.
Jan.	10	3 52	6440	342.0	540	63.3
Feb.	10	3 50	6461	341.1	543	62.8
"	10	4 16	7120	309.5	485	63.8
						63.3

One word further about gas volumes. When experimenting, I usually ask myself this question: "How is the gas measured and charged for by the user?" The answer usually is: "Normal conditions of supply." Now, this is subject to about 20-10ths water column pressure, and not 15 inches of mercury. Temperature and barometric variations are never considered, unless the conditions are abnormal. But this is certain—the index-reader knows or cares little for anything but the position of the "hands of the dial." Therefore our corrections must tally with custom and practice. I am afraid Mr. Smith's tests of governors have necessitated a labour of love. I do not wish to discourage him, but my experience of them (which embraces their use up to 10 atmospheres) is that he is looking for the impossible; while the "pressure jet" is likely to deceive him as a measurer. I am anxious to be convinced that, with gas at (say) 2s. per 1000 cubic feet, a half-penny worth, or 20.8 cubic feet, under high pressure will or can do as much work as 3d. worth, or 124.5 cubic feet, subject to prevailing district pressures, as cited in the paper. Really, if 11,273 B.Th.U. net of gas can do as much work under a certain condition as 67,638 of such units of heat under another yet to hand serviceable one, then the gas industry is in for something I fail to find words to define.

The whole paper is so full of interest to me that I hope Mr. Smith will excuse my criticisms, as I assure him I have only the best interests of the gas industry at heart.

Glasgow Corporation Gas Department,
June 29, 1911.

WALTER GRAFTON.

SIR,—On reading the reports of the papers presented to the Institution at the recent meeting in Glasgow, I was astonished to notice the enormous saving in gas (claimed by Mr. Smith) on substituting high-

pressure gas for low-pressure gas, worked in conjunction with an air-blast, for melting gold.

On p. 890 of your issue of June 20 is given a table—a summary of the results of tests carried out "to determine the relative costs of melting gold in 100 oz. lots, with coke, air-blast and gas, and high-pressure gas, and then reducing it from 18 carat to 9 carat by alloying the gold in the usual way with silver, copper, and composition."

There are one or two points in this table which call for comment and explanation.

In the first place, it is stated that the operations lasted an hour, an hour-and-a-half, and half-an-hour respectively. Why is it necessary to charge a higher rate for labour in the case of the test with air-blast and gas?

Disregarding the series of experiments with coke as the fuel, and considering the cases of the gas-fired furnaces, it is to be noted that in the one case the cost of gas is given as 3d., and in the other as ½d. Now presuming that the same prices are charged for coal gas supplied at high and low pressure, the figures given by Mr. Smith mean that the system of heating by high-pressure gas is six times as efficient as that in which an air-blast and low-pressure gas are employed. Surely this is a somewhat extravagant claim?

It is to be expected that by using high-pressure gas in place of low-pressure gas in a form of bunsen burner, an increase in the efficiency of the heating process would result. The greater expansion of the gas in the first case on escaping from the burner-nipple causes sufficient air to be drawn along to allow of complete combustion without the necessity of any secondary air, whereas with the gas at low pressure secondary air is necessary for complete combustion. The volume of flame would be smaller for the same gas consumption in the first case; and in consequence there would be a hotter flame-zone produced. With air-blast and low-pressure gas, however, it would not be difficult to arrange for the admission of sufficient air to ensure complete combustion and to obtain proper mixing before ignition; so that it is difficult to see how high-pressure gas-heating in the case under consideration can be much more efficient than low-pressure gas properly worked in conjunction with an air-blast.

An advantage in the use of high-pressure gas would be that but one set of pipes would be necessary as against two in the other case; so that the cost of the installation would be less, and, in addition, the gas company could compress the gas more cheaply than the average consumer could compress air.

The 92 per cent. efficiency claimed by Mr. Smith in his iron-pot experiment induced me to calculate how much of the energy available in the gas had been transferred to the gold in the above tests.

The figures published with regard to these tests leave us in the dark on many points; so that I have been forced to make certain assumptions as to his working conditions. These assumptions are quite reasonable, I think, taking into account the data given. The assumptions made are—

1. That the metal used was pure gold, and that in no case was it alloyed with any other metal.
2. That the metal was raised to a temperature of 50° C. above its melting-point before the gas was turned off.
3. That the charge made for gas was 1s. 8d. per 1000 cubic feet.

The following calculation shows how much heat was transferred to the gold:

1 oz. troy = 31 grammes.

100 oz. = 3.1 kilogrammes.

Specific heat of gold = 0.032 calorie per gm. = 0.032 K.C.U. per kg. (ca. 0.128 B.Th.U.).

Melting-point of gold = 1063° C., say 1050° C. above the temperature of the room.

Latent heat of fusion of gold = 16.3 calories per gm. = 16.3 K.C.U. per kg.

∴ Heat required to raise the temperature of the gold through 1050° C., then to melt it, and further to raise its temperature through 50° C.

$$= (0.032 \times 1100 \times 3.1) + (16.3 \times 3.1)$$

$$= (35.2 \times 3.1) + (16.3 \times 3.1)$$

$$= 51.5 \times 3.1$$

$$= 159.6 \text{ K.C.U.}$$

That is to say, about 160 K.C.U. (640 B.Th.U.) are required.

Now if the gas costs 1s. 8d. per 1000 cubic feet, then for ½d. one would obtain 25 cubic feet.

The net calorific value of the gas is given by Mr. Smith in the iron-pot experiment (p. 885) as being 542 B.Th.U. per cubic foot; and that value is taken here. 542 B.Th.U. is about equal to 135 K.C.U.

Therefore the heat available on the combustion of 25 cubic feet of the gas

$$= 25 \times 135 = 3375 \text{ K.C.U.}$$

Of this energy, 160 K.C.U. are employed in melting the gold.

$$\text{i.e. } \frac{160}{3375} \times 100 = 4.7 \text{ per cent.}$$

Only 4.7 per cent. of the heat available is transmitted to the gold. [This process is evidently not one in which a 90 per cent. efficiency is to be looked for.]

Now according to Mr. Smith, with air-blast and low-pressure gas, the cost of fuel was 3d.; so that six times as much gas must have been employed. In that case, something like 0.8 per cent. of the heat available was transmitted to the gold. Is this the best that makers of furnaces for use with low-pressure gas can do? Would Mr. Smith give full details concerning these tests, so that it may be seen that the best possible methods of applying the systems of heating have been adopted in each case?

In the same paper, on "The Uses of High-Pressure Gas for Industrial Purposes," Mr. Smith says: "Another field in which high-pressure gas has an advantage over low-pressure . . . is in the heating of liquids." In support of this, he cites two tests in which water was heated in an iron pot from the temperature of the atmosphere to the boiling point. The conditions under which the experiments were made are unfavourable for heating by low-pressure gas, and the tests appear to me to be worthless. No mention is made of the size and weight of

the iron pot, nor are many details given of the method of lagging the pot and reducing heat losses. Further, one would like to know how the gas consumptions were determined, and why the rate at which gas was burnt in the case of the low-pressure experiment was considerably less than that in the case of the high-pressure experiment? Does Mr. Smith wish to persuade the general public that 47·5 per cent. represents the best efficiency that can be obtained with low-pressure gas when used for water heating?

In a report of the discussion on his paper, Mr. Smith is quoted as having said: "The better the mixture of gas and air, the higher the initial temperature of combustion, and the greater the combustion radiation; . . . and he quite agreed . . . that the larger the flame the greater its temperature." [Vide "JOURNAL," June 20, p. 892.] I should like to ask Mr. Smith what he means by the phrase "initial temperature of combustion?" By "combustion radiation," it is to be presumed that he means the energy radiated as the result of combustion taking place? The energy thus radiated is very largely in the form of heat; and it is certainly not increased by mixing the gas with air before ignition. The percentage of the total energy emitted as heat radiation is greatest when no air is mixed with the gas before ignition, as will be seen from the following results obtained by Professor Callendar.*

Total Radiation of Meker Burner per Cent. of Heat of Combustion.

Total radiation per cent. . . 10·5, 12·3, 14·0, 15·9, 14·1, 14·6, 17·0
Ratio of air to gas by volume . . 5·0, 4·0, 3·0, 2·5, 1·5, 1·0, 0·0

The gas was in all cases completely burnt. The ratio of gas to air before ignition merely describes the nature of the flame.

If Mr. Smith's second statement were correct, then it would follow that the bunsen flame is a cooler flame than the luminous flame obtained by shutting off the primary air. This is not the case.

There may be a great future before high-pressure gas; but extravagant statements of the nature of those made by Mr. Smith will tend to concentrate criticism on the system when it is least able to bear such criticism with equanimity.

HAROLD HARTLEY.

10, Eldon Place, Leeds, June 28, 1911.

Glover-West Vertical Retorts at Manchester.

SIR,—In answer to requests from your readers, I beg to forward particulars of the temperatures in the combustion chambers of the Droylsden installation of Glover-West vertical retorts, together with other useful information.

Temperatures in Combustion Chambers.

		Degrees Fahr.	
		Left Hand.	Right Hand.
Top combustion chamber	No. 6 . .	2460	2460
" "	No. 5 . .	2400	2400
" "	No. 4 . .	2400	2400
" "	No. 3 . .	2460	2460
" "	No. 2 . .	2500	2500
Bottom combustion chamber	No. 1 . .	2500	2450

Circulating chambers, 1600° Fahr. at inlets.

Producer gas contains an average of 22 to 23 per cent. of CO.

Waste gases contain an average of 18 per cent. of CO₂.

Pull on the waste-gas flue equals 2·10ths at the bottom, where the waste gas enters the chimney, decreasing to nothing at the top.

Pull at the primary-air inlet equals 2·5·10ths.

Chimney gives 7·10ths pull.

J. G. NEWBIGGING.

Manchester, June 29, 1911.

Scientific v. Unscientific Carbonization.

SIR,—The three valuable papers mainly dealing with vertical retort carbonization were somewhat shorn of interest by the few (preventing the many) discussing them, and also in the curtailment of time for the authors to respond.

In the readers of the papers there was apparent "light treading," and each one evidently expected his story would be different. In that they were all not mistaken, for the meeting was left as far removed from anything else except "a few ideas in the melting pot," the same as ten years ago.

The race to obtain the prize results from a ton of coal has now begun in earnest, although the starter's pistol cracked more than a hundred years ago. From that time it has rested upon the heads of the gas engineering profession, who have been guilty—in the largest way—of extravagance in wasting our (now) precious coal supplies.

If any proof is necessary, it remains in the fact that the scientific way to distil or carbonize coal has at last been discovered, in that it is now possible to get from a ton of coal 20 to 30 per cent. increased volume of gas actually carrying the same illuminating value, and better heating value, than was ever known before—to say nothing whatever about the residuals.

The old "ten-thousand-to-the-ton" men have either disappeared altogether, or have had their mouths closed by the "vertical position men."

This country at least has taken unscientific carbonization of coal "lying down" quite long enough.

I do claim a great effort, and an enormous amount of work, to remedy this great waste of our pent-up light and energy—now so precious to us. And glad as I am to see Manchester, Sunderland, and other places doing so well, I hold confirmed records equally as good obtained at Exeter by continuous carbonization nearly ten years ago.

T. SETTLE.

Exeter, June 30, 1911.

* See British Association, Section G, Sheffield, Third Report of the Committee on Gaseous Explosions.

Corrosion of Service-Pipes.

SIR,—In reply to the note in your last issue by Mr. Hole, I have to say that "acidiferous subsoil" can have only one meaning to my mind, and I believe to the minds of most people; and I believe I might define that meaning as a subsoil which is in itself or contains in itself substances which are acid in character and which will give an acid reaction when partially dissolved in water. Granting this definition to be true for practical purposes, surely it is impossible to regard the corrosion of services which admittedly takes place in a forced soil containing ashes, &c., as due to an "acidiferous subsoil," if such subsoil is not acidiferous but alkaline; and so far as I have examined such subsoils, they have been invariably alkaline and not acidiferous. I, therefore, reaffirm what I stated in my notes.

JAMES MCLEOD.

Greenock, June 28, 1911.

Publicity and Sales of Gas.

SIR,—Mr. Humphrys' article and your leader in this week's issue make one feel that the Publicity Committee has not been formed a moment too soon; for I am quite sure that, in these days of competition, Mr. Humphrys will find very few in agreement with him that "a dignified silence is preferable."

It would be a serious mistake to allow hostile statements to be made publicly and give no contradiction; and this is one of the principal reasons why the Publicity Committee has been formed. The objects of the Committee will be not only to controvert false statements, but to educate the public to a true appreciation of the uses of gas—not only as a light but for cooking, heating, and power purposes. And this can only be done by the whole gas industry uniting and supporting the Committee, financially and otherwise, in their work.

It is to be hoped that the Committee will lose no time in getting to work and justifying their existence, not only to their supporters but to those who are at present either "sitting on the fence" or out of sympathy with the movement.

R. W. EDWARDS.

Aldershot, June 29, 1911.

Maintaining a Constant Draught in Main Flues.

SIR,—The remarks on the papers read before the recent meeting of the Institution of Gas Engineers, having reference to the advisability of maintaining a constant draught in the main flue of retort-benches, naturally raise the question as to the best means of accomplishment. A governor, to maintain a constant vacuum irrespective of the chimney pull, would seem to meet all requirements. Has such an apparatus been successfully applied?

It would also appear to be a good solution to a chimney which fluctuates considerably—due to local aspects, from a geographical point of view.

CONSTANCY.

June 26, 1911.

Belfast Gas-Works Results.—The report on the working of the Belfast gas undertaking for the year to March 31 last shows a gross profit on the manufacture and sale of gas and residuals of £64,568, which is an increase of £13,490 over last year.

Fish Poisoned by Tar.—A considerable area of the main road in the Kirkby Stephen district was recently tarred to settle the dust; but the drenching rain of a few days ago washed the tar into the River Eden, where numbers of trout have been found poisoned. Concern is felt by the farmers who live on the banks of the Eden lest their cattle should also be poisoned. The Westmoreland County Council, who are the authority for preventing the pollution of rivers, thus find themselves in the curious position of being chargeable with this offence within their own area.

Birmingham Gas Department Figures.—We have received from Mr. Thomas H. Clare, the City Treasurer of Birmingham, a copy of the detailed accounts prepared for the twelve months to March 31. Those relating to the Gas Department furnish some figures in addition to the ones which were given in the "JOURNAL" for May 16 (p. 467). The revenue account shows a balance of income in excess of expenditure of £211,754 for 1910-11, carried to profit and loss account. After providing for annuities, interest, and redemption of debt, the balance of the profit and loss account was £75,621. The amount of capital expended during the year was £30,744; and the value of buildings and plant abandoned, &c., was £63,250. The total expenditure on capital account to March 31 was £2,428,461. The amount of the reserve fund provided out of revenue, with accumulations, was £100,000; while the gross total of loans negotiated, including annuities, was £2,908,949. The amount provided from revenue for redemption of debt during 1910-11 was £57,983; and the gross amount provided for redemption of debt to the end of the year was £982,911. The balance of loans remaining to be provided for was £1,926,038.

A Recording Gas-Calorimeter as an Aid to the Detection of Crime.

—Mr. Brearley writes: Between the hours of 6 p.m. on Monday last (June 26) and 7 a.m. on Tuesday morning, the offices of the Longwood Gas Company were burglariously entered. A plate-glass window at the rear of the premises was broken, enabling the offender to open the catch which is fixed on the sash of the window. In a room adjoining, the Company have a continuously recording calorimeter in operation. Between this room and the damaged window is a door, which was open at the time. When the offender pulled down the top portion of the window, the draught extinguished the flame of the calorimeter—causing the pointer which marks the chart to at once move towards the zero line. This clearly indicated that the premises were entered at 10.40 p.m. Although some damage was done to one of the desks in an attempt to break open the drawers, the work of the office-breaker appears to have been disturbed. About this time one of the employees of the Company walked over a weighing machine situated in close proximity; and this apparently caused the intruder to beat a hasty retreat, before his nefarious designs fructified. Although no arrest in connection with the matter has yet been made, the field of inquiry is narrowed down by the effect produced on the chart by the calorimeter.

REGISTER OF PATENTS.

Coin-Freed Mechanism.

HIBBERD, C. E., of Victoria Street, Westminster.

No. 10,287; April 27, 1910.

This invention relates to coin-freed mechanism more particularly as applied to prepayment meters of the kind described in patent No. 14,758 of 1909.

The particular objects of the invention are to provide mechanism rendering capable the use of a smaller number of parts, or parts which are less delicate or capable of derangement—more especially in multi-coin prepayment mechanism. A further object of the invention is to provide means for controlling delivery to a prepayment meter.

Broadly, the invention consists in providing a third movable member to co-act with the two-leaf or equivalent elements referred to in the 1909 patent, normally free of same, but locked thereto on the insertion of a coin unlocking the coinholder. The leaves, upon a slight motion of the operating handle after such insertion, positively connect (as by a bolt) to the commodity controlling wheel or other device, but are positively disconnected upon further motion of the operating handle after the arrest of the leaf-like members by contact of a part of the rearward of them (or of the coin held between them) with a stop member from the commodity controlling means, as by a cam-pin or equivalent means carried on the forward leaf co-acting with the connecting bolt.

A further feature of the invention is an improved valve element particularly applicable to a coin-freed gas-meter in which means are provided automatically ensuring a gas-tight closure of the bearings or the equivalent parts through which moving members of the valve-operating means (or of the valve) enter the gas-duct. In one form, this valve consists of a box-like element having inlet and outlet orifices connected in the gas-main, and a shaft passing out of the box and carrying outside it an arm provided with a notch adapted to co-act with the operating member, such as a slidable collar, and carrying a counterpoise member. Inside the box, the shaft is provided with an arm projecting from it and carrying pivotally a conical valve plug adapted, upon partial rotation of the shaft, to effect the closure of one of the orifices referred to, which is provided with a valve-seat—by preference, a leather or cork washer suitably treated to prevent deterioration on long standing. The shaft has only one bearing in the casing, and has its other in a spring member attached to the casing and normally tending to press the shaft longitudinally out of same. The bearing in the casing is preferably coned on the inside, and co-acts with a conical shoulder upon the shaft inside the casing. These parts are normally pressed together by the spring. The counterpoise on the external valve-arm, to open the valve, is provided in order that jarring of the meter, when the slidable member of the commodity controlling shaft has passed from the notch, shall not close the valve, and thus place the valve-arm in such a position that the slidable member will on return foul same and be unable properly to reach its limit of travel.

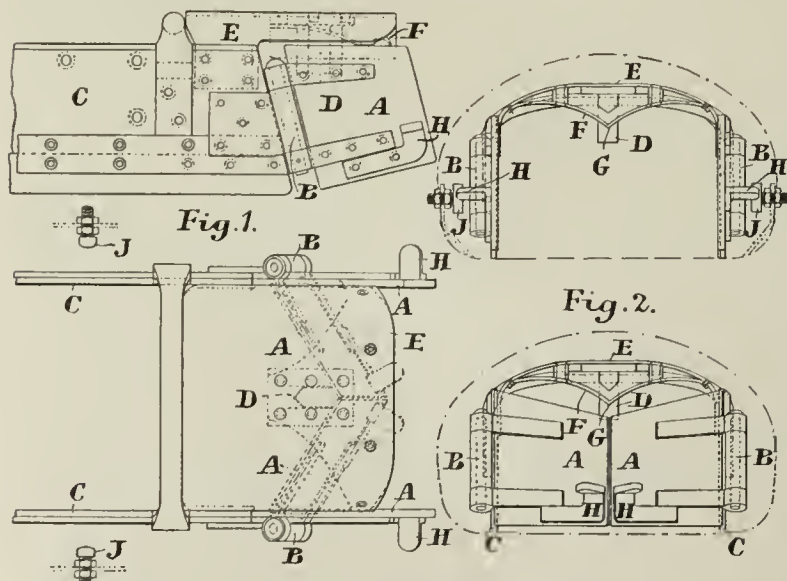
Discharging Coke from and Charging Coal into Gas-Retorts.

ALDRIDGE, J. G. W., of Victoria Street, and M'INN, A. C., Jun., of Fulham, S.W.

No. 13,322; June 1, 1910.

This invention relates to apparatus that discharges and charges simultaneously through gas-retorts, consisting of two stiff or jointed side-pieces held together by distance-pieces, and having swing push-plates adapted to push the coal from a movable bed-plate outside the retort directly on to and along the bottom of the retort, while the front end is pushing out the coke—the coal being automatically supplied to the bed-plate in the desired quantity as the charger advances into the retort. The constructions referred to are described in the Fiddes-Aldridge patents.

The present invention has for its object an improved arrangement of the front push-plate of the charger so that it shall not bear on the coal and the coal be levelled as the discharging-charger is being withdrawn. It consists in pivoting the plates on a vertical pivot, so that they swing horizontally, and in providing an arched hood at the front, to which the levelling plough is secured.



A Modification of the Fiddes-Aldridge Charger-Discharger.

Fig. 1 is a side elevation and plan of a part of a charger fitted with the improved push-plate. Fig. 2 is a front view showing the swinging plates open and shut.

The front push-plate is formed of two plates or doors A, pivoted by hinges B to the side plates C, the hinges lying in the planes of the side plates and being inclined backwards in these planes at an angle from the vertical preferably of about 15°. The doors when swung inwards meet and abut at an angle considerably out of the straight line against a stop D fixed to the arched hood E, as shown by dotted lines.

The hood extends from the front of the discharging charger some distance in the rear of the closed position of the doors. On its front end, it carries a coal-spreader F, consisting of a plate riveted to the underside of the hood and bent down in the middle to form a coal-spreading edge or plough G, which pushes the coal from the middle towards the sides of the retort.

On the outside of each door is bolted a bracket H, projecting beyond the side of the charger when the doors are open, so that as the charger is withdrawn from the retort with the doors opened by the resistance of the coal, the brackets come in contact with tappet bolts J, attached to the movable apron plate of the machine, and knock the doors over their dead-centre, when they close by their own weight, owing to their being hung at an angle.

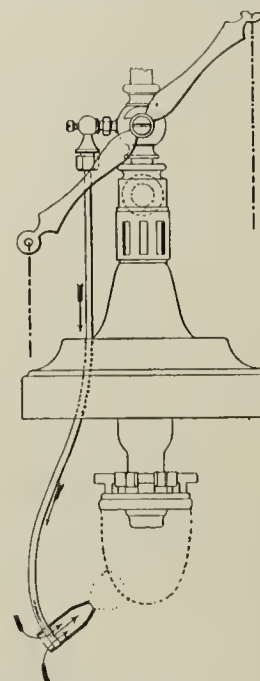
The discharging-charger can be entirely filled with coal, the whole of which is left in the retort as the apparatus is withdrawn; "there being no obstruction of any sort tending to draw the coal back after the discharging-charger."

Incandescent Gas-Burners.

WIGLEY, P., of Olton, Warwickshire.

No. 14,144; June 11, 1910.

The patentee claims the combination and employment with an inverted incandescent gas-burner and its mantle, of one or more small external pilot bunsen burners and means for controlling the gas supply to them—all so arranged that the flame of the pilot bunsen burners impinges on the exterior of the mantle when the bunsen flame inside the mantle is turned off—thus providing "simple and efficient means whereby an incandescent burner can be caused to give either its full light or any desired light less than the full; the proper gaseous mixture being obtained under all these conditions."



Wigley's Incandescent Burner with "Glimmer" Light.

The patentee provides outside of, and adjacent to, the mantle a small pilot bunsen burner fed with gas from the pipe which feeds the main bunsen. This pilot bunsen is so arranged that the flame from it impinges on the outside of the mantle and illuminates a portion of it when the supply to the main burner is turned out. Thus, when the burner is constructed as shown, either the full light can be obtained or a reduced incandescent light formed by the flame from the pilot bunsen impinging on a small portion of the exterior surface of the incandescent mantle.

Gas Heating-Stoves.

WILDE, P. R., of Bath.

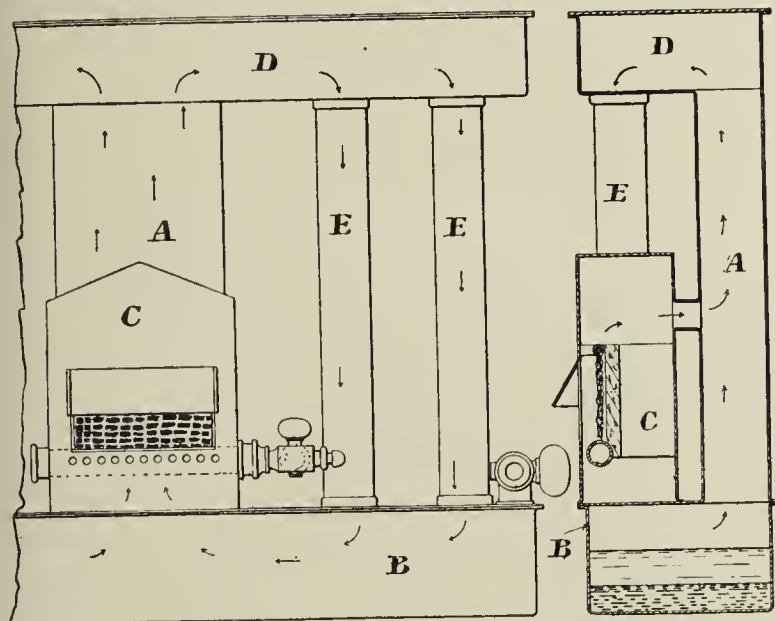
No. 15,411; June 27, 1910.

This invention, according to the patentee, relates to "a method of and means whereby a fire can be burned without the provision of any outlet for the fumes, because the draught necessary to support combustion is obtained by a method which differs from any known methods." In order to produce the necessary draught, he makes use of the natural law that when gases are suddenly condensed within a closed receiver a vacuum or negative pressure is produced. This negative pressure causes a strong suction action at the point of entrance to the receiver which is occupied by the flue-pipe of the stove. By arranging for this negative pressure to act continuously, by a continuous rapid condensation, a draught is obtained by which the combustion of the fire is maintained and the fumes are drawn into the closed receiver. The complete condensation and transformation of all the products of combustion are effected by causing them, without again passing through the fire, to move in a circle or continuously to circulate, during which time they are repeatedly exposed to the conditions that cause their destruction, and for so long a time as is necessary to complete their entire transformation.

As shown, a vertical flue-pipe A communicates at its lower extremity with a closed tank B below the level of the stove proper or burner

July 4, 1911.]

part C and adapted to be partially filled with water containing an excess of undissolved lime or other reagent capable of combining with the carbonic acid or the sulphur or other compounds in the products of combustion. The upper extremity of the flue-pipe communicates with a closed chamber D, which is also in communication with the free space in the lower tank by (preferably) four tubes E. The burner part C comprises an atmospheric burner held in position within a casing, and above which depends an asbestos curtain, the heat from which, and also the flame, is deflected by a brick or other backing. The curtain is preferably of a comparatively thin section, in order to prevent undue absorption of heat and also to allow a ready radiation thereof. A canopy or shield of mica is provided, to prevent any odour of burning matter escaping from the front of the burner.



Wilde's Condensing Gas-Stove.

The products of combustion and hot air will, on admission to the vertical pipe A, ascend and enter the upper chamber D, and in doing so will create a draught, which will cause the air in the lower tank B to pass up the pipe A. The removal of air from the tank B causes a downward draught in the tubes E connecting the two tanks. Then is established a circulation of hot air, which passes by the flue-pipe A to the upper chamber D; from the upper chamber D to the lower tank B; and so on. The fumes, in passing from the lower tank to the upper chamber, meet the hot fumes as they come from the burner and cause rapid condensation, because the fumes rising from the lower tank are comparatively cool. The carbonic acid combines with the lime in the water and allows free lime to be dissolved in it in readiness to unite with the further supplies of carbonic acid; and the carbonic acid absorbed by the water causes the deposited carbonate of lime to be redissolved as bicarbonate of lime. The sulphuric acid will also be dissolved by the water. The water which is formed by the act of combustion will, by condensation, be able to be used again and again.

Inserting Valves in Gas-Mains under Pressure.

RUSCOE, A. O., of Queen Anne's Chambers, S.W.

No. 14,458; June 15, 1910.

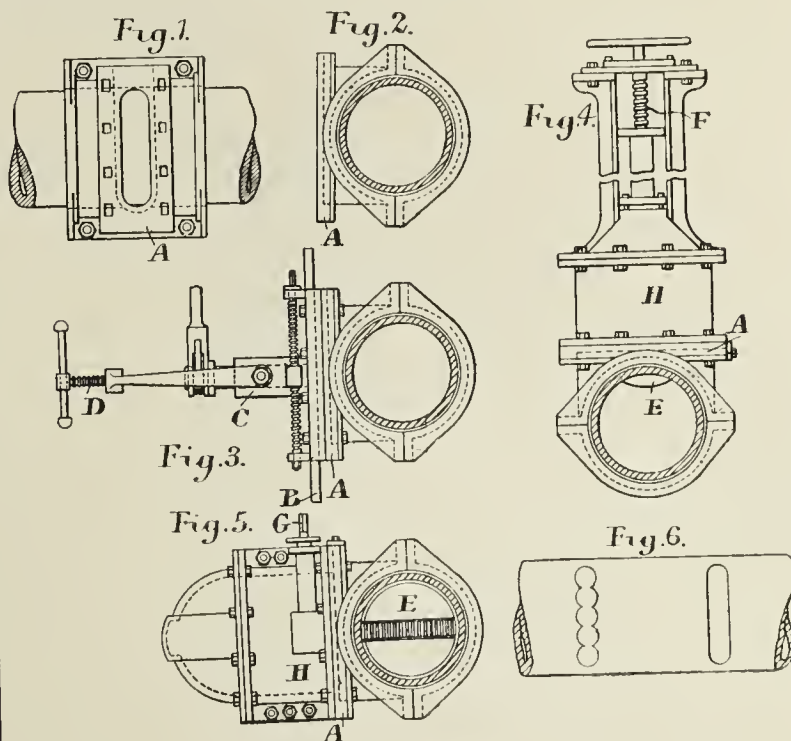
This invention relates to the insertion of valves in pipes containing gas under pressure, and has for object to enable the work of cutting the main or pipe and fixing the valve to be accomplished without any great loss of gas or interference with the supply until the actual moment when the valve is closed. The invention is further that such a valve, if its use be not further desired, can be removed while still under pressure and the cut in the pipe closed up without any great loss of gas. The valve so removed can be utilized at some other place, or can be subsequently used at the point from which it was removed. The cutting of the pipe and the fixing of the valve in position ready for use are divided for the purposes of description into three operations, described with reference to the accompanying illustration.

Figs. 1 and 2 are a plan and side or end elevation of two half-clips which form the sleeve employed to carry, first, the drilling and reaming machine and, finally, the valve and its mounting and operating gear. Fig. 3 shows mechanism employable as a drilling machine and as a reaming machine; being mountable on one of the half-clips of the sleeve. Figs. 4 and 5 show valves and valve casings mounted on one of the half-clips of the sleeve; the former being of the vertical screw-type and the latter the internal rack-and-pinion type. Fig. 6 shows, at the left-hand portion, holes drilled in and across the pipe during the first part of the second operation (the holes touching or breaking into one another), and, at the right-hand portion, the slot or cut formed in the main or pipe at the end of the second operation, and made by reaming or machining the rough or serrated edges of the holes. The edges of the slot form seatings for the valve when in its closed attitude.

After a description of the sleeve and the valve-box and damper-valve (the first division of the invention), the patentee proceeds to the second part, which relates to the drilling of the holes and the reaming of the slot or cut in the main.

The base-plate of the drilling and reaming machine is mounted on the valve-box A, and is secured to it by bolts. The plate is slotted to allow of the action of the drills and reamers on the pipe, and is also adapted to permit the traverse, in a direction transverse to the axis of the pipe, of a carriage B carrying the drill and reamer driving means. The traverse of the carriage is effected by a screw mounted at its ends in uprights on the base-plate and engaging a nut in the carriage. C is a strong upright boss mounted on the carriage B, and bored through

to receive the drill or reamer spindle which passes through a stuffing-box at the upper end of the boss. The carriage is of such length that when the drill or reamer spindle is at one or other end of the diameter of the pipe, the slot is wholly covered by the carriage, and gas cannot escape to the atmosphere. The spindle is well fitted to the bore of the boss C, and is adapted to be driven by a ratchet brace, or by gearing. The feed of the drill is effected by the feeding screw D, which is supported and brought into position by a bridle pivoted to the boss C.



Ruscoe's High-Pressure Main Tapper.

The drilling machine is employed solely in the drilling of a series of holes in the one-half of the main to allow of the formation of a slot or cut of the right size; and on the completion of the holes, the drill spindle and drill are moved outward clear of them, and also of the damper-valve, which is pushed inward of the valve-box A, so as to shut off the interior of the main from it. When the damper-valve is closed, the drill spindle and drill are wholly withdrawn from the bore of the boss, the drill is removed and replaced by a parallel reamer, the head of which fits the spindle as did the drill-head. The spindle and reamer are now passed into the bore of the boss, up to the upper face of the damper-valve; care being taken to see that the centre of the reamer is true with the centre of one of the holes that have been drilled. The damper-valve is now moved outward of the valve-box, and the reamer is forced into the hole with which it is concentric until its inward end is level with the centre of the pipe. The reamer is now set in rotation by the ratchet brace or gearing, and is at the same time traversed from one side of the pipe to the other. Owing to the compound movement of the reamer, the rough edges formed by the breaking of the holes into one another are removed, and there is formed a slot, the edges of which are perfectly smooth. When the reaming has been completed, the damper-valve is moved inward, so as to permit of the complete withdrawal of the spindle and reamer and also of the disconnection of the drilling and reaming machine from the valve-box.

The third part consists of the fixing of the valve in position. The valve or valve-gate E is of a thickness in conformity with the diameter of the drill and reamer. In fig. 4, it is operated by the screw F and hand wheel, the screw engaging in a tapped hollow spindle, secured to the valve-gate. In fig. 5, the gate E has a rack cast on it engaged by a pinion operated by a spindle G. The valve-gate is lined on its periphery, and on each side that fits in the slot, with compressible material compressed after contact has been reached on the interior of the pipe and on the sides of the slot.

The valve boss or cover H is bolted on to the top of the valve-box A in exactly the same manner as is the drilling and reaming machine. The cover is of sufficient length to permit of the complete withdrawal of the valve-gate E from within the main or pipe. When it is bolted on to the valve-box, the damper-valve is withdrawn so as to permit the valve-gate to be moved into position across the pipe; and when this has been done, the damper-valve can be completely withdrawn from the valve-box and the slot in the end of it closed, as already described.

Washing Coke and Coal.

BENSON, R. S., of Middleton St. George, Durham, and HEAD, WRIGHTSON, AND CO., LIMITED, of Thornaby-on-Tees.

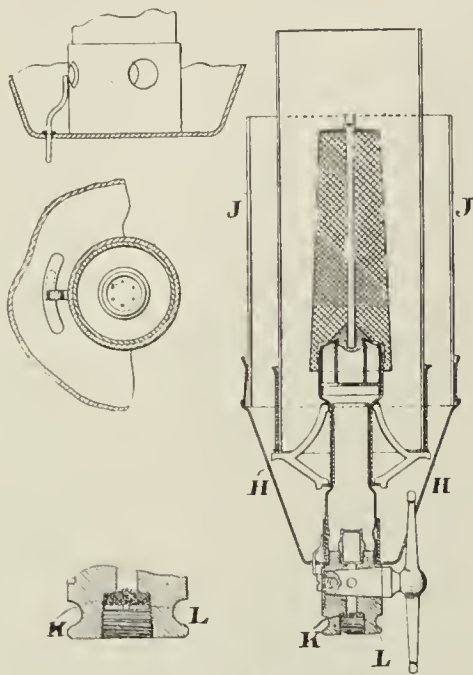
No. 24,268; Oct. 19, 1910.

This invention relates to a machine which "will treat a maximum quantity of coal at a minimum cost, and which is of simple construction and has a minimum of parts subject to wear and tear." This end is said to be attained by a construction which comprises essentially a tank, a compartment in the tank—a "wash-box" having an inclined perforated bed or bottom at a distance above the bottom of the tank, an adjustable sill across the deeper end of the wash-box, two upwardly inclined shoots at the deeper end of the wash-box and arranged one above the other (the inclination of the shoots being greater at the end next to the wash-box than that at the other end), a feed for the unwashed coal above the shallow end of the wash-box, a water supply leading into the tank (preferably behind the wash-box), and a "Marcus" propeller gear, as described in patent No. 14,412 of 1900, for imparting to the tank and parts carried by it what is known as the "Marcus" motion.

Gas-Mantles Incandescenced with a Diminished Consumption of Gas.

STORER, J., of Hawthorn, Victoria, and WITT, G. C. DE, of Melbourne.
No. 19,606; Aug. 22, 1910.

This invention relates to means for "obtaining perfect incandescence of gas-mantles with a greatly diminished consumption of gas," by the arrangement shown.



Double Chimney Incandescent Burner.

It is an ordinary non-luminous gas-burner, having the usual air inlets, passage for gas, tap, and handle for operating same. H is an inverted hollow sheet-metal cone, open at the top, and provided at the centre of the bottom with an opening. J is a glass cylinder supported by the usual lamp glass gallery, and about one-third greater in diameter. It extends upwards to a point slightly above the top of the mantle. K is a plug of unbleached wool inserted in the base of the burner. L is a disc in the base of the burner, and provided with perforations of such a size as to reduce the quantity of gas passing to the burner by approximately one-third of the normal supply. A sleeve containing a number of ports or passages surrounds the portion of the burner in which the air inlets are situated, and is provided with a handle by which it can be rotated so as to bring the ports either into or out of apposition with the air inlets, according as to whether the supply to the air inlets is required to be reduced or not. When large size incandescent mantles are used, the diameter of the air inlet is enlarged so as to make allowance for the expansion of the air upon heating, and also to counterbalance the throttling of the air current in the space between the lamp chimney and the hollow-glass cylinder.

To obtain "perfect incandescence of gas-mantles with a greatly diminished consumption of gas," the lamp chimney, its carrier, and the mantle are removed. The portion of the burner in which are the air inlets is unscrewed, and the inverted hollow cone H is placed in position—its base effectually closing the bottom of the cone. The plug of wool is inserted in the base of the burner and subsequently the diaphragm L. On the gas being lighted, the air for admixture with the gas, and also that required for combustion, passes downwards between the glass J and the usual inner chimney—being heated in its passage by the waste heat from the flame. The air so heated passes downwards into the cone H, and coming into contact with the pipe through which the gas passes heats it and also the gas. A portion of the heated air supplied to the cone passes through the air inlet, and admixes with the heated gas; the balance passing upwards to the flame to complete combustion. The increased temperature produced "effects perfect incandescence of the mantle, and consequent on the heating of the air and gas a very much less quantity of gas is consumed."

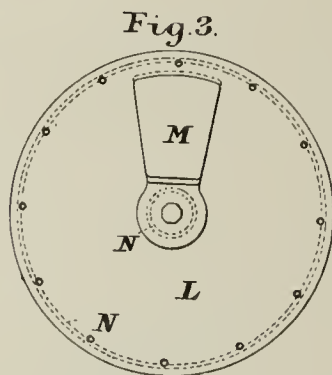
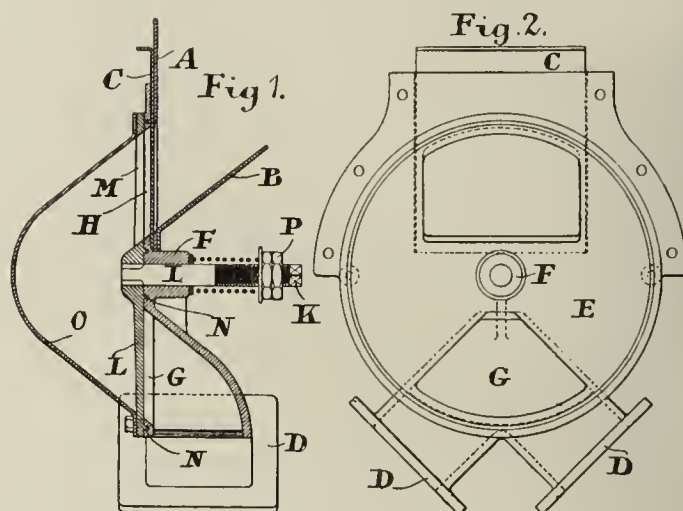
Feeding Devices for Continuously Operated Carbonizing Retorts.

CLOUDSLEY, J. L., Jun., of Palace Chambers, Westminster.
No. 26,540; Nov. 15, 1910.

As pointed out by the patentee: Continuously operated carbonizing retorts, fed by gravity so as to be constantly full of the material charged, require a continuously driven device for permitting the material to enter the retort, or shoot leading thereto, with the minimum possible escape of volatile products of the carbonization. A drum revolving in a casing has been an appliance commonly used as a feeding-device for the purpose, and, with the object of diminishing the surface of casing which has to remain substantially gas-tight, a drum oscillating on its axis has been substituted for the rotating drum. It is very difficult, however, he says, to keep the cylindrical surfaces of such drums in substantially gas-tight contact with the casing, and they are liable to allow of considerable escape of products after having been in use for a short time. The present invention relates to a device for feeding such retorts in which the material flows directly from the hopper into a pocket and from the pocket into the shoot, as determined by a revolving or oscillating disc having an opening in it which registers at each revolution or oscillation—first with the discharge opening of the hopper, and then with the outlet from the pocket into the shoot.

Fig. 1 is a vertical section through the feeding-device; fig. 2 is a front elevation (the pocket and revolving disc having been removed); and fig. 3 is an elevation of the disc removed from the feeding-device.

A B are the front and bottom plates of a coal-hopper, the discharge opening of which is adapted to be closed by a slide C. The head of the shoot leading to the retort or (as shown) the double head D, serving the shoots of two retorts, is cast in one with a plate E, having a boss F and two openings G H. The opening G constitutes the mouth of the double head D, while H is adapted to register with the discharge opening of the coal-hopper when the plate E is fixed to the front of the hopper.



Cloudsley's Vertical-Retort Feeding-Device.

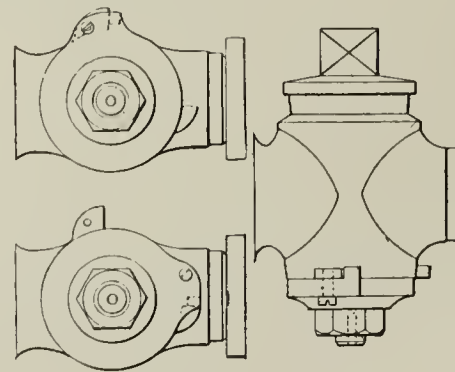
The boss F is drilled to form a bearing for a shaft I adapted to be coupled by its square end K with a driving shaft, and carrying at its other end a circular disc L having an opening M. This disc has circular flanges N adapted to fit corresponding grooves in the plate E so as to run in it—oil being introduced into the grooves from time to time.

Bolted to the disc L is a dome-shaped plate O, constituting the said pocket referred to. The slide C having been raised, as the disc L revolves with the shaft I and the opening M comes into register with the opening H in the plate E coal falls from the hopper into the pocket; and when the opening M registers with the opening G in the plate, coal falls from the pocket into the head D. In order to prevent breakage in the event of coal becoming jammed between the plate E and the disc L, the shaft I is screw-threaded to receive a nut P, between which and the boss F is a spring. If the coal becomes jammed, the spring is further compressed, and the disc L yields to the necessary extent.

Gas-Main Cocks.

SOLARI, J., of Exeter.
No. 20,700; Sept. 6, 1910.

Instead of the present method of open-and-shut stop arrangement with a cut-down barrel and pin in a plug, the patentee proposes to cast two stops on the bottom of the barrel of the cock, which will engage with a stop on the bottom washer on the plug; the stop on the washer and on one or both stops on the barrel to be made large enough to allow for a hole to be drilled for a pin or screw, so as to make the cock secure either open or shut as desired.



Solari's Gas-Main Cock.

As shown, the means for limiting the rotation of the plug in the barrel consists of two laterally projecting stops provided on the barrel, adapted to be engaged by a stop provided upon, and at right angles to, the plane of the washer which retains the plug in position within the barrel. The means for locking the plug in any determined position consists of a pin or screw adapted to engage one or either of the stops provided upon the barrel and the stop provided upon the washer.

PARLIAMENTARY INTELLIGENCE.

HOUSE OF LORDS.

The following further progress has been made with Bills:—

Bills brought from the Commons, read the first time, and referred to the Examiners: Belfast Corporation Bill, Halifax Corporation Bill, Local Government Gas Provisional Order Bills (Nos. 1 and 2), Thames Conservancy Bill.

Bill reported: Metropolitan Water Board (New Works) Bill.

Bills read the third time and passed: Merthyr Tydfil Corporation Water Bill, Paignton Urban District Council Bill.

Bills Royal Assented: Chesterfield Gas and Water Board Bill, Enfield Gas Bill, Gaslight and Coke Company Bill, Harrogate Corporation Bill, Hastings Corporation (Water and Finance) Bill, Luton Gas Bill, West Cheshire Water Bill, Wirral Water Bill.

The Gas Orders Confirmation Bill (No. 2) and the Gas and Water Orders Confirmation Bill have been referred to a Select Committee, consisting of Lord Barnard (Chairman), the Earl of Hardwicke, the Earl of Northbrook, Lord Belhaven and Stenton, and Lord Aldenham; to commence sitting to-day. The Orders petitioned against are the Guisborough Water and Cannock Gas Orders.

The following petitions have been presented against the Gas Orders Confirmation (No. 4) Bill: In respect of the Busby and District Order, by the Glasgow Corporation; the Preston Order, by the Preston Rural District Council; and the Uxbridge Order, by the Hertfordshire County Council. The Preston Corporation have petitioned against alterations in the Preston Gas Order.

HOUSE OF COMMONS.

The following further progress has been made with Bills:—

Lords Bill read the first time and referred to the Examiners: Merthyr Tydfil Corporation Water Bill.

Bills reported, with amendments: Chapel, Whaley, and District Gas Bill [Lords], Chester Water Bill, Margam Urban District Council Bill, Rotherham Corporation Bill, Sidmouth Gas and Electricity Bill [Lords].

Bills read the third time and passed: Ashborne and District Gas Bill [Lords], Belfast Corporation Bill, Harrogate Corporation Bill [Lords].

The London Waterside Manufacturers' Association (Incorporated) have petitioned against the Port of London (First Election of Members) Provisional Order; and the Order, with the Swansea Gas Bill [Lords], has been referred to a Select Committee, consisting of Mr. J. F. Mason (Chairman), Sir Godfrey Baring, Mr. Patrick White, and Mr. Walrond, who will commence sitting on Thursday.

ST. HELENS CORPORATION BILL.

Local Legislation Committee.—Wednesday, June 28.

(Before Mr. GARDNER, Chairman, Mr. FLETCHER, Mr. MANFIELD, and Mr. R. PEARCE.)

The extensive General Powers Bill promoted by the Corporation of St. Helens, which deals, among other things, with matters appertaining to the gas undertaking (the illuminating power, the test burner, stand-by charges, and the supply of gas to areas outside the limits of the Corporation, &c.), was last Wednesday before Section B of the above Committee.

Mr. W. J. JEEVES and Mr. G. M. BAILEY appeared for the promoters. The petitioners against the Bill were represented by Mr. WEDDERBURN, K.C., and Mr. BEASLEY, for the Corporation of Widnes; by Mr. G. J. TALBOT, K.C., for the Ashton-in-Makerfield Urban District Council; and by Mr. HUTCHINSON, K.C., for the Warrington Corporation.

Mr. JEEVES, in opening, explained that St. Helens was a county borough of 7284 acres, with a population of 95,566. Among other concerns owned by the Corporation was an extensive gas-works, which was purchased from a Company in 1875. The limits of supply comprised not merely the county borough itself, but the adjoining areas of Haydock, Ashton-in-Makerfield, and parts of the district of Prescott, Windle, and Eccleston. The limits of the Corporation's supply were surrounded practically on every side by the limits of other authorities and companies. In one or two instances, the Corporation were, with the consent of the adjoining authority, supplying gas outside their limits for the purpose of obliging their neighbours. The Bill, by clause 21, sought to legalize this position, and also to give a means of legalizing a similar kind of thing should the need hereafter arise. All the petitioners against the Bill represented by Counsel opposed this clause, which was in the following terms:

Where it is proved to the satisfaction of the Local Government Board that the occupier of any premises outside the area of supply of the Corporation is desirous of obtaining a supply of gas from the Corporation, the Local Government Board may, if the local authority within whose district the premises are situate and the Company, body, or persons (if any) authorized to supply gas to such premises consent, by Order permit the Corporation to give a supply to those premises on such terms and subject to such conditions as the Board think fit. Provided that if, in the opinion of the Local Government Board, any consent required by this sub-section is unreasonably withheld, the Board may proceed as if such consent had been given. An Order given by the Local Government Board under this section may, for the purpose of enabling a supply to be given thereunder, confer any such powers and impose any such duties on the Corporation as would have been conferred or imposed by the Gas-Works Clauses Act, 1847, or the Gas-Works Clauses Act, 1871, and as might have been conferred or

imposed by Provisional Order if the premises and the route along which mains and pipes are to be laid for the purpose of giving the supply were within the area of supply of the Corporation—anything in any Act or Order relating to the undertaking to the contrary notwithstanding.

In the extensions outside the district, the needs of these people had now been met. The Corporation had no legal right or no legal authority to expend any money for the purpose of this extension; and if they had said, as they might have said, and as in one case they did say, "We have no legal authority to spend money and we do not see our way to do it," the effect would have been that those outlying premises in the adjoining limits would have been without gas to-day. The Corporation felt that it was unreasonable that this should be so. They did not want to undertake these supplies for the purpose of revenue-getting or of ousting the statutory supplies; but they did feel they were justified in coming to Parliament and asking that some such powers should be given as would enable what was being done to be legalized, and to enable the same kind of thing, if the need should arise, to be done in the future. Widnes and Warrington, who were opposing, were, curiously enough, the two authorities in whose area in one case the Corporation were supplying, and in the other case might supply. Ashton was within the limits of the supplies both of the Ashton District Council and of the St. Helens Corporation. The Corporation were not, however, supplying gas in any part of the area; but they had the power to do so. The Widnes limits came right up to St. Helens, and included areas outside the borough limits. The Widnes petition alleged that clause 21 would curtail the petitioners rights to supply gas within their authorized limits, and would authorize the Corporation to invade their area. They pointed out that their annual make of gas was 363,954,000 feet, and that they were prepared to meet any demand within the area. While Widnes could have supplied the two or three premises in the northern parts of the Widnes area supplied by the St. Helens Corporation, the guarantee required by Widnes under the Gas-Works Clauses Act, in respect of the necessary extension of mains, would have made the possibility of getting a supply altogether prohibitive. Widnes realized that they could not supply these people at a reasonable price, and accordingly gave the St. Helens Corporation full consent to supply them. Widnes emphasized the temporary nature of the arrangement; but under the clause they would be able to take over the supply of the area affected at any time by purchasing the Corporation's mains. The position taken up by Warrington was practically the same. There was no case at the moment in which the Corporation were supplying gas within the Warrington limits; but some few years ago, both the Burtonwood people and the Warrington Corporation requested the St. Helens Corporation to supply gas in Burtonwood. This request was refused, and to-day Warrington was supplying Burtonwood. The St. Helens Corporation also supplied Rainford Station and Rainford Hall, in the area of the Rainford Gas Company, and had done so since before the Company was brought into being. The Company were not petitioning against the Bill. These cases were instances of the kind of thing desired to be met by the clause. The position of the Ashton District Council was that their area should be eliminated altogether from the gas supply limits of the St. Helens Corporation. They did not in their petition object to clause 21. He submitted that it was wholly unreasonable for Ashton to take up the position they had, having regard to the fact that, even if St. Helens were using their powers in the Ashton area, they were asking for no powers that were unreasonable. The Ashton Council were afraid that St. Helens might at some time or other operate their powers to the benefit of the gas consumers in the Ashton district, but to the detriment of the Ashton undertaking, which could not supply at so cheap a rate. The Local Government Board report stated that the clause embodied a proposal which would form a new departure as applied to gas supply. It appeared to the Board to be open to considerable objection that they should be required to issue Orders dealing with the supply of gas to particular premises. Moreover, the report stated, if there should be a considerable demand for the supply of gas in any area outside the gas limits of the Corporation, the question would arise whether the area should not be brought within the area of supply either of the Corporation or of some other body or persons, in accordance with the usual procedure; and in any such case, the supply of gas in isolated instances under the clause would be liable to retard the general supply of the area. The Board suggested the omission of the clause. Counsel submitted, however, that, notwithstanding the report of the Local Government Board, if there were premises just over the border of an authority (as was the case in St. Helens) which required a supply of gas, it was eminently desirable that there should be a means whereby they could be supplied at the lowest possible rate. It might very well be proposed that at any time the authority in whose area the extra supply was given should be entitled—say, on three months' notice—to purchase any mains that had been laid by the supplying authority, and that thereafter all powers for supply by the supplying authority should cease, and the supply be wholly given by the statutory undertaking.

Mr. RHODES, representing the Local Government Board, interjected that matters would be made worse if the terms and obligations were only enforced for a month or two, and determined at the option of the authority.

Evidence was then called.

Mr. Samuel Glover, the Gas Engineer to the St. Helens Corporation, stated, in answer to Mr. JEEVES, that during the last 25 years he had witnessed a very great development in the St. Helens undertaking. In 1875 the St. Helens Corporation purchased the undertaking from the old Gas Company for £131,000. At that time, St. Helens was only a small part of the present borough, and the limits included the townships of Ashton-in-Makerfield and Haydock. The capital expenditure since the Corporation purchased had amounted to £339,364; but the outstanding debt to-day was only £133,000, although the works were four times larger. The Company were entitled to charge 4s. 6d. per 1000 cubic feet for gas inside and 5s. outside; but these figures were reduced to 4s. and 4s. 6d. by the Corporation when they purchased. Gas was being supplied at present at 2s. 2d., subject to an average discount of over 5 per cent. The discounts really ranged from 5 per cent. to 12½ per cent.; so that the net price of gas for lighting was roughly 2s. This included the use of gas-

stoves and gas-meters free. St. Helens was among the earliest undertakings to abolish meter-rents, and the first to supply stoves without charge. The make had enormously increased, and the Corporation were most careful to purify their gas and eliminate the sulphuretted hydrogen, &c. Having regard to the fact that Ashton had always been within the Corporation limits, he saw no reason, in the interest of the gas-consuming public, why Ashton should now be eliminated. In one area there might be developments which would be more cheaply and beneficially supplied from St. Helens than from Ashton. The Burtonwood proposal was not accepted on the ground of expense. With regard to Widnes, at the point where the Corporation were supplying within the Widnes area, the Widnes gas-mains were about 2 miles away. The powers sought in the Bill were simply to allow the Corporation to supply, pending such developments as would justify the adjoining authority or company supplying. A supply had been provided near Bold for many years; but it was decreasing on account of the engineering works concerned generating their own electricity. The total revenue for all the supplies in the Widnes area amounted to £250. They were not at all necessary for the continued prosperity of the St. Helens gas undertaking, and were provided more in the direction of meeting the needs of the populace. The St. Helens gas undertaking had a gross revenue of about £60,000; and they felt that the existing powers ought to be legalized pending the time when the adjoining authorities would be prepared to undertake the lighting.

In cross-examination by Mr. WEDDERBURN, witness admitted that the prices for gas in Widnes were very considerably cheaper than in St. Helens. There had never been any friction in supplying gas in those parts where it was more convenient that St. Helens should do so than Widnes. There was no argument for the present proposal other than that the St. Helens Corporation wished to legalize their position. Witness was not able to quote any precedent for what the Corporation now asked.

Mr. WEDDERBURN: There is no precedent. Is it your invention, Mr. Jeeves?

Mr. JEEVES: No; it is not my invention.

Witness stated that any consumer might raise the question of the legality of the Corporation's action. As a matter of fact, no one had done so.

In cross-examination by Mr. TALBOT, witness admitted that from 1875, when the Corporation first acquired the undertaking, they had never supplied any gas in the district of Ashton. The Ashton District Council had full gas powers for the supply of the whole of their district; but they did not get the St. Helens powers put on one side. St. Helens did not raise any opposition to the measure in Parliament. Witness did not dispute the suggestion that the Ashton District Council were developing and progressing rapidly with their undertaking. The Corporation had in their minds no spirit of competition at all; but they had rights in the Ashton district, and they should exercise them if the people required gas and the Corporation were the nearest authority to give that supply. Asked whether or not the Corporation intended to exercise their powers, witness replied in the affirmative. He believed it had proved a convenient thing for two local authorities to compete for the supply of the same district, and quoted the Long Eaton case. The learned Counsel, however, pointed out that it was not really an analogous case.

In cross-examination by Mr. HUTCHINSON, witness dissented from the suggestion that the Corporation were poachers, and had come to Parliament to be whitewashed. He supposed the clause would, as a matter of fact, enable the Corporation to supply gas wherever and whenever they liked, irrespective of limits, with the consent of the Local Government Board if the Corporation were so foolish as to use their powers in this way. He would not say that Warrington did not supply any person within their area whom the Corporation could supply.

In re-examination by Mr. JEEVES, witness said there was a precedent for the clause in regard to electric lighting.

Mr. James Crooks, the Chairman of the Gas Committee, was called at the request of Mr. WEDDERBURN; and in cross-examination he admitted that there had been a conference consisting of a large number of authorities—Wigan, Liverpool United Gas Company, Rainhill, Manchester Corporation, Huyton, Roby, Ormskirk, Ashton, and others—all of whom relied upon the opposition of Widnes and Warrington. His personal view of the clause was that where authorities who had the power were unable or unwilling to supply, the powers sought were reasonable. The Corporation asked the clause more to legalize their position.

Alderman John Forster was next called for the promoters. At the conclusion of his evidence,

The CHAIRMAN, without calling upon the petitioners, announced that the Committee had decided to strike out the clause.

Mr. WEDDERBURN, on behalf of Widnes, asked for costs, holding that, after the report of the Local Government Board was issued, it was a vexatious and unreasonable thing for the promoters to persist with the clause.

Mr. HUTCHINSON supported the application on behalf of Warrington. Mr. JEEVES contested the application, on the ground that the St. Helens Corporation felt they ought to use every possible endeavour to provide the means of regularizing what they had done.

The Committee refused the application.

Mr. TALBOT then proceeded to address the Committee on the petition of the Ashton District Council. He submitted that it was an unheard-of thing that two local authorities should each have power to break-up the streets and supply gas in competition with each other. There was no such case on record. It did not exist here, of course, as there was no competition in fact. At this moment, Ashton were supplying the Great Central Railway Company just over their limits and in the township of Haydock, which was within the gas limits of the St. Helens Corporation. He appealed to the Committee that these powers, which had not been exercised by the Corporation for 40 years, and which were confessedly useless in view of the fact that Ashton were an efficient authority and were developing their business, should cease to remain on the Statute Book. It was a miserable technicality to say that Ashton should promote a Bill, and that they were taking advantage of the St. Helens expenditure. There was an absolute pre-

cedent in the Bill promoted by the Pontypridd Water Company. The Wigan Act of 1874 appeared also to be an absolute precedent.

Mr. JEEVES argued that Ashton could only get the provision they asked for by introducing into the St. Helens Bill a clause brought up by the learned Counsel.

Mr. TALBOT retorted that he asked the Committee to declare, as a condition to passing the preamble of this part of the Bill, that he was entitled to the relief he sought. If the Committee so decided, he would bring up a clause.

Mr. JEEVES contended that the precedents quoted were not on all-fours with the position in this case. He submitted that it was not the proper parliamentary practice to allow an alteration of this kind to be made for the benefit of a party other than the promoter, on a promoter's Bill, where no notice had been given. The Ashton powers were originally taken subject to the St. Helens powers.

The Committee conferred for some time in private, and then announced that no decision would be given, pending the advice of Speaker's Counsel.

The Committee then proceeded to deal with the remaining (unopposed) gas clauses. The Local Government Board and Home Office both reported upon clause 18, which empowered the Corporation to refuse to supply gas in certain cases. The Committee insisted upon the model clause. With regard to clause 19 (supply of gas where the consumer has a separate gas installation), the Local Government Board described the provision as exceptional in regard to the supply of gas, although clauses on the subject had been allowed in several cases. Mr. Jeeves submitted that where consumers had their own supply and required the Corporation to have a meter as a stand-by, the practice became particularly hard on the Corporation, as they made no charge for the meters. The Corporation asked that they should be entitled to make a minimum demand not exceeding £5 a year. Evidence was called in support of the clause, which was allowed.

MARGAM URBAN DISTRICT COUNCIL BILL.

The Local Legislation Committee of the House of Commons presented over by Mr. GARDNER had before them last Tuesday the Bill promoted by the Margam Urban District Council, which has for its object to confer general power on the Council in addition to those relating to the transfer of the portion of the Aberavon gas undertaking supplying Margam to the District Council. The part of the measure affecting the gas transfer was dealt with by Mr. Mooney's Committee (see "JOURNAL" last week, p. 1016). The financial aspect of the gas proposals were, however, before the present Committee, together with the general clauses. The financial clauses authorized the Council to borrow money (a) for the purchase of the gas undertaking of the Aberavon Corporation, and for defraying the costs and expenses incidental to the purchase and transfer; and (b) for, and in relation to, the purchase of land and for the erection of gas-works (£27,500).

Mr. HUTCHINSON, K.C., appeared for the promoters.

Mr. Frank Jones, in the course of his evidence, stated that a period of 40 years was usually given for the repayment of loans on new works. The value of the mains in the district was not very great—under £5000.

Mr. HUTCHINSON asked the Committee to allow 30 years for (a) and 40 years for (b).

Mr. RHODES, representing the Local Government Board, said that while 30 years was enough for the purchase loan, he must press the suggestion that separate borrowing powers should be conferred in regard to meters and stoves; that 30 years should be allowed for gas-holders, 20 years for exhausters and purifiers, and 30 years for the extension of mains.

Mr. HUTCHINSON submitted the precedent of the Lisburn case, in which 40 years was given as a reasonable period not only for new works, but for purchase.

Witness stated that the whole of the £27,500 would have a distinctly long life—60 years.

The Committee allowed 30 years for purchase and 40 years for new works.

SIDMOUTH GAS AND ELECTRICITY BILL.

The Bill of the Sidmouth Gas and Electricity Company was before the Unopposed Bills Committee of the House of Commons last Thursday. Mr. WHITLEY presided.

Mr. JOHNSTON, the Parliamentary Agent, stated that the Bill was opposed in the other House by the Urban District Council on almost every conceivable point. There was a somewhat lengthy hearing, as a result of which very considerable amendments were made in the Bill in regard to the reduction of capital, the standard price, and so on. The District Council asked for a purchase clause; but the Committee declined to give it, although a suspensory clause was granted. The Council were not satisfied; and one of the amendments which the promoters now brought forward was the introduction of a purchase clause. The standard price had been reduced to 4s., which was rather under than over the selling price. The comment of the Local Government Board was that the Committee ought to be informed of the dividends paid, and should satisfy themselves that the standard price was reasonable. With regard to this, from the formation of the Company in 1886 up to as late as 1900, the dividends varied from nothing up to 5 per cent. Only in the last six or seven years had the Company been paying the maximum dividend of 10 per cent. on the ordinary shares. During this period, in spite of the low dividends, the Company had been continuously reducing the price, which had fallen from 6s. 3d., when they started, to the present price, averaging about 4s. The Local Government Board also remarked upon the stand-by clause; but this was a clause which had been allowed by the Committee. The Board of Trade suggested an alteration of the sliding-scale dividend on the profits of the undertaking only, and not on the dividends paid on the whole capital. This went to the bottom of the whole proposal.

of the Bill. It was of vital importance that the capital should be a common capital, and that the sliding-scale should operate in this way. The point had been discussed before in Bills of this character when gas and electricity were combined, and a clause similar to that now proposed had been allowed in several cases. In this case, the population was smaller than that of any of the precedents; and an attempt at an independent electrical undertaking had already failed.

The Committee accepted the Bill as presented by the promoters, and ordered it to be reported to the House.

CHAPEL WHALEY GAS BILL.

The Unopposed Bills Committee of the House of Commons, presided over by Mr. WHITLEY, had the above Bill before them last Thursday.

Mr. OLDHAM, the Parliamentary Agent, explained that this was not a money-making company in the ordinary sense; they might be regarded as a consumers' company. Their main object was not to make a large profit, but to serve the interests of the community in the best possible way. As evidence of this, he mentioned that the directorate included five district councillors, and that the Company were asking not for the usual 10 per cent. dividend on the original and new capital, but only for 6 per cent.

Mr. MOON (Speaker's Counsel) directed attention to clause 28, which provided that when any shares or stock forming part of the additional capital authorized by the Act was to be issued, the Company, before offering them for sale by public auction, might, with the approval of the Board of Trade, offer such stock to the gas consumers and the persons employed by the Company at as near as might be the average market price of the shares of the Company. This provision was against the Standing Orders of the House, which provided that all new capital should be submitted to public auction.

Mr. OLDHAM argued that the clause was very desirable, particularly in relation to a company so governed as that of the promoters. He quoted the "JOURNAL OF GAS LIGHTING" for Jan. 3 last in support of the clause: "A much (in our opinion) neglected provision is included in this Bill. It is one that empowers the Company to offer issues of stock or shares to consumers and employees of the Company before submitting them to public auction or tender. Incontestably, it is a good thing to get the consumers and employees to have a financial interest in the concern."

The CHAIRMAN: We are not able to allow this clause.

The clause was accordingly struck out; and the Bill, as amended, was allowed to proceed.

LEGAL INTELLIGENCE.

SALE TO A CORPORATION OF GAS-WORKS. RIGHTS OF DEBENTURE HOLDERS.

Judicial Committee of the Privy Council.

(Before Lords MACNAGHTEN, ATKINSON, MERSEY, and ROBSON.)

Perth Gas Company, Limited, v. Corporation of the City of Perth.

An important decision for shareholders in gas companies, although only on an interlocutory point raised on a special case stated in an arbitration, was decided in favour of the Gas Company, the appellants, who had appealed from a decision of the Supreme Court of Western Australia in favour of the respondents, the Mayor and Councillors of the City of Perth. By the Perth Gas Company's Act, 1886, the appellant Company was incorporated with the objects of lighting the streets and buildings in the city. By section 50 of the Act, the Corporation could, by giving notice, acquire by purchase, at any time after Dec. 31, 1906, "all the land, buildings, works, hereditaments, lamps, pipes, stock, and appurtenances of, and belonging to, the Company in the name and on behalf of the Corporation." It provided also that, if the terms of the sale should not be agreed upon, the matter should go to arbitration. Before the Arbitrators, the Corporation took the point that the purchase money should be calculated on the basis merely of the value of the buildings, works, stock, and appurtenances *in situ*, regarded as capable of earning a profit, but should not include the value of the Company's statutory powers and privileges, or the amount of the profits that had been, or could be, earned by means of the property or the exercise of the powers and privileges in the Company's business. The Company did not agree to this basis, and the Arbitrators and Umpire stated a special case for the opinion of the Supreme Court, asking whether or not, in calculating the purchase money, regard should be had to (a) the value of the Company's statutory powers and privileges and (b) the amount of profits that had been, and could be, earned by means of the property and the exercise of the powers and privileges in the business of the Company. The Supreme Court answered the question in favour of the Corporation; and the Company appealed.

Sir ROBERT FINLAY, K.C., Mr. T. D. DRAPER, K.C. (of the Australian Bar), and Mr. F. WHINNEY appeared for the appellants; Mr. P. OGDEN LAWRENCE, K.C., and Mr. J. A. NORTHCOTE (the latter of the Australian Bar) were for the respondents. Messrs. Sutton, Ommanney, and Rendall (for Messrs. Parker and Parker, of Perth) were Solicitors for the appellants, and Messrs. Blyth, Dutton, and Co., for the respondent Corporation.

The arguments were concluded on May 17, and judgment was reserved.

Judgment.

Lord ATKINSON, who delivered the decision of the Judicial Committee, said the question resolved itself into this: What was the thing sold? Was it the whole undertaking of the appellant Company, or merely all

the local works, pipes, and other physical things by means of which they carried on their business? The answer depended upon the construction of section 50 of the Act of 1886, which section appeared to him not to have formed part of the Statute, as originally drafted. It seemed to have been inserted as an afterthought, without any attempt having been made to reconcile its provisions to those of the other sections of the Act, or with the general principles of law affecting incorporated joint-stock companies. Hence the difficulty of putting any meaning consistent with common sense and justice on its inapt and ambiguous language. Therefore, in order to solve this difficulty, it was necessary to consider some of the other provisions of the Act. His Lordship then dealt with the other provisions of the Act at considerable length; and, coming back to section 50, he said it was clear that this section provided that if any dispute or disagreement should arise, which might not, however, be a dispute or disagreement touching the price at all, but touching some other term or condition of the contract, the parties, or either of them, might, if they thought fit, require that it be referred to arbitration to determine, not the matter in dispute, but the amount of the purchase money, upon which matter alone was the determination of the arbitrators binding on the parties. It might possibly be that if the amount of the purchase money was the only matter in dispute the Company could not refuse to carry out the sale after the Arbitrators had fixed the price. But if the Company should, for instance, insist that their pending contracts should be carried out by the Corporation, and the latter refused to yield on this point, it seemed clear that the Directors could not be compelled to carry out the sale. There was no way of getting rid of the charge of the debenture holders upon the assets of the Company sold under section 50, save by their concurrence in the sale. There was little doubt that the debenture holders could by law restrain the Directors from completing against their will a transaction which would so vastly diminish the value of the debentures they held. The Directors, like every other encumbered vendor, would be bound, in the absence of agreement to the contrary, to convey to the purchaser the property sold free from encumbrances. All these considerations, in their Lordships' opinion, went to show that what the Statute contemplated was the sale of the whole undertaking, the whole charge, carried out with the consent of the encumbrances whose claims would then attach to the money which represented the entire property. There were no words in section 50 which prohibited such a transaction. Indeed, it was the only just and only workable one. Every other one was beset with difficulties almost, if not altogether, insurmountable. Their Lordships were therefore of opinion that the judgment appealed from was wrong, and should be reversed. Accordingly, they humbly advised His Majesty that the appeal should be allowed with costs.

DEBENTURES IN THE TEWKESBURY GAS COMPANY.

In the action of "Tysoe v. Tewkesbury Gas Company," which came before Mr. Justice Parker on the 13th ult., the plaintiff claimed a declaration that the mortgage debentures issued by the Company constituted a first charge upon all the property of the Company, and for the usual accounts and inquiries.

The Company was incorporated in 1870; and in December, 1892, in pursuance of a resolution of Sept. 19, it borrowed and raised for the purposes of the Company £2000 by the issue of a series of debentures for this amount. Each debenture provided that the Company would, on and after Jan. 1, 1898, pay the registered holder thereof for the time being the sum of £100; that the debentures to be paid off would be determined by ballot; and that six calendar months' notice would be given by the Company of the debentures drawn for payment. Interest was to be payable at the rate of 4 per cent. per annum, payable half-yearly. The conditions on which the debentures were issued were that all were to rank *pari passu*, and were to be a charge on all the plant, machinery, stock, book and other debts, goodwill and assets, and generally on all present and future property, real and personal, of the Company; and that such charge was to be a floating security, but so that the Company was not to be at liberty to create any mortgage or charge in priority to the debentures. It was further provided that nothing in the debenture should create any charge on, or prevent the Company from selling, assigning, or otherwise disposing of any business rights or privileges which were then, or thereafter might be, vested in, or held by, the Company. No debentures had been paid off, nor had a ballot been held. On Nov. 18, 1909, plaintiff gave notice to the Company to pay off the principal sum of £100; but this had not been done—the Company contending that, on the true construction of the mortgage debenture, it was at liberty, at its personal discretion, on or at any time after Jan. 1, 1898, to redeem the debentures. As the Company had never exercised its discretion, it was urged that the debentures had not become due.

Mr. GRANT, K.C., and Mr. OWEN THOMPSON appeared for the plaintiff; Mr. ROMER, K.C., and Mr. LUXMORE for the defendants.

His LORDSHIP reserved judgment, which was delivered on June 21. The question to be determined was what was the true construction of the debenture; and in determining this question, he could not properly refer to the prospectus on which the debentures were issued. The Company had sealed a debenture which, on the face of it, was transferable; and they were bound by the terms of the debenture, which provided that the Company would, on and after Jan. 1, 1898, pay the sum of £100. A covenant to pay created a liability to pay on demand; and a covenant to pay on or before a certain date created a liability to pay on the date named, with an option of earlier payment. On the true construction of the covenant, and in the events which had happened, the £100 was due and payable. But it was said that this meaning ought to be rejected because of the clause which provided that the debentures to be paid off would be determined by ballot, with six months' notice given by the Company of the debentures drawn for payment. The Company was not bound to hold a ballot, and it might very well be argued that this clause inferentially conferred on the Company a power to pay off any debentures before the given date provided the debentures were balloted for and notice given. This, however, was not the way

in which the Company asked the Court to construe the clause. Their contention was that they were not bound to pay any debentures unless they elected so to do, in which case they must hold a ballot. In other words, they said a covenant imposing liability to pay exempted them of all liability to pay unless they chose to hold a ballot. This would be a somewhat extraordinary construction; and he (his Lordship) could not see his way to adopt it. There would be judgment for the plaintiff for the principal and interest, with costs, with liberty to apply if the debenture was not paid within two months.

A stay of execution was granted with a view to an appeal.

Bankruptcy of a Gas-Stove Manufacturer.

The first meeting of creditors of Mr. Charles Edwin Ryder Terry, of Leamington, was called for the 26th ult. at the office of the Official Receiver, Coventry. The summary of debtor's statement of affairs showed gross liabilities amounting to £4277; but he believes that his assets exceed his liabilities, though in the Official Receiver's opinion they are of such a nature that it is difficult to estimate what they will realize. According to his statement to the Official Receiver, the debtor was formerly the Manager of a manufacturing firm in Birmingham. In March, 1901, having a capital of about £4000, he commenced business in partnership with a Mr. G. H. Walker; taking over the business of Messrs. Radcliffe and Co., range manufacturers and ironfounders, of Leamington—the purchase price being £4250. To this was subsequently added a business for the manufacture of gas-stoves, which was carried on under the title of the Imperial Stove Company. In 1902, the partnership business was amalgamated with that carried on by Messrs. Sidney Flavel and Co., when a new Company—viz., the Flavel Range and Imperial Gas-Stoves, Limited—was formed for taking over the businesses included in the amalgamation. For his share of the transaction, the debtor received 6000 £1 ordinary shares in the new Company; and, in addition, 1200 £1 preference shares were allotted to his wife, as consideration for moneys advanced by her to her husband, and used in the partnership business. Scrip for 3000 of the shares allotted to the debtor was handed to Mr. Sidney Flavel as security in respect of a guarantee given by the debtor to him in regard to the profits of the new Company. The debtor was retained as Managing-Director of the new Company at a salary of £300 per annum, which amount was for three years used in payment of his share of the liabilities of Messrs. Radcliffe and Co. In April, 1910, debtor left the service of the Company, and subsequently issued a writ against them on the 24th of October last for damages for wrongful dismissal; but the action has not been tried. A few days later, Mr. Sidney Flavel issued a writ against the debtor for the recovery of money alleged to be due to him in respect of his guarantee. The debtor defended the action, which was heard in April last, when judgment was given ordering that an account should be taken to show what money, if any, is due. Mr. Flavel considers that there is a sum of £12,307 owing to him; but the debtor does not admit the liability. The meeting was adjourned, owing to the absence of a quorum.

Claim for Compensation by a Beekton Workman.

Some weeks ago, his Honour Judge Tindal Atkinson heard a case in which a workman named Lock claimed compensation from the Gas-light and Coke Company for injuries sustained at their Beekton station. It appeared, from the statement made by the applicant, that, noticing that one of the chargers was approaching him, to receive a supply of coal from bunkers under his control which he knew to be insufficiently filled, he lowered himself into the basement for the purpose of communicating with the driver of the engine working the coal-hoist. As he was returning, the charging-machine caught him by the back of the neck, and held him suspended over the basement, which was 8 feet below. When the driver backed the machine, the applicant fell into the basement. The Company denied liability—first, because it was no part of the applicant's duty to communicate with the engine driver, and consequently the accident did not arise "in the course of his employment;" and, secondly, if it did so arise, applicant was guilty of "serious and wilful misconduct" in going to a part of the premises in which he had no business. His Honour, in a long considered judgment delivered a short time since, came to the conclusion that the act of communicating with the engine driver was not outside applicant's employment. The question then presented itself: Did the accident arise out of the employment? The conclusion he had come to was that it did not. He had next to consider whether there had been "serious and wilful misconduct" on the part of the applicant. In his opinion, there had. But this was not to be a bar to the recovery of compensation, if it resulted in death or serious permanent disablement. The applicant had sustained such disablement; and therefore the respondents were precluded from relying on his misconduct as a defence to the claim. As, however, he had decided in their favour on the other point, the award would be for them. His Honour said that, in the event of there being an appeal, he would state his conclusions in writing, so that his findings might be put clearly before the Court.

Rhyl District Council Gas Supply.

The working statement presented by Mr. Leonard G. Hall, the Engineer and Manager of the gas undertaking of the Rhyl Urban District Council, for the year ended the 31st of March last, shows that the quantity of gas made was 60,292,000 cubic feet, of which 54,815,000 cubic feet were sold for private and public lighting; being 90.92 per cent. of the total production. The quantity of coal carbonized was 5104 tons; and it yielded per ton 11,811 cubic feet of gas, of which 10,739 cubic feet were sold. The residuals produced were: Coke, 3254 tons, of which 2359 tons were sold; tar, 56,100 gallons (11 gallons per ton of coal); ammoniacal liquor, 167,700 gallons (32.8 gallons per ton of coal). The manufacture of gas cost £5002; and the gross cost was £6754. Deducting the returns for residuals, the net cost was £4868. The revenue being £10,257, the profit was £5389; being at the rate of 1s. 11.59d. per 1000 cubic feet of gas sold.

MISCELLANEOUS NEWS.

SWINTON AND MEXBOROUGH ARBITRATION.

The Price to be Paid for the Gas-Works.

A report appeared in the "JOURNAL" last week (p. 1016) of the first day's proceedings in an arbitration—held at the Surveyors' Institution, Great George Street, Westminster—to determine the price to be paid by the Swinton and Mexborough Gas Board for the undertaking of the Swinton and Mexborough Gaslight Company. The arbitration arose out of an Act of 1909, under which a Gas Board for the two urban districts named was established, and obtained power to acquire the undertaking of the Gas Company. The hearing occupied five days—June 20, 21, 26, 29, and 30.

The Arbitrators were Mr. CORBET WOODALL, for the Company, and Mr. HARRY E. JONES, for the Gas Board. Mr. A. J. RAM, K.C., acted as Umpire.

The Hon. J. D. FITZGERALD, K.C., and Mr. F. N. KEEN (instructed by Messrs. Baker and Co.) appeared for the Company; while Mr. HONORATUS LLOYD, K.C., and Mr. VESEY KNOX, K.C. (instructed by Messrs. Lees and Co.), represented the Board.

Second Day's Proceedings.

Mr. E. H. STEVENSON, re-called, and further examined by Mr. FITZGERALD, handed in a statement as to revenue from sales of tar and liquor, showing the adjusted stocks of tar for 1909 and 1910 on the basis of 11 gallons per ton of coal carbonized.

The UMPIRE said he understood from the Arbitrators that they were prepared to agree, subject to what Counsel might say, to the figure of 11 gallons of tar. They took it as a fact that probably there had been a miscalculation in the stocks. It was also agreed to take the liquor for the period in question at 14 gallons of 14-oz. strength, or 19.6 gallons of 10-oz. strength.

Witness remarked that the alteration which would be required in his figures for the error in tar and liquor was so slight that it was not worth speaking of, because he had taken 20 gallons of 10-oz. liquor, and the figure for tar was accepted.

Examination continued: In respect of the increase in prepayment consumption which he anticipated, he added £218 for the purpose of arriving at the profit for 1911; and this, put on to his adjusted profit of £3337 for 1910, made his estimated profit for 1911 £3555.

Mr. CORBET WOODALL: Why did you go into 1911 at all? Do you claim for prospective profit?

Witness: Because the value of the undertaking has to be on the day of transfer; and I do not think it is possible that the day of transfer can be earlier than Dec. 31. So that the Company will have the working of 1911; and the valuation ought to be on the value of it at the end of 1911.

Mr. FITZGERALD: Then, taking this figure as the estimated adjusted profit for 1911, the first deduction is the interest on an existing mortgage of £6000.

Witness said that was so. At 4½ per cent., this was £270. Capital liabilities (in which he included the cost of the Act of 1908, which the purchasers had to pay) he put at £12,000; and 4½ per cent. interest on this was £540. This made the interest on the mortgage and overdraft £810, and would leave the estimated available net profit at the expected day of transfer £2745. In the next paragraph of his valuation, he showed how he appropriated this. In the first place, he took a reduction of 4d. per 1000 cubic feet in the price of gas, which would represent £581. This would enable them to pay dividends of 11 per cent. on the £9500 "A" stock, and of £7 14s. per cent. on the £10,000 "B" stock. These dividends would absorb £1815; so that there would still be a surplus of £349. As a matter of fact, the Company had not reduced the price of gas yet; they simply went on in the old way. They could, however, have done so very easily. The £1815 of dividends he had capitalized at 28½ years' purchase, making £51,727; and to this he added 10 per cent. for compulsory purchase (£5173), bringing the total value of the undertaking out at £56,900. He had taken 28½ years' purchase because the undertaking was just at the beginning of its history as a standard price Company. It was increasing in size fairly rapidly. The profits were also increasing; and he had no doubt whatever that the following year they could reduce the price of gas again at least 2d. per 1000 cubic feet, if not more, and increase the dividends. In fact, the balance shown by him allowed for a further reduction of 2d., which he had not taken into the dividend calculation; and the natural growth of the undertaking would allow of additional reductions in price before very long. Then it was admitted that, taking a concern as a whole, one always gave a higher price than for individual shares. He admitted that he had given a higher number of years' purchase than he would have done if there had not been a prospect of a reduction in the price of gas and an increase in the dividends. He would then have asked for 26½ years' purchase.

Mr. HONORATUS LLOYD (in cross-examination): As I understand, the amount of your valuation is £56,900. Then, in addition to this, of course, we have to pay the £6000 mortgage, and the figure, which you say is £12,000, for capital liabilities. That makes it £74,900; and it means we should then have an undertaking dealing with 34,892,000 cubic feet of gas?

Witness: No. You have left out public lighting—2,500,000 feet.

Then it is somewhere about 37,000,000 cubic feet. That is rather a convenient figure, because 37,000,000, divided into £74,900, gives me just over £2000 per million cubic feet. That is the capital at which I should start my business. It is pretty hot, is it not?—No; not for purchase. There have been a number of purchases as high as that, and some more. I should think you could borrow money at 3½ per cent., which gives you £70 per million cubic feet.

Do you know that in 1908 the 5½ per cent. shares were quoted on the Sheffield Stock Exchange at 6½-6¾?—No; and if I had known it, it would have made no difference in my view of the matter.

Then on June 19, 1911 (that is, this month) the 10 per cent. shares were quoted at 7-7½; and the "B," at 5½-6¼. Your price (making all due allowance for the fact that it is a whole concern, as against portions) works out at about £17 per share?—That is with the 10 per cent. put on.

And without the stock, &c.?—Yes.

In addition to all your figures, we should have to find something for working capital?—Yes; a small amount. I should think about £1500, or perhaps £2000.

You take the adjusted profit for 1910 as being £3337. Is there included in that the adjusted profit made upon the prepayment meter business, which has been largely found by my capital?—Yes.

Is the next figure, £218, entirely one of increase in prepayment consumers?—Yes. But the profit is not because of prepayment consumers; it is because of the improved working of the Company.

You show how £1815 might be distributed, upon a reduced price of gas, by giving 11 per cent. on the £9500, and £7 14s. on the £10,000. In other words, Parliament having prevented your raising any further capital, and saying that I should repay you capital expenditure, you now take credit for the profits that are earned by the different working, and you apply the benefit of those profits to the old capital; and so you get at the result?—Yes; and we should have been perfectly right if we had reduced the price of gas this year, and divided those profits. Parliament did not put any stop upon the Company improving its position. There is absolutely no sterilization in this Act.

Can you tell me whether part of the leakage has been reduced by taking the weights off the gasholder?—I do not think so. But there is the works pressure of from 34-10ths to 36-10ths; and that shows there is ample pressure in the district.

Re-examined by Mr. FITZGERALD, witness said that £2000 per million cubic feet of gas sold had been not an unusual price at all to pay for undertakings in the past. In the case of the Prestatyn gas undertaking, the price, if he remembered rightly, was over £3000 per million feet sold; and this was very largely due to the prospective value which was claimed.

Mr. Henry Woodall, in answer to Mr. KEEN, said that he had twice visited the works of the Gas Company (for whom he acted in connection with the application to Parliament in 1908), and had prepared a structural valuation of the works. The figures of the capital expenditure shown in the Accountants' tables was £34,423; and his structural valuation showed that this capital was amply represented in the works themselves—the total of his valuation being £35,645. In his opinion, the works were in very fair order; and the buildings were suitable and substantial. His structural valuation agreed very closely with that of Mr. Stevenson; but there were one or two slight differences. He had prepared a table showing the capacity of the works and the surplus or deficiency in relation to the average day of the maximum week's make in 1910. The make on the average day of the maximum week was 203,000 cubic feet. There was plenty of room for extensions on the present site, which was well situated. The capacity of the coal-store was 700 tons; whereas six average weeks' consumption was only 473 tons. The tar and liquor tank was much larger than was necessary for the purpose. The retort-house and retorts were much in excess of requirements. The condenser was equal to the demand, and the exhaustor was really too big for the work; but the scrubber was deficient, and he had allowed for an addition. The capacity of the purifiers was above the maximum day's make; and he had reckoned in the cost of re-sheeting the old gasholder, to increase the storage capacity. The value of the surplus plant he reckoned at £4819; and the deficiencies he put at £605—making a net surplus of £4214. In 1910, the total expenditure on repairs and maintenance of works, mains, and meters was 7½d. per 1000 cubic feet of gas sold; and in his opinion this was more than was necessary to keep the plant in its present condition. In connection with this matter, it was somewhat important to note that, in the case of the prepayment meter business, meters only were provided by the Company, and not gas-fittings. In view of the way in which the district was honeycombed with coal-workings, he would expect the leakage to be high; but he thought it might be very much lower than it was. The increased profits would more than counterbalance any additional expenditure necessary to reduce the leakage. As to repair and maintenance of works, the amount in 1910 was 4 73d. per 1000 cubic feet of gas sold; but to his mind 3d. should be ample, as there was no machinery. A reduction of 1 73d. per 1000 feet was equal to £253 a year. He had prepared a valuation of the undertaking based on the assumed profits of 1911. He took first the profits shown in the accounts for the year 1910, £2722; and to this he added the following items: Excess expenditure on repairs, £253; error in quantity of tar and liquor, £277; additional allowance to directors, £40; gratuity to old servant, £19; and one week's additional wages paid in 1910, £29. This made a total of £3340. Then he allowed a 10 per cent. increase in consumption, which came to £334, making £3674. Then he deducted £270 interest on the mortgage, and £594 for interest at 4½ per cent. on a bank overdraft of £13,200, leaving a net estimated profit at the end of 1911 of £2810. In the matter of the overdraft, instead of making the round addition which Mr. Herbert Stevenson did to bring the figure up to £12,000, he had added to the actual £11,554 sums of £305 for re-sheeting the old gasholder, £300 for a new scrubber, and £1050 for new meters and services. The profit of £2810 he appropriated as follows: Reduction in price of 4d. per 1000 cubic feet, £644; and maximum dividends of £11 and £7 14s. per cent., £1815. This left a surplus of £351. The £1815 was a well maintainable figure, as there was a surplus shown after paying it. There was also an excess value in land and plant, while the output was growing steadily, and there was a large number of people desirous of having gas. Having regard to these facts, he thought 28½ years' purchase was the right figure to take. To this he added 10 per cent. for compulsory purchase—making the total £56,900. In addition to this sum, the Board would have to discharge all liabilities, including the bank overdraft, and to purchase stock-in-trade, &c., in accordance with the Act.

Mr. HONORATUS LLOYD (in cross-examination): What in your view would be a fair figure to take, one year with another for the future, in order to cover all works of repair?

Witness: In order to earn this revenue, I think the amount I have

allowed [5 52d. per 1000 cubic feet of gas sold] is quite sufficient. I should personally spend more; but I should get a larger revenue.

My point is this—apart from the result, whether you produced more income or whether you could divide it, what is the proper sum that you say ought to be set aside to be spent on repairs?—Answering your question, I should say that 7½d. would keep works, mains, meters, and stoves in good condition; but I also say that it would enable us to earn a larger revenue, and to reduce the price. Then, with our lower price, we could divide more.

Cross-examination continued: Great improvements had been made since he saw the works early in 1908. The old retort-bench was then in a very bad state. The new retort-bench was put in subsequently. In making out his structural valuation, he had adopted what it would take to construct the works. He had not depreciated in any way. As he had said before in his evidence in Parliament, he really thought the exhaustor ought to be duplicated, at a cost of £150. The 28½ years' purchase he regarded as a reasonable figure.

Re-examined by Mr. FITZGERALD, witness said he gave evidence in the Prestatyn gas case. His evidence then was that the maintainable income was £521; and the award was in round figures £14,200. This would be equal to close upon 28 years' purchase, or 27½ years' purchase of the maintainable income. But in that case, as in the present one, there was a prospective profit.

Mr. FITZGERALD: Are you quite clear that by an expenditure of 7½d. per 1000 cubic feet on the works and repairs they would be kept in good order and in a position to earn an additional dividend?

Witness: Yes; I think with this expenditure the leakage would be reduced very considerably.

Mr. HARRY JONES: 7½d. would be about the normal repairs for a works of this sort, would it not?

Witness: Yes; I think it would be full. You see, there is no machinery of any sort in the works, except just the exhaustor driven by a gas-engine.

Mr. FITZGERALD: Now, if 7½d. would be about right for a normal undertaking, what do you say about an undertaking which is on a site that is constantly moving—subsiding? You would not consider it was sufficient in a case where the subsoil is always moving?

Witness: I think when you visit the works you will see that there is not very much damage except with regard to the gasholder, which is out of level; but it is working perfectly well, and has worked perfectly well for thirty years, and I see no earthly reason why it should not go on working satisfactorily.

Mr. CORBET WOODALL: I should like, in view of possible contingencies hereafter, to know whether you regard the 7½d. as due to the fact that there is subsidence in the district, or whether you consider it a reasonable sum for works in good order with no special charges?

Witness: I think it would be too high for a works with no special charges and in good order.

Mr. CORBET WOODALL: I think you will probably find that if you eliminate depreciation you never spend more than 6d. upon repairs and upkeep.

Mr. J. H. Brearley, examined by Mr. FITZGERALD, said he was well acquainted with the Company's works and the area of supply. The site was an excellent one; and there was considerable surplus area for future development. The coal-store was ample; and the retort-house was a spacious, well-constructed building. From every aspect, the carbonizing plant represented a considerable surplus over the present requirements. The condensers were in excess of present needs, and so was the exhaustor, though it would probably be better if there were two smaller ones. The scrubber, with careful working, was equal to existing requirements; but improved results would undoubtedly be obtained if an addition were made, at a cost of from £250 to £300. Personally, he would supplement the purifiers, not because they were not big enough, but to produce more economical working. He would suggest spending £300 in this way. The whole of the large gasholder was more than 40 yards from the railway fence. In April, he took measurements and found the maximum difference in the levels of the tank was 9 15/16 inches; while on visiting the works again in June he discovered that the maximum difference in levels was 9 3/4 inches—showing a reduction of 5/16 inch in practically two months. The governors were ample; and the stores and workshops were well equipped, and quite equal to the Company's business. In his opinion, the leakage could be still further reduced. He had inspected the mains at different points, and found them good. In no case were the joints leaking. There was a reddish brown oxide on the outside; but this was really one of the best preservatives of gas-mains. In 1901, there were 4116 houses in the district of supply; and now there were 5941. On last year's accounts, the consumption of gas per consumer worked out at 12,162 cubic feet. In 1901, it was 33,700 cubic feet. This showed that a certain number of large consumers had gone, and their place had been taken by smaller ones, which undoubtedly improved the stability of the undertaking. He produced a valuation of the works and distributing apparatus, arriving at a total of £36,038, to which had to be added the cost of the 1872 Provisional Order, amounting to £347. He quite agreed with Mr. Stevenson that 3d. per 1000 cubic feet was a fair figure for repairs of works. He had corrected the accounts accordingly—adding £250 to the available balance. Coming to his final valuation, he made the adjusted profit for the year 1910 £3299 (taking the incorrect apportionment of sales of tar and ammoniacal liquor at £243 10s., and six-sevenths of one week's wages on account of 53 weeks being included in 1910 £25). Then he added for increase in private consumption, based on the average rate of increase during the last three years (6.88 per cent.), £227, giving an estimated adjusted profit for 1911 of £3526. From this he deducted, for interest on the mortgage and £1200 capital liabilities, £810; leaving an estimated available net profit at the expected date of transfer of £2716. This he appropriated in a reduction of 4d. in the price of gas, £583, and in the payment of the authorized dividends of £11 and £7 14s. per cent., with gas at 3s. 2d. per 1000 cubic feet, £1815—leaving a surplus of £320. The £1815 he multiplied by 28.57 years' purchase, giving £51,854, to which he added 10 per cent., or £5185, for compulsory purchase; making a total of £57,039. In addition to this, the Gas Board would take over the mortgage debt, pay the amount of overspent capital, and pay the taxed costs of the

Company's 1908 Act, reasonable costs of winding-up the Company, compensation to officials, value of stock-in-trade, coal, &c., at the date of transfer. The Company would retain any cash in hand or in the bank, book debts, and any profits to be divided at the date of transfer. If the sales of gas went on during the next three years as they had done during the last three, the sale in 1913 would be 42,831,500 cubic feet; and he had no doubt a greater figure than this would be achieved. This would, he estimated, mean 970 additional prepayment meter supplies, the cost of fitting up which, at £4 5s. each, would be £4122. The increased profit from the larger sale of gas would be £729; and deducting £206, as the annual charge for interest and dividend at 5 per cent., on the cost of fitting up, there would be a surplus profit for reducing the price of gas and increasing the dividend, as per sliding-scale, of £523.

Cross-examined by Mr. VESEY KNON, witness said he felt confident the works, mains, and meters could be maintained at 5½d. per 1000 cubic feet. The charge at Longwood was higher; but this was owing to special circumstances which did not exist at Swinton.

Third Day.

Mr. C. H. Holland, examined by Mr. FITZGERALD, said he was Assistant-Secretary and Assistant-Manager to the Gas Company, who, in 1906, engaged a man for the purpose of detecting and remedying the leakages in the mains, except when he was meter-taking, which might occupy a month out of the year. The leakage was due principally to drawn joints and fractured mains. The former had been re-caulked; and in some parts of the district smaller cast-iron mains had been removed and steel mains substituted for them. In this way the leakage had been, and was still being, diminished. About two years ago, weights were placed on the gasholder to increase the pressure in the Kilnhurst district; and there was no foundation for saying that they had since been taken off. The total weight put on was approaching 2 tons, and would produce perhaps 2-10ths extra pressure. There had never been any difficulty in working the gasholder by reason of the list; and therefore he attached very little importance to it. It became necessary to put on new guide-wheels, at a cost of 7s. 6d. each, to replace two that were broken; and while this was being done, a carriage (worth £4 7s. 6d.) fell into the tank, and had not been recovered. No damage was caused through it remaining there, because the tank was a good deal larger than the holder, having been made with a view of telescoping the holder if necessary. As to the small holder, there was no ground for saying that the tank leaked. At the general meeting of the Company on April 22, 1909, it was resolved "that the Directors' remuneration be increased to £100 per annum." Previously, it was £80; and it was stated that the increase was in consideration of the Directors having had a good many extra meetings in connection with the Act of 1908 and the Gas Board's application to Parliament.

Mr. HONORATUS LLOYD: The resolution is what I thought.

Mr. HARRY JONES: That would be permanently.

Mr. FITZGERALD: The Company were expecting to come to an end that year, or the beginning of the next year.

Cross-examined by Mr. HONORATUS LLOYD, witness said he had been Assistant-Secretary for nine years; but he had never been formally appointed Assistant-Manager. He assisted his father (an old man), who was both Manager and Secretary. The man they engaged to look after the leakage was a main and service layer. Some of the mains were turned and bored; and many of the joints were cemented. The man they originally engaged to see to the mains was not with them now; but others had taken his place. The Water Company had recently complained that the water in their mains was contaminated by gas. There had been complaints in one or two districts of want of pressure. The small holder required resheeting; but he was satisfied that the tank was all right. The large holder was constructed with the idea that it might later on be telescoped; but it had not been suggested that this should be done. Several of the guides of the holder had required to be adjusted. This was before the new carriage was fitted on. Witness then proceeded to explain the method adopted for taking the stock of tar and liquor in the storage tank.

Re-examined by Mr. FITZGERALD: The Company had been advised by a mining engineer, Mr. John Longbotham, in 1903, not to spend £2000 in purchasing the coal under the large gasholder; and in the eight years that had since elapsed, the whole expenditure they had been put to in connection with the subsidence of the holder could be covered by a five-pound note. This showed the wisdom of Mr. Longbotham's advice.

It was intimated that this concluded the Company's case; and evidence on behalf of the Council was at once called.

THE CASE FOR THE COUNCIL.

Mr. William Cash, examined by Mr. HONORATUS LLOYD, said he had examined the books and accounts of the Company, and eventually agreed with Mr. Keen the set of tables which had already been put in. Under section 26 of the 1909 Act, the Company were to maintain until the transfer "the proper conduct of the undertaking, and any expenditure incurred by the Company on capital account prior to the transfer with such consent"—that was, the consent of the Board—"as aforesaid shall, upon the transfer, be repaid to the Company by the Board." The evidence he was about to give would proceed on the assumption that, subject to this consent, the Board were to repay the over-spent capital account. No capital had been raised since 1886; and the capital account was, at the end of 1910, over-spent to the extent of £8923, and had been consistently over-spent all through the history of the Company. There had been nothing in the shape of depreciation written off in respect of meters or stoves. The allocation between capital and revenue was rather a rough-and-ready one. They had followed the Company's allocation as far as possible. The Board were to repay to the Company the over-spent capital; and assuming that there should have been a greater deduction for depreciation of meters and stoves in the past, then the figure of £8923 would be correspondingly amended. He regarded this as a most important point. It was not only a question of whether in the final year which they were considering as the basis for arriving at the compensation to be paid to the Company, there was a charge for repairs and maintenance of stoves

and meters; but if there ought to have been, and was not, such a charge in the earlier period, then the figure would have been correspondingly altered, and so, as a natural consequence, the balance of undivided profit as disclosed by the balance-sheet would be reduced. The same remarks applied to the note appended to the tables, that there had been no adjustment made in respect of any disused or abandoned plant. In 1909, the total capital expenditure was £33,322, which was equal to £642 per million cubic feet of gas made, and £988 per million sold. So far as his experience went, he could not think of a single company that did not write off depreciation for stoves. As to the liability of the Board to repay the over-spent capital, it was, of course, essential that care should be exercised to see that they did not pay for the same thing twice over; and in his opinion this was the most difficult part of the whole case. If the Board were to repay to the Company the whole of the over-spent capital, then he did not see that the Company were entitled to claim, in effect, a premium upon it—as they did by using the surplus earning power of this capital expenditure to increase their dividends.

Mr. HONORATUS LLOYD: Mr. Brearley, after giving his forecast for 1911, went on to 1913 for comparison for certain reasons; and he makes the principle with admirable clearness. He claims to compare the year 1913 with the year 1910 on the basis of 6.88 per cent. increase of sales and profit. Then he gets at his estimated increase of sale, and gives a figure which is to furnish him with an increased profit of £729. Then upon this he allocates the annual charge for interest and dividends at 5 per cent., on the money to be expended, £206, and shows a surplus profit for reducing the price of gas and increasing the dividend as per the sliding-scale of £523. Now, is he there, in effect, taking advantage of the capital that we have to find, and allocating everything over the 5 per cent. interest as profit upon the existing capital?

Witness: Certainly. If the principle is to be admitted, I do not see why you should not go on *ad infinitum*.

Though the Act provides that we shall repay the capital over-spent if our consent has been given to the expenditure, we do not want to rely upon the technical point that our consent has never been asked, and we are not relying upon it. But we do not want to have to repay the capital, and also the capitalized profit upon it?—I do not think that is what was ever intended under the Act. To my mind, the intention was that the Company should have the value of their undertaking, plus the capital expenditure which the Company had to make until they were taken over.

Is that the reason why, from the point of view of the clearness of accounts, you thought the year 1909 was the better one to take?—Yes. In the first place, it is the year within which the notice to treat is served. Of course, the accounts for 1910 were evidence of the possibilities of the undertaking, still those additional profits have been earned with a capital now to be repaid by the Board, and not by the Company's capital.

Examination continued: It was exceedingly hard, when once they got into 1910, to eliminate this difficulty. He had, however, prepared a statement showing what the capital expenditure from October, 1909, to Dec. 31, 1910, consisted of. The amount was £1694. Some of it was for meters; and if they had not been provided by this capital, the sale of gas would have been less. He handed in a balance-sheet to show what the position would be at the end of 1910. The effect was that the Company, after discharging the accounts indicated and paying the dividends, would be left with a balance of £2754 which they could not divide. This amount, therefore, he deducted from the £8923, leaving a net sum of £6169 as the over-spent capital that the Board would have to pay. In addition, of course, there would be refunded any amount spent since December, 1910, as well as the costs of the 1908 Act. If the Board were given this £2754, they would get in effect a working capital. He had prepared a statement of profit at Dec. 31, 1909, made out on the lines of his evidence. The figure arrived at, which included profit on fittings, was £1633. He had taken out the details that made up the total for repairs and maintenance of mains the last two years; and, so far as he was able to judge from these, it did not look as if there were any big system of overhauling.

In cross-examination by Mr. FITZGERALD, witness agreed that the sum of his evidence was that there was no entry or allowance in the accounts for depreciation of stoves and meters. It was a fact that in the form of accounts given in the Gas-Works Clauses Act no allowance at all was made for depreciation, except as to works on leasehold land.

Mr. FITZGERALD: You must be aware, as an experienced auditor and gas director, of the fact that the Income-Tax Commissioners on the Board of Inland Revenue have issued a regulation in regard to gas and water undertakings, that no depreciation shall be allowed in any circumstances in respect of any portion of the undertakings?

Witness: And we have fought the question over and over again; and over and over again the Special Commissioners have allowed it in spite of the circular.

And further than that, they have also issued this in their regulations: That all expenditure on repairs and renewals with corresponding extensions and improvements is to be charged and allowed as working expenses as and when incurred. Accordingly, if you charge all expenditure on repairs and renewals as working expenses as and when incurred, you carry out the provisions of the Act for the purposes of Inland Revenue?—Yes; for Inland Revenue purposes.

Then you agree that you are carrying out, are you not, the form of accounts given in the Act of 1871?—No; I do not agree. I certainly will not say for one moment that the form of accounts as prescribed by Statute prevents your charging depreciation.

You must know that it is quite common for gas companies to follow the form of accounts which the Act has prescribed?—I say I do not know a single gas company that does not write off depreciation of stoves. The Act tells you to arrive at what are the profits for the year, and to state your accounts in a certain form. I say that until you have made a proper reserve for depreciation at least of stoves, you have not arrived at the true profits of the Company.

You said in your evidence that for the year 1909 you charged £183 for depreciation of meters. I want to know on what sum the £183 was charged?—It is calculated at the ordinary 4 per cent. on £1785, and 6 per cent. on £1860. One figure I have raised by starting at the Company's capital account, and from 1904 charging-back as capital

all new meters bought. The other, by charging-back to the starting figure of 1904 on new meters bought since, and writing-off depreciation on the diminishing value.

Then, for the purpose of reducing our profits in a particular year, you have taken the capital expenditure since 1873 on meters, and calculated the depreciation on the whole of the capital expenditure extending over very nearly forty years. Do you not see that if you manipulate accounts in this way, you can prove anything?—I do not agree. I do not think there is any question of manipulation.

Cross-examination continued: He was writing off depreciation on diminishing value. There was nothing in the Act which put any obligation on the Company to provide working capital for the Board; but it entered into the calculations as to the value of the undertaking they were going to sell. Section 56 of the Act said the Board had to provide their own working capital; and they were authorized to borrow for this purpose such sums as the Local Government Board might sanction. As to the Company's accounts, if, instead of taking the profit at Dec. 31, 1909, he had taken it at Dec. 31, 1910, he would have produced an entirely different result, and one much more favourable to the Company. The total result of his table was that he had brought the income of the Company for 1909 to a less amount than the sum actually paid in dividends that year, though, in fact, a small balance was carried forward after payment of the dividends. He had proceeded on the basis that the undivided profit in cash would go to the Board.

Mr. VESEY KNOX (in re-examination): What you are really proposing to do when you allow for depreciation of stoves and meters is to put down against the profits of the year that which you know will have to be paid for, if not now, in a year or two, in the form of renewals?

Witness: Certainly.

Therefore it is the opposite thing to a suspense account, which the Company have provided, though there is no express authorization for any suspense account in the Act of 1871?—That is so.

Then my learned friend put to you that the Board of Inland Revenue have tried to prevent an allowance for depreciation by gas companies in this way; and I think you said that this point had been fought before the Special Commissioners for Income-Tax?—It has certainly been fought before the Special Commissioners. It has never been fought in the High Court yet; but I believe it shortly will be tested. I may say I am dealing with this question of income-tax, not only with gas companies, but with all trading undertakings. The Inland Revenue Commissioners will only allow certain deductions for depreciation, which in a great number of cases are nothing like adequate, and nothing like what a prudent man would put on one side, or what an accountant would allow for if he were certifying for the profits of a trading business.

Mr. A. J. Thomson, in answer to Mr. VESEY KNOX, said he was Manager of the Manvers Main Collieries, Limited, who owned most of the coal which was being worked in Swinton, and a large part of that which was being worked in Mexborough. His Company had worked the Barnsley seam under part of the land of the Gas Company. He had been informed that the gasholder had subsided. In this district subsidence might continue for anything up to twenty years after the working of the seam. It was five years since the coal was first worked under the gasholder; and it took two years to do. Up to the present, his Company had not worked the coal under the canal; but if they did so, he certainly thought it would have a further effect upon the surface. So far, they had not acquired the right to work this coal; and nobody else had any right to do so. Under the Barnsley seam was the Parkgate seam, which was let to his Company. No doubt this seam also existed under the gasholder; and when it was worked, the holder would be in a very risky position, if not protected. He agreed with Mr. Longbotham that the expense of buying the portion of the Parkgate seam under the gasholder would be prohibitive. There was a spot about 100 yards from the present holder where it would be perfectly safe to put up a new one.

Mr. FITZGERALD called for the production of the lease under which the Manvers Main Company were working.

Mr. VESEY KNOX said he had never seen it, and so could not produce it. The matter was not within his control, or in the control of the witness either.

Mr. FITZGERALD: At present there is no evidence whatever that the Parkgate seam under the gasholder belongs to the Manvers Main Colliery Company or anyone except Lord Fitzwilliam.

Witness: It may not be let exactly under the gasholder.

Cross-examined by Mr. FITZGERALD, witness said he thought that if the gasholder went down, his Company would be protected by the terms of their lease. He did not admit that it was because he wished to get rid of their liability in the matter that he suggested the holder being put upon another site. The Gas Board had requested him to look into the question of another site. He did not believe his Directors had considered the question of their liability if they let down the gasholder.

Fourth Day.

Mr. Charles Hunt, examined by Mr. VESEY KNOX, said he had inspected the Company's works and area of supply. The only fault he had to find with the site of the works was in connection with the mining subsidence. Having regard to this risk, he should say that rather less than one-half of the 2½ acres was suitable for gas-works.

Mr. FITZGERALD, at this point, said he had the most definite information that the Parkgate seam under the gas-works was not leased to the Manvers Colliery Company.

Mr. HARRY JONES: As long as the coal is there, there is a chance of its being worked out by somebody.

Mr. FITZGERALD: Yes. I agree there is a chance of its being worked; and that is the way to look at it.

Examination continued: The retort-house was in fair condition; and there was a coal-shed adjacent to it of a capacity equivalent to five or six weeks' maximum consumption. It was a slight structure, without any brickwork. No value could be attached to the two old settings of retorts; and they should be either written off the capital account or the new ones should be charged entirely to revenue. Three new set-

tings were put in; and then a fourth was added, which was really necessary in order to safely maintain the present production. According to the actual production last winter, with the new retorts there was a margin (after allowing 15 per cent. for repairs) of 16 per cent. He did not regard the condensing plant as being sufficient; and there ought to be an additional exhaustor to ensure regular working, in which case the house would have to be enlarged. The scrubber was evidently too small for the present production of gas. When he visited the works, a purifier had just been emptied; and the oxide reeked with ammonia—showing that no real attempt was made at that time to properly purify the gas from ammonia. This would affect the amount of liquor available for sale. With the scrubber working as he saw it, the yield of liquor would be very low. The purifiers he considered should be renewed entirely. The smaller gasholder was completely worn out, and could not have been in use for a considerable time. The crown plates were riddled with large holes. The tank did not appear to be water-tight. As to the larger holder, its present condition precluded the possibility of another lift being added to it with any degree of safety, and placed in serious jeopardy the continuity of the gas supply. In January, 1910, he found the cast-iron tank of the holder to be out of level to the extent of 7½ inches; and in January of this year he made another measurement, when it was 9½ inches out of level. He understood subsequent measurements seemed to show that the subsidence was continuing. In addition to what had already been stated in evidence, he found two of the channel-guides fractured at the bottom. Supposing the subsidence went on, the only thing to do would be to either take down the holder and re-erect it on another site or provide an entirely new holder on sound ground. It would not be economical to re-sheet the small holder. The money would be better spent on a much larger holder. The storage capacity was now actually deficient. The works certainly on the occasion of his visit in 1910 showed grave neglect as regarded their upkeep, especially with respect to what he called the derelict gasholder and the purifiers. Then the leakage of gas was extremely high, even for a mining district. He had made an examination of the mains at different points; and he gathered from this that the heavy leakage was to be accounted for partly at any rate by the mains having originally been badly laid. Fifteen openings were made; and in seven of them the joints were leaking. In two other cases, though they detected no leakage, the ground was found to be impregnated with gas. Many of the pipes had turned and bored joints; and none of them were made with a recess, which was frequently resorted to, so that in the event of trouble with the joints they could be run with lead. The pipes being laid as they were, it would be necessary either to relay them or to use split collars at each joint to stop the leakage. In one instance, at least, he saw the pipe had not been driven home in a straight line; and this led him to fear that the pipes were not properly laid at the outset. He estimated that at least £6000 would be required to put the distributing mains and services in good condition. There would, he took it, then be a reduction of one-half in the leakage, and perhaps a small additional consumption. So he deducted from capital value only one-half of this amount, or £3000. About one-half of the sum he had named would be represented by replacing the small pipes with 3-inch mains. The following schedule was submitted by witness giving particulars of the deductions he claimed from capital value for dilapidations and deficiencies: New purifiers, £900; new gasholder, 241,000 cubic feet capacity, to replace existing one, including foundation, £3650; land for same and connections, £1000; one-half cost of overhauling mains and replacing small ones with 3-inch, £3000—total, £8550. He had not included in this a certain number of small matters. His table of amended profit for the year 1909 was as follows: Gross profit as shown in the accounts, £2353 14s. 5d.; add gratuity to old servant, £18 11s.; total, £2372 5s. 5d. Deduct excess credit for tar, £49; underspent on repairs and renewals, £58 10s.—total, £107 10s. Gross profit amended, £2264 15s. 5d. Deduct interest on mortgage, £270; interest on bank overdraft and cost of 1908 Act, £455 17s.; interest on overdue account, £37 5s.—total, £763 2s. This left a net profit of £1501 13s. 5d. Having gone carefully into the question, he considered that 7d. per 1000 cubic feet in this case would be a fair allowance for repairs, maintenance, and renewals of works, mains, services, meters, and stoves. He had also considered the 1910 accounts, and admitted that there was a good deal of improvement. A statement of amended profit for the year 1910 was as follows: Gross profit as shown in the accounts, £2722 4s. 2d.; and gratuity to old servant, £18 11s.; excess expenditure on repairs and renewals, £36 12s.; for wages, £29 4s.; tar and liquor, as per Mr. Stevenson's statement, £277 4s. Gross profit as amended, £3083 15s. 2d. Deduct interest on mortgage, £270; interest on bank overdraft and cost of 1908 Act, £504; interest on overdue account, £37 5s.; total, £811 5s. This left a net profit of £2272 10s. 2d. Next he had gone into the question of what the returns for residuals were during a period of six years to 1910. The increased return per ton of coal carbonized in 1910 over 1909 was: Coke, 1s. 0½d.; tar and liquor, 1s. 2½d. This was a total increase per ton of coal of 2s. 2½d., which, on 4103 tons, represented £460. He did not think the figure of profit shown in 1910 was maintainable, on account of this exceptionally high return from residuals. If he were to deduct the £460 increase from the £2272 net profit for 1910, there would be about £1800 left; and this would leave, taking the two years 1909 and 1910 together, an average profit of £1650 in round figures, subject to the liability to make up the worn-out plant and deficiencies. On this basis, he had prepared a valuation, in which he multiplied the £1650 by 20 years' purchase, making £33,000, and deducted £8550 claims for worn-out and defective plant—leaving £24,450. To this would have to be added the following items: Expenses of reinvestment (loss of interest, stamps, and brokerage), overspent capital, &c., as per Mr. Cash's statement, mortgage to be taken over, the payment for stocks, and the taxed costs of the 1908 Act.

Mr. VESEY KNOX: Why have you adopted 20 as the multiplier in the case of this undertaking?

Witness: I took the particulars from the "JOURNAL OF GAS LIGHTING" showing what the yield upon investment would be of all the companies quoted weekly in that paper for April 4 last, with the exception of the Bournemouth Company, which is a water as well as a gas undertaking.

What did it show as the average number of years' purchase according

to the market valuation?—Of sliding-scale companies, the average is 20·94 years; and of the maximum-dividend companies, 22·23 years.

What is the variation in the case of the sliding-scale companies between the highest and the lowest?—23·21 is the highest (that is Newcastle); and 18·79 is the lowest.

Were the undertakings of very much larger size than this?—Yes, much larger; representing many millions of capital.

Mr. FITZGERALD (in cross-examination): Gas stocks have been appreciating, have they not, in the course of the last twenty years?

Witness: Not as compared with twenty years ago.

I notice that in the Stourbridge gas arbitration (that was in the year 1893), you capitalized the dividends at 31 years' purchase?—Yes; I think so. The value of money was much more than it is now.

But the return from gas stocks was higher than it is now?—I do not think so.

I will take a leading case like the Gaslight and Coke Company. The table you have put in shows that the return on this Company is now £4 7s. 7d. In 1893, it was £5 8s. 1d. You are, as we know, Chairman of the South Suburban Company. The table shows the South Suburban's present return is £4 13s. 6d. In 1893, it was £5 4s. 2d. I put it to you, therefore, with some confidence, that in 1893 the return from gas stocks was higher than it is now?—If those figures are typical of the gas stocks, I admit it. The Stourbridge case was rather exceptional.

With regard to retorts, where you are renewing existing work, if you are putting in work of a better and more expensive character, you do charge some portion to capital, do you not?—Not if you do not increase the productive capacity.

As to repairs and renewals, do you observe that by debiting the Company with £3000 for repairs of mains, you are putting another 1d. on; so that you are really charging 8d. here?—No; I do not see that. You have to put the mains in proper condition first, and then the annual expenditure (7d.) will keep them so.

It is obvious, from your putting in the table for 1910, that you agree that the considerable extra profit earned in 1910 is one of the factors to be taken into account in arriving at the value of this undertaking?—Yes; I do.

Mr. VESEY KNOX (in re-examination): It has been put to you that there are certain companies, selected by my learned friend, in which there was, in fact, a larger return on the price in 1893 than on the price of to-day. Was that an altogether exceptional thing?

Witness: So far as I know.

Mr. FITZGERALD: You can take all the companies, and you will find it is the same thing.

Mr. CORBET WOODALL: Taking this list which you have put in, would you expect, assuming it to be possible from other points of view, that you could go into the market and buy the whole undertaking at the rate shown in your table?

Witness: I do not know that you could.

The UMPIRE (referring to the figure for putting the mains in order, &c.): In respect of what do you charge only £3000 as against the Company, instead of the £6000 which is the total expenditure?

Witness: Because something will be saved—I cannot tell what. I thought that would be a rough allocation.

Apart from the question of saving, out of this £6000 you are putting down a number of mains larger than those at present. This will add to the capital value of the Company. There is no allowance for that in the £3000?—There is no allowance, beyond the fact that I have halved the amount.

Mr. Cash was re-called at this point, and stated that he had agreed with Mr. Keen a memorandum as to adjustment of revenue from sales of tar and liquor in 1909 and 1910. As to tar, the result was to make a deduction from the profit of 1909 of £49, and an addition to the profit of 1910 of £104, if the prices at which the Company took stock were accepted. If the stocktaking price were altered to the average price per ton realized the following year in each case, the result would be: In 1909, add to profits £4 17s. 3d.; and in 1910, add to profits £74. With regard to liquor, on the basis of a make of 14 gallons of 14 oz. liquor per ton of coal carbonized, and assuming this quantity to have been sold at the contract price, the result would be: In 1909, add to profits £81 8s.; and in 1910, add to profits £75 3s.

Mr. Frank H. Jones, examined by Mr. HONORATUS LLOYD, said that until the last two years the amount the Company had spent upon the undertaking had been most inadequate. The condition of the works showed this, as well as the balance-sheet. He had prepared a valuation the figures of which agreed with those given by Mr. Hunt, with whom he went into the matter carefully. Having regard to all the circumstances, it was fair to take £1650 as the maintainable income; and 20 years' purchase was a fair multiplier to take for this Company. It was an undertaking which was selling a smaller amount of gas than ten years ago for a larger capital; and undoubtedly it had been proved to be badly managed and badly maintained. With two exceptions, the works were sufficient for the purposes of fairly earning the income. Probably they would not have to incur any big expenditure except for purifiers and a gasholder. When he saw the works on Jan. 21 of this year, the gasholder tank was about 10½ inches out of level. The holder itself was absolutely level. From what had been said, it appeared to be a most dangerous structure. The proper course was to build a new holder on safe ground. It would be very unwise to spend £300 on repairing the small holder. He felt certain the tank leaked considerably. The cost of the work on the mains he had also agreed with Mr. Hunt. The mains themselves were generally in good order; but a great many of the joints were leaking.

Cross-examined by Mr. FITZGERALD: His valuation was on the same basis as Mr. Hunt's, with the exception that Mr. Hunt had allowed a blank sum for interest on money and the cost of reinvestment, and he had not. Since 1908 the Company might have been improving their position, but only with a view, he thought, of this tribunal settling a price. He did not pretend for a minute there was not a very large future for the undertaking. If the income increased, the price of gas could be reduced, and a bigger dividend be paid; but the price had not been reduced. He had not made any allowance at all, either in the number of years' purchase or in any other way, for the increased income that would probably be earned. He had dealt

with the price of gas as it was to-day, and as it had been for some time. The undertaking could reduce the price, and should reduce it, 6d. per 1000 cubic feet.

Re-examined by Mr. HONORATUS LLOYD: Whatever improvement there had been quite recently had been out of capital which the Board had to repay.

The UMPIRE: Does your £3000 for putting the mains and services into a proper and safe condition represent the same amount of work as Mr. Hunt spoke about?

Witness: I think it does. I think Mr. Hunt includes increasing certain mains. I should not like to say for certain.

He did. He distinctly said that a considerable proportion of the £6000 was for substituting something larger than 2-inch mains. Is there anything of the sort in your figure of £3000?—No; I think if you increase the mains that is a fair capital charge.

Supposing the amount necessary to put the undertaking in a satisfactory position was spent by the Company to-day, have you considered what number of years' purchase you would then allow?—I should not allow more than 21 or 22 years then at the very outside—not for this scale of company, and with its history.

Mr. HONORATUS LLOYD here announced that since the morning he had received information that the Parkgate seam under the Swinton Gas-Works was leased to Messrs. John Brown and Co. for forty years from March, 1891. No one, he added, had suggested that it had yet been worked.

Mr. John Wilkinson, of Halifax, was next examined by Mr. HONORATUS LLOYD, and said that when he visited the works in January, 1910, they were in a very bad condition. He did not consider that the plant generally was in excess of present requirements. The purifiers were deficient both as to size and condition; and neither the condensers nor the tower scrubber was quite equal to the existing output. As to the bigger gasholder, on Jan. 15, 1910, the tank was 7¾ inches out of level; and on Jan. 21 last, 9¼ inches. Then on March 18 measurements indicated that it was 10 inches out of level. The tank was still moving; and its future was uncertain. Another gasholder should be erected on a fresh sound site. He had tested the pressures on the district; and some of them were insufficient for present-day requirements. The initial pressure at the works had also been taken by him on the same night; and it was 28·10ths. The governor was in operation. To furnish a satisfactory supply would necessitate an absolute overhauling and renewal of the distributing system. The only way in which they could stop the leakage from the joints of the mains was by putting a clip on them; and this would cost more than commencing at the beginning and completely stripping the lot and laying new ones. Therefore the only reasonable way to tackle the job was to do so in sections from the works, and to relay the whole of the system with iron lead-jointed pipes. Witness handed in the following statements, showing the necessary adjustments to determine actual net profits: Gross profits for year ended Dec. 31, 1909, £2353 14s. 5d.; less profits on fittings, £65 9s.—£2288 5s. 5d. Deduct under-spent on repairs, renewals, and maintenance of works, mains, meters, and stoves (being the difference between 7d. and 6·6d. per 1000 cubic feet of gas sold), £56; allowance for law charges, £10; under-charged for inspection of meters and collection, &c., £17; interest on mortgage, £270; interest on £7491 bank overdraft, £336 18s.; and interest at 4½ per cent. on £828, being value of meters, &c., purchased in 1908, but not yet paid for, £37 5s.—total, £727 3s. This left a net profit of £1561 2s. 5d.; add profits on fittings, £65 9s.—making the total £1626 11s. 5d., as against the maximum dividend of £1650. In valuing the undertaking he multiplied the standard dividend of £1650 by 20 years' purchase, giving £33,000; and from this he deducted £8750 for worn-out and deficient plant, leaving £24,250. The blank items he left were: Add for expenses of reinvestment, loss of interest, stamps, and brokerage; and add balance payable to the Company in respect of over-spent capital, &c., as per statement to be submitted by Mr. Cash. The sum of £1650, he said, was the full amount the Company could earn with ordinary prices ruling in an ordinary year. The year 1910 was not a normal one, because of the largely increased price obtainable for coke, tar, and liquor. The price of 4s. 2d. per 1000 cubic feet to prepayment consumers was not one likely to bring a great rush of business in a district like Swinton.

Mr. FITZGERALD (in cross-examination): Do you venture to tell the tribunal that your charge at Halifax for repairs, renewals, and maintenance of works, mains, meters, and stoves comes to anything like 6·6d. per 1000 cubic feet of gas sold? Putting the sinking fund aside, your charge is less than 6·6d., which we are allowing?

Witness: If you exclude the contribution to the sinking fund, it is less, undoubtedly. But I maintain the sinking fund is used.

Where you are dealing with the profits for the year 1909, you bring them out at £1626. But you have not taken into account the adjustments made with regard to the tar and liquor by Mr. Cash and Mr. Keen. This would have increased the figure?—It would have increased it; but I say that adjustment is not proper.

You are proposing to give us £24,250, and that represents exactly 14·8 years' purchase of our maximum dividend?—That is after allowing for the amount claimed for deficiency. You have taken off the amount that we are claiming for deficiencies.

That means that, according to your valuation, we should receive 14·8 years' purchase of our maximum dividends, which we have been receiving for years?—Yes; but you have been receiving them at the expense of the undertaking.

This concluded the evidence; and it was arranged to meet on the following day to hear the speeches of Counsel.

Reductions in Price.—The Bath Gas Company make a reduction of 1d. per 1000 cubic feet in the price of gas; bringing it down to 1s. 10d. as from Midsummer. At Arbroath, the price of gas to ordinary consumers has been reduced from 2s. 8½d. to 2s. 6d. per 1000 cubic feet; and to those using gas for power purposes, the charge will be 2s. 3½d. The Llandudno Urban District Council have lowered their price 3d. per 1000 cubic feet.

INSPECTION OF GAS-LIQUOR AND OTHER WORKS
UNDER THE ALKALI ACT.

District Inspectors' Reports.

In another part of the "JOURNAL," the report for the past year of the Chief Inspector under the Alkali Works Act, 1906 (Mr. W. S. Curphey), is dealt with. We give here some extracts from the reports of the District Inspectors.

The first district is Ireland, which is under the supervision of Mr. E. G. Ballard). He says the works for the manufacture of sulphate of ammonia there are numerous, and, on the whole, are well conducted; the various plants being maintained in a good state of repair, and no complaints having arisen. Much more care was taken at one works mentioned in last year's report as unsatisfactory; and there has been no reason to find fault with the manner in which the works have since been carried on. Taking all the places where sulphate of ammonia is made in Ireland, the number of works absorbing the sulphuretted hydrogen in oxide of iron is 37; the number burning it, 3; the number working on the continuous system of distillation, 34; and the number working on the intermittent system, 6. The proportion of total liquor distilled by the continuous and intermittent systems was 99·4 and 0·6 per cent. respectively. The proportion of sulphuretted hydrogen treated by various methods, in terms of sulphate made and per cent. of total make, is as follows: By oxide purification, 89·4; precipitated by metallic salts, 10; burnt, 0·6. Products equivalent to 3081 tons of sulphate of ammonia were made during the year. In places where tar is distilled, Mr. Ballard says ample provision is made for dealing with the noxious vapours evolved at certain stages of the process, either by burning the gases or by absorption in oxide of iron. Where tar is heated for the manufacture of roofing felt, the works are so arranged as to meet the requirements of the Act. There were no complaints throughout the year.

In the North of England district, which is under the supervision of Mr. E. Morley Fletcher, three new works for the manufacture of sulphate of ammonia were added to the register. One was an ordinary gas-works, and the other two were coke-oven works, with recovery of bye-products. There was considerable extension of this latter class of plant during the year, and the quantity of sulphate of ammonia derived from coke-ovens has doubled itself in the last five years. In several coke-oven works, the direct recovery of the ammonia has been adopted, whereby much of the cooling and scrubbing plant, with subsequent distillation of the ammoniacal liquor, is dispensed with. The total quantity of liquor distilled, equivalent to sulphate, was 51,388 tons; and the proportion distilled to liquor ammonia was 0·68 per cent. The proportion of sulphate made by the continuous processes was 99·9 per cent.

Reporting upon the district comprising Cheshire, North Wales, and part of Lancashire, Mr. Ballard states that there were registered in the district three works where gas liquor is concentrated for sale and employment in various manufactures; and all such works were carefully carried on. There are other works where the liquor is dealt with in the manufacture of ammonia soda; and they were all well conducted. On the whole, the works in which sulphate and muriate of ammonia are produced were, Mr. Ballard says, carefully carried on. In one case, neglect of a strict supervision of the oxide purifiers was apparent in November last, and necessitated a formal letter from the Chief Inspector with regard to the matter. Improvements were carried out, and the works are now on a satisfactory footing. The various sulphate of ammonia plants elsewhere in the district have been maintained in a good state of repair; and the manufacturers have displayed every care to meet the requirements of the Act. All the stills in the district, to the number of 22, are on the continuous principle of distillation. In the manufacture of sulphate and muriate of ammonia, sulphuretted hydrogen is evolved; and the principal method by which this is dealt with is by absorption in oxide of iron. All the tar-works in the district were efficiently carried on.

In the district comprising Widnes, Runcorn, and Liverpool, which is under the supervision of Mr. Herbert Porter, the number of works dealing with gas liquor and sulphate and muriate of ammonia was the same last year as before. All the plant was properly worked and maintained; while at one works entirely new and larger plant was erected. The former remark applies generally to tar-works, of which there are six in the district.

The district of North and East Lancashire, which includes part of Yorkshire, is under the supervision of Mr. Harold J. Bailey, who has succeeded Mr. J. W. Young, now the District Inspector for Scotland. There were 52 works registered last year for the treatment of gas liquor and sulphate and muriate of ammonia; sulphate being produced at 46, liquor at 11, and muriate at one. The proportion of ammonia made by continuous distillation was 89·8 per cent. of the whole, calculated as sulphate. Generally the works were carried on with freedom from nuisance, though Mr. Bailey says in some cases more frequent attention to purifiers is required. Heap purifiers continue to give satisfaction; and no cause of complaint has arisen where these are installed. During the past year, there were 26 works registered for the distillation of tar. In two instances the foul gas from the worm-end is absorbed in oxide of iron; but in all other cases it is destroyed by combustion.

The number of works on the register at the end of the year for the East Midland district, which is under the supervision of Mr. R. D. Littlefield, was 136, or three less than in the preceding year. There were, however, 198 separate processes under inspection, compared with 196 in 1909. There were 59 works registered for the manufacture of sulphate and muriate of ammonia and the treatment of gas liquor—eight being for the last-named purpose. During the year, a new bye-product coke-oven plant, in which the free ammonia in the gas is absorbed by the direct method, was successfully inaugurated. Sulphate of ammonia is made at 50 works—in 48 of them by the continuous process, and in two by the intermittent process. The proportion of liquor distilled by the former process amounted last year to 99·4 per cent. of the whole. The production of sulphate of ammonia from coke-oven works increased considerably last year; and Mr. Littlefield

says there are indications that it will be further extended in the near future. The output of tar in the district is constantly augmenting; and several new plants are under consideration.

In the South Midland and Norfolk district, which is under the supervision of Mr. Edward Jackson, there are 107 works registered where either ammonium sulphate, chloride, or carbonate is manufactured or gas liquor concentrated. This is an increase of three works for the year. The total number of separate processes under inspection where these ammoniacal products are manufactured now reaches 117. The three new works registered last year were all for the manufacture of sulphate of ammonia. At one of them, plant has been erected at an ordinary gas-works; and a continuous still, with the usual fishing saturator, has been put in. One of the other new works was in connection with bye-product coke-ovens. The plant is of the usual type at these works—viz., a continuous still, with fishing saturator and iron pipe condensers. The saturator gases are finally passed into the condensers and scrubbers of the coke-oven gas plant—the plan now generally employed at this class of works. The total acidity of the chimneys was found not to be raised to any important extent by this method of treatment. At the third new works, an interesting plant has been erected by Mr. George Wilton at a small gas-works carbonizing about 2000 to 2500 tons coal a year.* The plant, which Mr. Jackson says appears to be quite suitable for works of larger size, has been designed to meet the difficulties so often experienced in small works in dealing satisfactorily with the ammoniacal liquor, and particularly the constantly increasing trouble arising as to the disposal of the effluent, mainly on account of the sulphocyanides and phenols which it contains. Such works are usually situated in country (agricultural) districts, where this effluent is more difficult to get rid of without nuisance than in busy manufacturing centres. Mr. Wilton states that the effluent is reduced by one-fourth, compared with the ordinary sulphate of ammonia plant; and the small quantity produced at the works in question is evaporated in shallow pans placed over the retort-benches. The process also considerably reduces the chances of nuisance, from an administrative point of view, in connection with the Alkali Act, as, by the decomposition of the sulphides of ammonium in the acid washer, the sulphuretted hydrogen goes on with the crude coal gas to the ordinary purifiers. Plant is now in course of erection in the district on the lines of one of the methods recently proposed for the direct recovery of sulphate of ammonia from coal gas by utilizing the sulphuretted hydrogen which it contains to make the sulphuric acid required. Mr. Jackson characterizes this as "a process with great possibilities;" and he says it will be extremely interesting to watch the development and working of the cycle of reactions by which the result is obtained. Mr. Jackson gives the following figures showing the proportion of ammoniacal liquor produced from various sources in the district on a sulphate of ammonia basis:—

	1909. Per Cent.	1910. Per Cent.
From gas-works	54·9	51·2
„ coke-ovens	34·0	35·2
„ producer-gas plant	6·9	9·9
„ iron-works	2·8	2·3
„ coal-carbonizing works . .	1·4	1·4

There was an increase in the production of ammoniacal liquor in the district last year of 10·3 per cent. compared with the 1909 figures. Of this additional production, coke-ovens and producer plants contribute 8·5 per cent.; the gas-works increase only amounting to 1·8 per cent. The number of works using the continuous method of distillation last year was 101; the proportion of liquor distilled being 99·7 per cent. At eight works, the liquor is obtained from special processes, and does not contain any sulphide of ammonium; the sulphur present being oxidized. The gases from the saturators in some cases are, however, burnt, to destroy the offensive tarry (phenoloid) smell before escaping. No sulphuretted hydrogen is generated from the ammoniacal liquor distilled in several works. It amounts to 12 per cent. of the total production. The tar-works in the district have increased to 38 registrations. There were no important alterations made last year for dealing with the offensive vapours arising during the process of distillation. In one-half of the works, the combustion method is in use for rendering the worm-end gases inoffensive before being discharged into the atmosphere. In the other half, lime and oxide of iron purifiers are usually employed to arrest the noxious gases. Two new plants were registered. One was in connection with bye-product coke-ovens; and at the other, tar of an exceptional quality from a Mond-gas plant is distilled.

In the South and South-West of England district, which is under the supervision of Dr. Alfred C. Fryer, there are 96 registered works where the manufacture of sulphate and muriate of ammonia is carried on. One new works was registered last year for the manufacture of sulphate of ammonia. It has a continuous still, hand-fishing saturator, and water-cooled iron pipe condensers; and the sulphuretted hydrogen generated in the process is absorbed in a heap of oxide of iron. New sulphate plant, with the usual continuous stills and hand-fishing saturators, was put down in one works, replacing an intermittent distillation plant; while in two others, new sulphate houses and still were erected. New saturators replaced old ones at seven of the plants; and in four works new oxide of iron purifiers have been built. One works was complained of during the early part of the year. The Directors and Manager met a deputation of the Town Council, together with the Town Clerk, the Medical Officer of Health, and Dr. Fryer. After full consideration of the matter, it was apparent that the sulphate of ammonia plant was not to blame, but the vapours complained of came from the destructor chimney, as those responsible for the working of the town destructor had been relying for their temperatures on readings from a faulty pyrometer. In one works some sulphuretted hydrogen was found to be escaping from cracks in the sides of a brick oxide of iron purifier. The purifiers had not been constructed originally on the best method; and the Manager therefore took the opportunity of building an outer wall, set in cement, round both purifiers, leaving a cavity which was filled in with pitch.

In the report for 1909, attention was directed to an interesting

* Some particulars as to this plant will be found in the "JOURNAL," Vol. CXII., p. 474.

experiment carried out at a small gas-works in the South of England, where coal gas was bubbled through dilute sulphuric acid, and the solution evaporated down with a steam-coil to obtain crystals of sulphate of ammonia. Dr. Fryer points out that in many small gas-works no attempt is made to recover the ammonia from the gas. The water in the purifier lutes and gasholder tanks is converted in time into weak liquor; and consequently the gas becomes charged with free ammonia, while the weak liquor made upon the works cannot be disposed of, as the cost of carriage is prohibitive. Hitherto no plant has been devised which is sufficiently simple and inexpensive to allow of its adoption in small works. Dr. Fryer has therefore watched with considerable interest the experimental plant at Wareham described by Mr. Moon in the paper read by him before the Southern District Association of Gas Managers last November, to which reference has already been made in a foot-note. Having offered some observations on this plant, he refers to that at Dunstable, and states that the method is being further extended by the erection of a larger installation at the works of the Woking Gas Company. He says these larger plants are more satisfactory, inasmuch as they aim at collecting and utilizing the whole of the ammonia driven off from the coal. Indeed, it is considered that the opportunities for leakage of ammonia are much less than with the usual arrangement of plant, seeing that storage-tanks for liquor, in the ordinary sense, are dispensed with—the working-up of the whole of the ammonia taking place continuously as it is produced. The plants are furnished with a direct-fired still, whereby the whole of the ammonia is recovered, so that a better technical result is obtained, at the cost of an increased capital outlay and greater cost of working. Dr. Fryer adds: "Although this new method of sulphate of ammonia manufacture is suitable for larger works, yet it is probable that it will be appreciated by smaller works isolated in position, but placed in the midst of agricultural districts where the local sale of sulphate of ammonia is advantageous. The Wareham method, with its low initial capital cost, and ease of operation without the necessity of any great amount of attention, will be a boon to those smaller gas-works where considerable difficulty is experienced in the disposal of gas liquor. It is, therefore, probable that the manufacture of sulphate of ammonia will now be carried on at many of those smaller gas undertakings where hitherto there has been little hope of making a profit by its introduction."

Dr. Fryer says the increased production of ammoniacal salts in the last 26 years is very marked. There are now in his district 96 works where these salts are manufactured; while in the year 1884 there were only 48 on the register. The actual increase since that date of ammoniacal salts, calculated as sulphate of ammonia, is 52 per cent. The number of works in the district in which continuous distillation is employed is 75; and the proportion of liquor treated by this process is 96.3 per cent. The distillation of tar is carried on at eight works; and the exit gases are efficiently dealt with—in three cases by combustion, and in the others by absorption in oxide of iron.

In the South Wales and Monmouthshire district, which is supervised by Dr. T. Lewis Bailey, the manufacture of sulphate and muriate of ammonia was registered at 15 works last year—ten being works for treating gas liquor, and the remainder coke-ovens with bye-product plant. Sulphate plants are in course of erection at three gas-works where hitherto none have existed, and one new coke-oven plant was, at the date of the report, expected to be soon ready for registration; two others being in contemplation. Dr. Bailey says the plant continues to be maintained in good working order on the whole, though it has occasionally been necessary to call attention to minor structural defects, and to emphasize the need for closer supervision in connection with the treatment of foul gases. "A point which perhaps calls for special mention is the cooling of the foul-gas main communicating with oxide of iron purifiers. When this is effected in a water-tank, more attention is needed to the water supply than is sometimes given; the result being an insufficient cooling of the gases prior to their entry to the purifiers. Where cooling-tanks have been superseded by a spray-cooling of the pipes, considerably improved results have been obtained—the heated water in such cases being carried away as produced." The total amount of ammonium salts, in terms of sulphate of ammonia, produced during the past year shows an increase of practically 6 per cent. over the previous twelve months; and it is anticipated that future years will show a still further increase, especially as considerable attention is being given to the manufacture of sulphate, and there is every likelihood, as pointed out by Dr. Fryer, of simpler processes being introduced, which will be suitable for smaller works in outlying agricultural districts from which freights make the transit of gas liquor an impossibility. The number of works using plants for continuous distillation last year was 14; and practically the whole of the liquor was treated by the continuous process.

As usual, Mr. F. Napier Sutton has much that is of interest to say about his work in the district comprising the eastern and south-eastern counties, in which there are 11 alkali and 175 scheduled works—a total of 186, or four more than in 1909. One is for the manufacture of sulphate of ammonia. The 89 works concerned with the distillation of gas liquor mainly produce sulphate; but carbonate and nitrate of ammonia, liquid (concentrated and refined), and anhydrous ammonia continue to be made as hitherto. The total quantity of ammonia compounds produced shows an increase of 1160 tons (in terms of sulphate) compared with the year 1909. The gas-works belonging to statutory companies and local authorities made 90.6 per cent. of the products; the balance of 9.4 per cent. having come from the works of private firms. Nearly the whole of the gas liquor was treated by continuous methods of distillation; and only five small intermittent distillation plants now exist in the district. The proportion of saturator gases utilized for the direct manufacture of sulphuric acid showed an increase of 3.7 per cent. last year, and is now 59.1 per cent. of the whole. The Claus sulphur-recovery process is in use in ten works; and the proportion of gas treated is 16.8 per cent. This shows considerable reduction; but Mr. Sutton says it is mainly due to the treatment of less liquor by the Hills desulphurizing process at one of the works in the district. The most recently erected Claus plant has yielded the best return of sulphur per ton of sulphate made; and the recovered sulphur is of exceptionally good quality. This, it is thought, may be due to the position of the kiln, which is placed above the main depositing

chamber, and the sulphur vapour passes directly downwards into this. Mr. Sutton considers it to be a great improvement on the usual design where the kiln is placed at the end of the chambers, and is less likely to cause blockage by the deposit of sulphur at the outlet. At 61 works the foul gases are absorbed in oxide of iron, either in "heap" form on a concrete floor or in open box purifiers; and 13.2 per cent. of the gases is thus treated. This system is in use at 31 works; and the extension of it is recommended as being more efficient, simple, and less costly in labour than the box purifiers. Mr. Sutton makes the following remarks on this subject:

It is well to draw attention to the importance of proportioning the area of gas distribution within the oxide to the size of the heap. It has sometimes been the practice to simply cover the gas-inlet pipe with a hood or plate, and to place a cone-shaped heap of oxide over this. Through such an outlet, the velocity of the gas is such that it quickly forces its way to the surface by a confined path; fouling the oxide in a limited area, and leaving much absorbing material untouched. By placing two, four, or more grids supported on bricks over the gas-inlet pipe, and covering with a plateau-shaped mound of oxide, the gases are brought slowly into contact with an increased area of material, and absorption is spontaneous, general, and complete.

The saturator gases are burnt in a special furnace, with subsequent neutralization of the acid products, at eleven works; and 9.7 per cent. of the gas is thus accounted for. At two of these works, the neutralizing plants are used in conjunction with the Radcliffe process for the treatment of spent liquors from the stills; and here the neutralization is not so efficient, Mr. Sutton states, as in other cases, on account of the limited quantity of water used on the scrubbing-towers. At two works, the saturator gases continue to be passed from the sulphate plant to the foul coal-gas main, and so on to the purifiers.

In the report for 1909, Mr. Sutton called attention to the advantages of using a continuous lime feed on the liquor-stills; and he says the remarks then made have led to the adoption of the principle at several works, which has resulted not only in better yields of sulphate, but in the reduction of the amount of lime used. At one works, the increase of salt since obtained has been very marked. The observations made on the comparative cost and value of caustic soda and caustic lime as decomposing agents of the fixed ammonia salts likewise aroused some interest, and stimulated the users of caustic soda to look more closely into the matter. Periodical complaints, extending over some years, have been made of noxious smells alleged to arise from the gas-works of a popular seaside town. The works are awkwardly situated in the heart of the town, with good residential property at higher levels on two sides. The onus was placed upon the sulphate of ammonia plant; and, in order to meet any possible objection, this has been safeguarded by exceptional precautionary measures to prevent any smell. Mr. Sutton says the destruction of the saturator gases is now effectual; the spent liquor settling-tanks are covered, and the vapour therefrom condensed; the "devil liquor" is collected in sealed vessels, and is run back to the ammoniacal liquor well; and the vapours arising from the saturator surface are collected under a hood, and conveyed to the boiler fires. Consideration of the infliction of a fine under sections 7 and 20 of the Alkali Act arose early in the year. A sudden blockage occurred in the neutralizing towers connected with the sulphate plant at one works in the district; and the foreman, without the knowledge or consent of the Manager, disconnected the apparatus for the purpose of clearing the obstruction, without first turning off the liquor supply to the still. Consequently, for some time the foul gases escaped into the atmosphere, to the danger of the workmen and surrounding property; and the Inspector found the plant in this condition. Mr. Sutton characterizes this as "a grave error of judgment on the part of the foreman, who should have been aware of the gravity of his action." He was severely reprimanded, and a warning was given. Section 20 provides that where an offence is committed under the Act by an agent or workman without the knowledge or consent of the owner, the servant or workman is liable to pay the fine and the costs of the proceedings.

On the subject of tar distillation, Mr. Sutton says there was a further extension last year of plant for the preliminary dehydration of tar, or semi-distillation by heating processes before running the tar into the finishing stills for separation by distillation of the heavy oils. When this is properly carried out, the distillation period in these stills occupies only some four or five hours, and the stills can be recharged and worked at once. The plant has consequently a greatly increased capacity. Mr. Sutton reports that the demand for "prepared" tar—viz., tar from which the water and spirit have been removed by partial distillation, and thus made suitable for road dressing—is likely to find considerable extension in the immediate future. On this matter he says:

In recent years, increasing quantities of tar have been used on the streets and highways in the preparation of roads suitable for the ever-increasing motor traffic; and, unfortunately, large quantities of tar so used have not first been submitted to such treatment as would ensure the removal of all useless and harmful ingredients. The heating of tar to the extent required to remove the water and naphtha, and thus make it both useful and safe for road dressing, necessitates it being raised to a temperature of 140° C.; and when heated to this extent, it should be done in a properly constructed still, and under skilled supervision, which would ensure the volatile products being properly condensed and dealt with. When raw tar is heated in the open and on the roadway, as is frequently the case, the volatile products evolved are likely to cause nuisance and damage. Further, the washings from roads newly treated with raw or improperly prepared tar are liable to seriously pollute watercourses and streams; and recently the Board of Agriculture and Fisheries has issued a circular to the Borough Councils of England and Wales calling attention to complaints of alleged pollution of streams, and consequent damage to fisheries, by washings from newly-tarred roads. If properly prepared tar was invariably used, there would be no necessity for the issue of this caution.

Report to the Secretary for Scotland.

Following the reports of the District Inspectors is Mr. Curphey's report to the Secretary for Scotland. The details of the work done in this portion of the United Kingdom are furnished by Mr. J. W. Young, formerly a District Inspector, who, as already mentioned, was selected

to succeed Mr. Curphey on his appointment as Chief Inspector. We extract the subjoined particulars.

The number of works in Scotland registered under the Alkali Act during the past year was 168; being a decrease of one on the number registered in 1909. Three works were added to the register, while four previously registered were closed. The processes carried on numbered 278, compared with 274 the preceding year. The quantity of salts of ammonia made (expressed as sulphate) was:—

	Tons.	Inc. on 1909. Tons.
Gas-liquor works	20,334	360
Iron-works	18,815	29
Shale-works	59,113	2065
Producer gas, coke, and carbonizing works	18,696	1751
Total	116,958	4205

The number of visits of inspection was 606; and 412 separate chemical tests were made. The escape of noxious gases arising from various processes was rather less last year than in 1909. There were 104 works registered for the treatment of gas liquor and the manufacture of sulphate and muriate of ammonia; and they received 275 visits. The whole of the gas liquor was distilled by continuous methods; the sulphuretted hydrogen evolved in the course of operations being dealt with by oxide of iron purifiers in 59 works, by the Claus process in one work, partially by precipitation of metallic salts in another, and partially by combustion in four others. At the iron-works, shale-works, coke-ovens, and producer-gas works, other methods are adopted, as to which there was no change last year from previous practice. The Claus process worked smoothly, with most satisfactory results; the average acidity of the chimney attached to the process being 0.95 grain of sulphuric anhydride per cubic foot.

With the exception of four works, there was little fault to find with the oxide of iron purifiers. In these cases, however, it was necessary to urge grave remonstrance against improper conditions. Mr. Young states that in many works more attention is required, in the case of the ordinary box purifiers, to combat the tendency of foul gases to creep up the face of the inner wall. He points out that the activity of a box purifier may be greatly prolonged by renewal of the oxide round the edge, without disturbance of the remainder. He says this apparent avoidance by foul gases of the centre of purifiers partly explains the superior efficiency of small boxes over large ones, in that the perimeter is proportionately greater. For several other reasons, he thinks it is advisable to substitute a number of small boxes for a few large ones. This change has been made with most satisfactory results at one of the leading works, and is probable at another still more important. Among other causes of purifier troubles are insufficient cooling of the foul gases before entering, and "souring," which seems rather more common in Scotland than in the North of England. The blue appearance of prussiates, or the rarer red of thiocyanates, of iron is not at all infrequent. These colours demonstrate oxidation of previously formed sulphide of iron to sulphates. Oxide containing these compounds remains inert however long it is exposed in order to sweeten. Notwithstanding repeated advice by Mr. Young's predecessor as to the need for the addition of lime or some other alkaline material in such a case, its use is still exceptional. The "heap" system, in place of box purifiers, has not as yet made much progress in Scotland. It is employed at present at eight works, in most of which it has been newly introduced; but Mr. Young has been informed that there have been instances of reversion to the box system. At two works the heaps were very unsatisfactory; but, owing to lax management, it is doubtful whether any other system would have resulted better. Their advantages are generally appreciated by those who have used them. Their virtues, however, may become a vice, in that too much is expected of them. Mr. Young relates the following experience:

Recently I had complaint from an experienced manager to whom I had recommended a trial. I found, on inquiry, his trouble was that back-pressure had proved too heavy on the still, after the heap had absorbed the foul gases from as much gas liquor as would have obliged a box purifier containing the same bulk of oxide to have been renewed twice at least; that the trial had been made at a time of year when working was most nearly continuous; that the oxide itself was blue, sour, and consequently partly inert; and, lastly, that the distributing area within the heap for the foul gases was too small. I take blame to myself on this latter point. Experience has led me to modify my earlier views. The area of distribution should be ample, though less than in a box purifier; and the contour of the heap should be flattened rather than conical.

With regard to the degree of purity and appearance of the sulphate of ammonia obtained from the saturators charged with common acid from pyrites, Mr. Young says it is generally better in Scotland than he has observed elsewhere. This is probably owing to more careful working. At one place he noticed that the salt was particularly good; and he found that the tar, which is customarily employed in skimming operations, was always inserted through the acid charge-hole in the rear of the apron. This seemed to render the separation of arsenic sulphide more nearly complete than when the tar is added in the usual way in front of the apron. A marked improvement was noticed when this simple change was tried at other works.

Mr. Young says it is always pleasant to hear of the utilization of "rubbish;" and he mentions that for some years the Dalmellington Iron Company have been supplying the village near their works with illuminating gas. In place of coal, a waste material removed from the blast-furnace flues is charged into the gas-retorts; and a coke containing 60 per cent. of carbon and a valuable proportion of iron remains after gasification. This is returned to the blast-furnaces. Thus, instead of rubbish, costing money for removal, the Company obtain coke and iron gratis, and the villagers a 50 per cent. reduction in their gas bills.

There were 41 works registered last year for the distillation of tar, though in a few of the smaller gas-works this is partial, and entails only the removal of the naphtha. In the other works, the tar is separated into pitch, and more or less completely into the various liquid constituents. The uncondensed gases are in most cases treated in purifiers filled with lime, or lime mixed with oxide of iron; but at the iron-works these gases are returned to the general circulatory system.

At one works, where the stills are gas-fired and vertical in shape, the manhole is in the centre of the base of the still instead of being above as usual. From the point of view of safety and comfort to the men cleaning a still and easiness of ventilation, Mr. Young says it seems most desirable that this pattern should be more generally adopted. He knows of fatal accidents in works, and several narrow escapes from death, which would have been impossible in stills of this type.

In the course of his comments upon Mr. Young's report, the Chief Inspector refers to the increased production of sulphate of ammonia in Scotland, as shown by the figures already given. He says the increase from gas-works may be regarded as a measure of the growth in gas manufacture. The small increase from iron-works cannot, however, be taken as an indication of the comparative activity in blast-furnaces, as the production of Scottish pig iron last year was 1,414,000 tons, compared with 1,361,000 tons in 1909. A larger number of blast-furnaces were kept in operation; and the comparatively small increase of ammonia recovered in iron-works may be attributable to a greater use of coke in the furnaces. The increase from shale-works indicates an active year; and the increase from producer gas, coke-works, &c., is associated with the starting of two new recovery plants during the year. The "direct" system of the recovery of ammonia from coke-oven gases, already mentioned in his report to the Local Government Board, was put into operation in Scotland with successful results during the year.

In continuation of the table presented in recent annual reports of the progress of shale distillation and ammonia recovery, Mr. Curphey gives the figures, compiled from the statistical returns to the Home Office on Mines and Quarries, for the ten years ended Dec. 31 last. They show that the total quantity of shale mined in the United Kingdom in 1901 was 2,350,277 tons; the amount of sulphate of ammonia recovered being 40,011 tons, or 38.2 lbs. per ton of shale. In 1906, the figures were 2,545,724 tons, 48,534 tons, and 42.7 lbs.; while last year they were 3,130,280 tons, 59,113 tons, and 42.3 lbs. Mr. Curphey says it is of interest to note that a condition of approximate uniformity has been maintained of recent years in the proportion of ammonia yielded per ton of shale mined and quarried.

EDINBURGH AND LEITH GAS COMMISSIONERS.

The Accounts for the Past Year.

The annual accounts of the Edinburgh and Leith Gas Commissioners, dealing with the year ending May 15, which have been issued subject to audit, and with reference to which a short statement was given in last Tuesday's "JOURNAL" (p. 999), show the following results.

The original capital account amounted to £993,000, upon which there was payable annuities to the amount of £35,200. The capital has been reduced by £98,433, by the redemption of £3510 of annuities; leaving the capital at £894,566, and the annuities at £31,690. Loan capital authorized amounts to £1,400,000. By their Act of 1908, the Commissioners are empowered to borrow, in addition, any sum up to £800,000, for the purpose of redeeming annuities, compulsory or otherwise. This power does not appear to have been yet exercised; but the Commissioners have, for general purposes, borrowed £1,099,195. Mortgages have been repaid to the amount of £109,873. There has been added to reserve fund £25,000. The borrowing powers have been further reduced by £250 which has been realized for property sold. The borrowing powers which remain amount to £165,682.

The capital expenditure of the Commissioners is stated at £2,244,528, made up of £1,068,934 as the cost of acquiring the undertakings of the Edinburgh, the Edinburgh and Leith, the Portobello, and the Corstorphine Gas Companies, which sum is reduced by £15,361 received for plant and properties sold and value of plant transferred to the Granton works; leaving the cost of acquisition at £1,053,573. Capital outlays since the dates of acquisition have amounted to £886,979 (which includes £841,537 upon the Granton works) upon works; £193,677 upon main and service pipes, and cost of laying; £65,046 upon gas-meters; £10,170 upon properties not embraced in the works; £13,048 upon gas cooking and heating stoves; £22,671 upon parliamentary expenditure; and £363 upon office furniture. The only capital outlay during the year was £517—upon main and service pipes. There was transferred, in December last, to old works, &c., suspense account a sum of £435,000, which was subject to a deduction of £25,000 in respect of mortgages repaid out of the special reserve fund; leaving the amount in the suspense account at £410,000.

In the revenue account, the total income is stated to have been £338,052—a decrease upon the previous year of £14,902. The decrease is explained by a falling-off in the quantity of gas sold, equal to 2.39 per cent., and the reduction of 2d. per 1000 cubic feet made in November last to ordinary and prepayment meter consumers. Gas sold amounted to 1,895,265,700 cubic feet—a decrease of 46,413,700 cubic feet. The revenue from gas, less £3754 of discounts and allowances, amounted to £252,631—a decrease of £22,311. Ordinary consumers used 1,611,609,000 cubic feet of gas; and prepayment consumers, 70,628,000 feet. The other consumptions were: Gas-engines, 27,583,300 cubic feet; gas for engines and trade purposes other than lighting, 32,576,300 feet; stair-lights, 67,811,900 feet; public lamps, 82,560,000 feet; and gas supplied in bulk, 2,397,400 feet. The other revenues were: Coke, less £6616 working expenses and railway carriage, £30,980—a decrease of £1191; tar, £12,405—an increase of £925; sulphate of ammonia and ammoniacal liquor, less £5035 working expenses, £23,859—an increase of £2716. The rental of stoves, meters, &c., amounted to £2821—an increase of £45; prepayment meters, &c., £4360—a decrease of £327; and meters for special purposes, £261—an increase of £327. Stair-lighting (a new scheme) cost, for maintenance and labour, £5992. The sale and fitting of gas appliances realized £3676—an increase of £87. The cost of coal was £95,037—an increase of £1433; of gas oil, £1273—a decrease of £1637; of carbonizing wages, £11,781—a decrease of £852; of salaries and wages at works, £12,901—the same as in the previous year; of purifying materials and the wages of purifier men, £789—a decrease of £72; and of repairs and maintenance of works and

plant, &c., £24,311—a decrease of £7567. The total cost of gas manufacture was £146,098—a decrease of £8395. Distribution of gas cost £27,748—a decrease of £487. Gas stoves and appliances cost £7624—a decrease of £1113. Management cost £11,394—a decrease of £77. Rents and feu-duties amounted to £627—an increase of £3. Rates and taxes came to £22,923—an increase of £5535. Allowances during the pleasure of the Commissioners amounted to £1008—a decrease of £225. The Commissioners' contribution to the superannuation fund equivalent to the contributions by the employees, amounted to £1669—a decrease of £141; and there was a special contribution by the Commissioners to the superannuation fund of £2035—the same as in the previous year. The total cost of superannuation was £4713—a decrease of £367. Compensation cost £108—a decrease of £79; law and parliamentary expenses, £121—a decrease of £84; and bad debts, £822—an increase of £39. The total expenditure was £222,177, which was £5416 less than in the previous year. The balance to profit and loss account was £115,874—a decrease of £9486.

From the balance of £115,874, there is payable: Annuities, £31,888; and interest on money borrowed, £39,659. There was transferred: To sinking fund in respect of annuities redeemed, £3311; in respect of interest on mortgages repaid, £2535; for redemption of annuities, £6709; for repayment of money borrowed, £10,992; to general reserve fund, £1085; and to special reserve fund, £13,548. These sums, with £398 expenses of mortgages, amount to £110,126, and leave £5748 at the credit of profit and loss, compared with £13,564 a year ago.

The sinking fund for the repayment of money borrowed amounted twelve months ago to £144,684. There was transferred to it from the profit and loss account £10,992; in respect of mortgages repaid out of the sinking fund, £2534; and interest was received for the year amounting to £2306. The sinking fund for the redemption of annuities amounted a year ago to £256,745. There was added to it during the year, from the profit and loss account, £6709; transferred in respect of annuities redeemed out of the sinking fund, £3311; and received as interest, £5951. The total of the sinking funds was thus brought up to £432,233. Twelve months ago there had been paid in the redemption of mortgages £79,873. During the year, there was expended upon this head £30,000, raising the expenditure to date upon the redemption of annuities to £109,873. A year ago, there was expended in redeeming annuities £80,437; and there was expended on this head in the year £19,871—making the total cost to date of redeeming annuities £100,308. The sum left in the sinking funds, after these payments, is £223,052.

The superannuation fund account began the year with £4718. There was contributed to it by employees £1669, and by the Commissioners a similar amount; and interest received raised it to £10,294. The expenditure from the fund consisted of: Allowances to employees, £3024; and contributions repaid to employees on leaving the service, £127. There is left in the fund, £7143.

In a statement of gas made, sold, &c., which is issued with the accounts for the first time, and which has been prepared to meet the requirements of the Scotch Office, it is stated that the coal carbonized and oil equivalent amounted to 190,997 tons; gas made to 2,044,182,000 cubic feet; gas sent out, to 2,043,292,000 feet; gas sold, to 1,895,265,700 feet; gas used at works, offices, &c., to 20,243,200 feet; and the gas unaccounted for, to 127,783,100 feet. The gas made per ton of coal and oil equivalent amounted to 10,703 cubic feet; gas sold per ton of coal and oil equivalent, to 9923 feet; gas sold per cent. on gas sent out, 92.76; gas used at works, offices, &c., per cent. on gas sent out, 0.99; and gas unaccounted for per cent. on gas sent out, 6.25. The average cost per ton of coal and oil equivalent was 10s. 1.02d.; the cost of coal and oil per 1000 cubic feet of gas made was 11s. 3.1d.; and the net revenue from residual products per ton of coal and oil equivalent was 7s. 0.50d. The consumers of gas within the municipal boundaries of Edinburgh and Leith numbered: Credit, 81,760; and prepayment, 11,420. Outwith the municipal boundaries: Credit, 2390; prepayment, none. The total number of consumers was 95,570. The average price of gas per 1000 cubic feet, after deduction of discounts, &c., was 2s. 7.99d. The prescribed illuminating power of the gas was 14 candles; and supplied, 17.07 candles. There are 436½ miles of mains; 11,938 public lamps, and 17,579 stair lights; and there are 8957 gas-cookers on hire.

The accounts were submitted to the Commissioners at a meeting on Monday the 26th ult.; and, on the motion of Judge Inches, they were remitted to the Committee for consideration and report.

STOURBRIDGE GAS UNDERTAKING.

Annual Report and Accounts.

The Gas Engineer and Manager of the Stourbridge Urban District Council (Mr. Charles H. Webb, M.Sc.) has presented his report for the year ended the 31st of March. It shows that the sales of gas increased by 5,923,900 cubic feet; being 3,160,800 cubic feet on ordinary, and 2,763,100 cubic feet on prepayment meters. The money value of this increase is £749 12s. 2d. The residuals market was good throughout the year; and this, with the increased sales of gas, brought the gross profit on the year's trading to £11,977. After deducting income-tax, instalments of sinking fund, interest, &c., there was a surplus of £3005—an increase of £496. The working statement shows that 227,770,000 cubic feet of gas were made; and that 204,505,100 cubic feet were sold for private and public lighting, or 89.79 per cent. of the make, which was at the rate of 11,025 cubic feet per ton of coal carbonized. The coke and breeze made per ton of coal was 12½ cwt.; tar, 11.44 gallons; and the sulphate made per 100 tons of coal was 16½ cwt. The accounts (certified by Messrs. Wood, Drew, and Co.) show that the sale of gas produced £26,983; meter and stove rentals, £1272; and residuals, £10,077—making a total of £38,332. The expenditure being £26,355, the amount carried to the profit and loss account was, as stated above, £11,977. This was at the rate of 11s. 7.14d. per ton of coal carbonized and 14.05d. per 1000 cubic feet of gas sold; the surplus (£3005) being at the rate of 2s. 10.91d. per ton of coal and 3.52d. per 1000 cubic feet of gas sold.

BRADFORD CORPORATION GAS DEPARTMENT.

Annual Report of the Engineer and Manager.

The Gas Engineer and Manager of the Bradford Corporation (Mr. Charles Wood) has presented to the Gas Committee his report on the working of the gas undertaking in the twelve months ended the 31st of March. It is accompanied by an analysis of the gas accounts, compared with those for the preceding year.

Mr. Wood opens his report with the gratifying statement that there is reason for everyone connected with the Gas Department to be proud of the past year's results; the trading showing a net improvement over the previous year of the satisfactory sum of £13,672. The net profit was £12,934, which is more than double that made in any previous year since the price of gas was reduced to the present figure seven years ago. These results have been obtained, Mr. Wood points out, notwithstanding the increased amount paid for wages, rates and taxes, and nearly every class of material used, and, above all, in spite of the still heavy burden caused by the purchase of the several gas undertakings since 1900. The payment of interest and sinking fund charges on the goodwill alone of these undertakings cost £18,800 last year. In addition, the benefit to the gas consumers in the added districts amounted to no less than £13,166. All the repairs and renewals, new services, and the alterations at the Thornton Road works were charged entirely to revenue. In comparing the returns with those of others, Mr. Wood says it is important that these facts should not be overlooked. The coal contracts last year were, he believes, absolutely the most favourable made anywhere. The working results—taking into consideration the fact that the Committee have been using up the old carbonizing plant at the Thornton Road and other works—have easily been a record. The only feature that is not entirely satisfactory is the small rate of increase in the quantity of gas sold in the central area of the city. This is explained to be due to the extended employment of electricity, and to the more economical methods of using gas; and Mr. Wood says it only proves the necessity of utilizing every reasonable opportunity of advertising the many advantages of gas and extending its use.

The total quantity of gas produced during the year was 2,138,002,000 cubic feet; being an increase of 66,823,000 cubic feet, or 3.22 per cent., compared with the previous year. The gas sold, including 160,335,000 cubic feet used in the public lamps, amounted to 2,004,042,000 cubic feet, or an increase of 3.03 per cent., of which about 19 million cubic feet, or 0.95 per cent., was used in the recently acquired Ripleyville district. Mr. Wood gives a table showing the quantities of gas sold in different districts during the year ended Dec. 31 last, and for the preceding year. For purposes of comparison, the figures for 1899 are also given; this period being prior to the taking over of the North Bierley, Clayton, Eccleshill, Idle, and Heaton districts. The table shows that there was an improvement in every district.

During the year ended March 31 last, 204,765 tons of coal and cannel were carbonized; 5.31 per cent. of cannel being used, against 5.52 per cent. in 1909-10. The average cost of the coal was 10s. 7.52d. per ton; the previous figure being 10s. 9.25d. The quantity of coal carbonized per retort was 306 lbs.; being 1 lb. less than for the previous twelve months. The average quantity of gas made per ton of coal was 10,441 cubic feet; being 19 cubic feet less than in 1909-10, due to the working at Ludlam Street.

Dealing with the revenue account for the year, Mr. Wood remarks that the total salaries for manufacture, distribution, and management amounted to £5715, an increase of £205; and carbonizing wages to £28,905, an increase of £981. Coal cost £108,806, or £2168 more; and the expenditure on purification was £4211, or £53 more. The sum of £27,385 was spent on the repair and maintenance of works; being an increase of £724. The repairs to mains and services, including the cost of new services, amounted to £5023—being a decrease of £465. A sum of £669 was spent on repairs of meters, or £149 less than before. Meter inspection cost £3605, or a decrease of £53. The Finance Committee's charges for administration and collection of accounts were £1700—the same as for several years past. Miscellaneous expenses amounted to £847, or a decrease of £257. Stationery cost £506, or £24 more; and bad debts, which amounted to £1357, were higher by £25. The amount paid for rents (principally ground rents) was £32 more than before. A sum of £14,703 had to be paid for rates—an advance of £445. The stove department cost £3781; but the revenue therefrom was £3904—leaving a balance of profit of £123, against £583 in the previous year, when the sales of stoves were abnormally great. During the year, a good deal more was spent in advertising the uses of gas, of which Mr. Wood says the Committee will certainly reap the benefit by increased business.

The following are the main items of income: £192,872 was received for gas—an increase of £4789; meter-rents amounted to £2640, or £60 more; coke yielded £39,262, or £6567 more; tar brought in £13,571, or an increase of £2405; and ammoniacal liquor produced £20,454, an increase of 3628; while from the sale of spent oxide a sum of £2996 was received, or an increase of £496. The cost of coal, less residuals (excluding the profit on the chemical works), was £35,518; being £10,432 better than in the year 1909-10. Purification, less the revenue from spent oxide, cost £1214, or £443 less. The rents received amounted to £1086, or £82 more. The gross profit on the chemical works, including the profit on the sale of ammoniacal liquor, was £3621, against £3365 in the preceding year. The gross profit was £72,496, or £14,091 more than before. Interest on loans, &c., amounted to £29,493, which is a decrease of only £142. Income-tax was £212 more; while the contribution of £26,866 to the sinking fund shows an increase of £250, due to the purchase of Messrs. Ripley's undertaking. The net profit is thus £12,934, or £13,672 better than for the year 1909-10.

During the past year, the sum of £1803 was spent on capital account entirely upon gas-mains, and £1046 at the chemical works. These sums, with the purchase price of Messrs. Ripley's gas undertaking (£15,151), bring up the total expenditure on capital account to £1,183,631.

A sum of £27,500 was received last year towards the cost of street

lighting. The amount paid for gas used for this purpose worked out at s. 3³/₄d. per 1000 cubic feet.

The principal items of the working results are given in the tables appended to the report; and almost every item shows an improvement. The average cost of gas in the holders has fallen from 11⁶/₀rd. to 10¹⁸/₅d. per 1000 cubic feet. The average illuminating power of the gas supplied during the year was 17⁰⁵/₅ candles, as officially tested; but Mr. Wood says it must be remembered, when comparing the results with others, that the Act of Parliament requires in Bradford a certain kind type of burner to be used. When tested by the "Metropolitan" No. 2 argand burner, Bradford gas has an increased value of from ¹/₄ to 4 candles.

The following are some of the items from the working statement for the past year; the figures for 1909-10 being given for comparison:—

	1909-10.	1910-11.
Coal and cannel carbonized, tons . . .	198,009 ..	204,765
Gas made, thousands of cubic feet . . .	2,071,179 ..	2,138,002
" per ton of coal, cubic feet . . .	10,460 ..	10,441
" per retort charged, cubic feet . . .	1,436 ..	1,430
Retorts charged . . .	1,442,121 ..	1,494,682
Gas accounted for, thousands of cubic feet .	1,944,971 ..	2,004,042
" per ton of coal, cubic feet . . .	9,823 ..	9,787
" per cent. on make . . .	93 ⁹ / ₁ ..	93 ⁷ / ₄
Coke and breeze saleable, tons . . .	86,883 ..	89,474
" per ton of coal, cwt. . .	8 ⁷ / ₇ ..	8 ⁷ / ₃
Tar made, tons . . .	12,171 ..	12,509
" per ton of coal, gallons . . .	11 ⁹ / ₈ ..	11 ⁹ / ₁
Liquor made, tons . . .	27,413 ..	27,412
" per ton of coal, gallons . . .	30 ² / ₄ ..	29 ² / ₅

The analysis of the accounts shows that the net cost of gas was £120,375, or at the rate of 14⁴/₁₆d. per 1000 cubic feet of gas sold, compared with £129,678, or 16⁰⁰/₂d. per 1000 cubic feet sold, in 1909-10. The net profit last year was, as shown above, £12,934, compared with a net loss of £737 before; the rates per 1000 cubic feet of gas sold being respectively 1⁵/₄9d. and 0⁰/₉rd.

OSSETT CORPORATION GAS UNDERTAKING.

Successful Working.

At the last meeting of the Ossett Town Council, the report of the Gas Engineer and Manager (Mr. A. E. Mottram) for the year ended March 31 was submitted. It showed that the make of gas was 121,950,000 cubic feet, of which 114,983,300 cubic feet had been sold; being an increased make of 5,691,000 cubic feet and sale of 5,471,900 cubic feet, compared with the previous year. The quantity of coal carbonized was 10,927 tons, and the yield of gas 11,160 cubic feet per ton, compared with 10,590 tons and 10,978 cubic feet per ton before. The gross profit was £8265. As the interest and sinking-fund charges came to £6483, there was a balance of £1782. Attached to the report was an analysis showing the cost of gas per 1000 cubic feet sold last year compared with 1909-10. The gross cost was 2s. 3⁷/₁₆d., against 2s. 4⁶/₈d.; and the net cost exclusive of capital charges, 1s. 5⁶/₈d., compared with 1s. 6⁹/₉d. Interest and sinking-fund charges added made the total cost of production 2s. 7²/₁₆d., against 2s. 9²/₁₆d. The receipts for gas, meter-rents, &c., were 2s. 10⁹/₄d., against 2s. 10⁸/₆d. before; and the instalment proposed to be added to the reserve fund was 3⁷/₁₆d., against 0⁷/₂d.

In submitting the Gas Committee's minutes for adoption, Mr. H. Robinson, the Chairman, paid a high tribute to the able, devoted, and exemplary industry of the management, and said that in every department officials and workmen alike had shown a deep and intelligent interest and enthusiasm in the work. The Committee had spent close upon £500 within the works. In early years, after the rebuilding of the retort-house, it was rightly thought that the outside had the first claim. The saving in the leakage had shown this to be a very wise policy. Now they had been able to turn their attention to the inside; and the works were in a sound and satisfactory condition. During the year, they had been visited by the Manchester Junior Gas Association, who unhesitatingly and unanimously expressed their delight, and some of them their envy, at what they saw. Special attention had been paid to the cleaning and regulation of burners in houses and workshops; and this had involved heavy charges. High-pressure gas had been adopted in the Market Place; and it had not only given them the best lighted market-place in the district, but had induced quite a number of business men to light up their premises on this system. In addition, the Corporation had now decided to light the large hall and Council Chamber with it. Turning to financial matters, Mr. Robinson said the capital was becoming pleasantly less. In their first year, it was £1 12s. 5d. per 1000 cubic feet of gas sold; last year it was £1 0s. 5d. At the outset, it was £14 3s. 11d. per ton of coal carbonized; now it was £10 7s. 5d. Another pleasing feature was that the reserve fund, which they started with £329, would be augmented by the profit balance of £1782; making £2110, or nearly half the amount they had power to accumulate. There had been a record in every direction—in make, in sale, in the number of customers, in the low percentage of leakage, and in profit; and each proved in its own way the soundness and capacity of the plant, the excellence of the management, and the utility and appreciation of the gas they made. Having given at some length particulars to bear out this statement, he said that since the Corporation took over the works they had increased the make by 40 million cubic feet, extended the mains 16 or 17 miles, and had doubled the capacity of the works; and in ten years they had practically paid for it all. This was a record of which they had no need to be ashamed.

The Metropolitan Water Board's Rate.—A statement has been issued by the Metropolitan Water Board to show the result of the collection on account of domestic charges and fixed supplies for the half year last ended. It appears therefrom that of the total sum of £1,163,358 to be collected, £1,047,298, or 90⁰²/₁₀₀ per cent., was actually received; £83,435, or 7¹⁷/₁₀₀ per cent., was written off; and £32,625, or 2⁸¹/₁₀₀ per cent., was carried forward as recoverable arrears.

EXPLOSION AT A SHEFFIELD GAS-WORKS.

On Monday evening of last week, a severe explosion took place at the Effingham Street Works of the Sheffield United Gaslight Company, resulting in the wreck of a 4 million capacity Livesey washer, and damage to the mains and connections thereto.

It is usual at this time to thoroughly clean out all the thick tar which accumulates during the year; and for this purpose the various manholes were taken off. At the time of the explosion, the repairs had been completed, and the washer boxed up, with the exception of two set pin-holes in the top of the washer, which were left open to allow the air to blow off while the washer was being filled with liquor. The man in charge of the operation was standing by the side of the washer holding a safety lamp in his hand, about 3 feet below the level of the escaping air, when a violent explosion took place, completely demolishing the washer and breaking a 24-inch main, which, in falling, dragged the outlet-valve off the supply main. The gas that was being made—as well as what would come back from the holder—became ignited, and made a big blaze. Steps were at once taken to stop the make and shut off the scrubbers, by which means the flames were soon subdued, with the additional help of the fire hose. Unfortunately, one of the workmen, a man named Foster, was so severely burnt and injured by the explosion that he died in the Infirmary on Wednesday.

At the inquest which was held, Mr. J. W. Morrison, the Engineer to the Company, stated he was under the impression that the explosion was caused through spontaneous combustion of greasy or tarry waste that had been left in the washer, as he had proved by experiment that the safety lamp which the man in charge of the work was using was in perfect condition; and from the evidence of the men working in the vicinity, there did not appear to have been any sparking, or matches used for any purpose whatever. The air in the washer had become explosive through gas given off from the ammoniacal liquor, the tar on the perforated plates, or gas leaking from the inlet or outlet valves. Without retiring, the jury returned a verdict of "Accidental death."

PLYMOUTH GAS-WORKERS AND CO-PARTNERSHIP.

Last week the employees of the Plymouth and Stonehouse Gas Company had their annual outing. This was the eleventh event of the kind, and will probably be the last; the Directors having intimated that, in view of the establishment of a co-partnership scheme, these excursions will not be continued. As usual, the employees were divided into three parties, each of which carried out the same programme. The first section went on Tuesday; the party, which numbered 215, travelling by train to Dartmouth. Sir Joseph Bellamy, the Chairman of the Company, was absent through indisposition; and Mr. John Bayly represented the Board of Directors. Mr. P. S. Hoyte (Engineer and Manager), who had charge of the arrangements, and Mr. H. B. Heath (Secretary) also accompanied the party.

After luncheon, Mr. J. Walters proposed the toast of "The Chairman and the Company." Referring to the introduction of the co-partnership scheme, he said a pleasing feature of it was that the men would in future have a nice little banking account. He thought it a grand thing for the men; and personally he thanked the Directors for introducing the scheme. Mr. W. French, of the slot-fitting department, said that, though they were to lose these pleasant outings, they would gain something more valuable. The men could not but appreciate what the Directors were now doing for them. Mr. J. Ford, on behalf of the fitters, also expressed satisfaction with the introduction of the scheme. Mr. Bayly, in reply, said the Directors had watched with interest the development of the co-partnership movement in other companies, and had resolved to adopt the system when they saw that it could be worked satisfactorily. It was exceedingly gratifying to the Board to learn that, at a general meeting, the men had passed a resolution in favour of the scheme. There was a provision under which part of the money credited to the men could be withdrawn. They hoped, however, that this would not be taken great advantage of, but that the men, for their own sakes, would let it accumulate. Mr. Hoyte remarked that the co-partnership scheme would cost the Company a large sum; but much was expected from it. In order that the men might understand it in all its details, the scheme was being formally drawn up; and after it was prepared, a meeting would be held at which it could be discussed. If the offer was accepted in the spirit in which it was made, the result would be to encourage habits of thrift, as well as to make the men partners in the undertaking. Though the outings would be discontinued, there would still be an opportunity for the employees to meet once a year at a gathering in Plymouth.

During the luncheon, a telegram was sent to Sir Joseph Bellamy expressing regret at his absence, and wishing him a speedy recovery. In the afternoon the party went to Torquay, and there had tea, returning to Plymouth by train. The similar parties on Wednesday and Thursday were equally successful.

LYTTELTON (N.Z.) GAS AND WATER SUPPLY.

According to the annual report of Mr. L. A. Stringer, the Town Clerk of Lyttelton (N.Z.), the revenue of the gas undertaking for the year ended the 31st of March was £4389, and the expenditure £3517; showing a profit of £871, which was brought up to £966 by the addition of £95 profit on fittings. The quantity of coal carbonized was 1002 tons; and the gas accounted for, 11,470,100 cubic feet, of which 11,014,900 cubic feet were sold. The make of gas per ton of coal was 11,447 cubic feet. This figure was based upon the quantity of gas accounted for; the total make not being available owing to the dismantling of the old station meter and the late arrival of the new one. The salient features in the operations of the Gas Department (the Manager of which is Mr. William M'Auliffe) were the installation of a

new gas-engine and exhauster and the new station meter just referred to, the cost of which, amounting to £210, was met out of the year's revenue. Coal cost 1s. 7d. per ton more for handling than in previous years; and this, with an additional 18 tons carbonized, accounted for £98. A sum of £200 was transferred out of revenue to the sinking fund. There was a reduction in the charge for gas for all purposes to 5s. 10d. net per 1000 cubic feet, which, it was stated, brought the price below that of any other works of equal size in the Dominion.

With regard to water supply, in the five years ended March 31, 1910, there was a steady increase in the demand; and the year under review was no exception to the rule. The total consumption was 60,248,080 gallons, or at the rate of 41·26 gallons per day per head of the population, compared with 39·15 gallons in the preceding year. In 1882, the requirements of the borough amounted to 41,000 gallons per day; whereas in the past financial year 194,000 gallons were needed to meet the daily demand. Producer-gas plant has been introduced in connection with the pumping plant; and a statement in the report shows its value in comparison with steam plant. In 1908-9 (the last complete year with this plant), there was 59½ million gallons of water pumped, at a cost of £381 for fuel; being at the rate of £6 7s. 6d. per million. Last year, which was the first complete one with the producer plant, 70½ million gallons were pumped, at a cost of £205 for fuel; being at the rate of £2 18s. per million. In other words, if the steam plant had been continued in use, the 70½ million gallons of water pumped last year would have cost £450 for fuel, against an actual cost of £205; showing a saving of £245.

PINE-WOOD GAS

At 50s. per 1000 Cubic Feet.

The monthly publication of the New York Consolidated Gas Company (entitled "Gas Logic") published in its June issue a communication entitled "Mountain Gas Making," the author of which, Mr. Geo. E. Stonebridge, wrote: When the writer was a boy he saw the first gas-pipes laid in The Bronx, and his parents subscribed for the service before the pipes were laid. The price at that time was \$4 per 1000 cubic feet; and it was consumed for light only. When the price at last dropped to \$1 per 1000, we felt satisfied that the bottom was touched, with the existing mode of manufacture. But while the price was still \$4 per 1000, we moved to Nevada City, Cal. This little city among the gold mines was the county seat, with a population of 4000. There were 21 street lamps; the lamp-posts being tapered wooden poles, with a hole through the centre of each for the pipe. The price of gas was \$12 per 1000 cubic feet. But the material from which the gas was made was decidedly interesting. Instead of coal or oil, the gas was manufactured entirely from fat pine roots; and there was a standing price for them of \$12 per cord, which was twice that of oak and three times that of ordinary pine. The holder in which the gas

was stored was so small that it could not be seen unless it was full, as a high board fence concealed it from view. All the streets of the town ascended a hill, radiating from a central point like the hub of a wheel. Near this hub the gas plant was located; and it required little pressure to send the gas up the surrounding hills. The yellow pine in this region was a stately tree. It grew to a height of 200 feet, and sometimes to a thickness of 7 feet. When the woodcutters found a particularly "fat" spot in a tree, they laid the piece aside, to be sold to the Gas Company, while the rest of the tree went into ordinary cord wood. All summer the teams hauled the wood into town and stacked it in large piles. It was almost impossible to do any hauling in the winter, for the mud on the mountain roads was so deep that they were almost impassable. So the Gas Company stored a supply of fat pine for the making of gas during the winter months—thus guarding against a shortage of raw material. If for any unforeseen reason a shortage really should have happened, it would have cost the Company a pretty penny; for the cost of hauling would have been so high, owing to winter conditions, that the gas would have had to have been manufactured and supplied to consumers at a great loss.

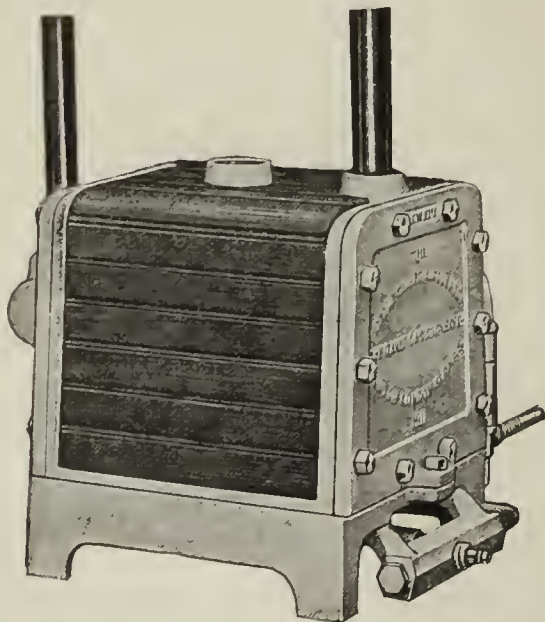
SHEFFIELD CORPORATION WATER DEPARTMENT.

Annual Report of the General Manager.

The General Manager of the Water Department of the Sheffield Corporation (Mr. W. Terrey) lately presented to the Water Committee his report for the year ending the 25th of March. It shows that the total capital expenditure on the undertaking up to that date had been £3,571,182, compared with £3,517,186 at the corresponding period last year. The total income from all sources for the year was £178,111, or £7219 higher than that for 1909-10; and the expenses of maintenance and management amounted to £41,590. The net revenue was thus £136,520, or £6568 more than before. Deducting annuities and interest, £112,657, the net profit was £23,863—an increase of £5363. The sinking fund requires £12,419; so that the year's surplus is £11,444—an increase of £5417 compared with 1909-10. The value of the water supplied to the Health Committee without charge, for street watering, public baths, &c., was £3932. The special account relating to the sinking fund shows that the total sum provided out of revenue and appropriated for the repayment of debt to the 25th of March last, with earnings thereon, amounts to £283,820; and the available surplus on that date was £83,065.

The length of new mains laid during the year was 10 miles 719 yards; bringing up the total length (including Handsworth, re-incorporated on Sept. 29 last) to 572 miles. The average estimated population supplied within the statutory district, which covers an area of 134 square miles, was 518,906—an increase of 2·75 per cent. The Corporation also supply water in bulk to Rotherham, Doncaster, the Rotherham

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ural district, Chapeltown, and other outside areas, representing an additional population of 164,885; and making a total population of 83,791 supplied from the works of the Corporation. The number of houses served was 112,436, or an increase of 4490. The additional number of water-closets supplied was 4279, making a total of 60,239; and of baths, 17,944—an increase of 1211. There are 4218 meters in use, against 4139 before. The total number of domestic and trade supplies on the 25th of March was 213,208; being an increase of 10,891 new supplies laid on during the year.

The total volume of water sent from the works of the Corporation during the year, including the statutory compensation water to the Rivers Rivelin, Loxley, and Little Don, was 10,434,135.519 gallons. It was disposed of as follows: Trade purposes, by meter, 1,906,818,033 gallons; supplies in bulk to local authorities by meter, and statutory supplies to Rotherham and Doncaster, 1,183,004,500 gallons; domestic purposes, including water supplied for extinguishing fires and waste, 4,433,695,090 gallons—making the total town supply 5,523,517,623 gallons. Adding the compensation water, 4,910,617,896 gallons, makes up the above-named total of 10,434,135,519 gallons, compared with 10,248,467,812 gallons in 1909-10. The average daily supply during the past financial year was 28,586,672 gallons, against 28,077,994 gallons in the preceding twelve months.

NOTES FROM SCOTLAND.

From Our Own Correspondent.

Saturday.

The annual accounts of the Edinburgh and Leith Gas Commission, of which an abstract is given in another column, disclose a business which has been successfully prosecuted, and continues to be so. After much negotiation with the Scotch Office, who in these matters are authoritative, the form in which the accounts are henceforth to be presented has been fixed. While not disputing that there may be improvement in the alterations, this improvement can lie only in the direction of making the form of accounts assimilate to the accounts of other undertakings. The changes have been dictated by a desire for uniformity in gas accounts which is altogether good; but they have not been necessitated, nor will they have the effect of rendering the financial position of the undertaking in any degree more stable, so far as the community is concerned, nor the preparation of the accounts an easier task upon the Treasurer's department of the Gas Commission. Probably in the Scotch Office the official who is charged with the duty of tabulating the financial and other results of the gas undertakings of the country will find it easier to understand the accounts when they are all framed upon the same lines, and lines, too, which they themselves have laid down. This is about all that can be said for the requirements of the Scotch Office. One effect of the changes is to render comparisons with the form of accounts hitherto

in use next to impossible to make; and so we have to go back for some years in order to realize fully how great has been the increase in the business of the Commission. Looked at in this way, we find that the output of gas has increased, in the course of the last nine years, by 130,553,000 cubic feet, and that the price has been reduced from 3s. 4d. to 2s. 8d. per 1000 cubic feet. In the same time, the gross revenue has increased from £329,052 to £347,502—an increase of £18,450. The number of consumers has augmented by 11,510; and the number of cookers on hire by 2514. There are 8957 gas-cookers on hire. This figure is not to be confounded with the number in use, because there are many gas-cookers which are not on hire, but are possessed outright by the users. Still the numbers on hire at different dates give an indication of the extent to which the use of gas for cooking is being adopted; and it is evident that an increase of 2500 in nine years does not indicate that the field which is available will be fully occupied at a very early date. The Commissioners seem to have some notion of this sort, as on Monday they remitted to a Committee to consider as to the holding of an exhibition of gas appliances in the autumn. A few words of a complimentary nature with regard to the form of presenting the accounts may not be amiss. When they came before the Commissioners, they were accompanied by a prepared detailed report by the Treasurer and Collector—Mr. A. Canning Williams—which, in their consideration of the figures, must be of great assistance to the Commissioners. In his report, Mr. Williams explains some of the new features; and otherwise he makes much plainer than the accounts do the trend of affairs during the year. They may be regarded as already final, because the audit cannot alter the results set forth; and the Commissioners have no reason to cavil over the accounts, nor over the results of the year's working.

The announcement is made that the estimates for the current year of the Dunfermline Corporation Gas Department were under consideration by the Gas Committee on Tuesday, and that it is understood that they showed that, as the result of economy of management, it would be possible to effect a reduction in the price of gas, but that it is unlikely that any alteration of charge will be made, because of the probability of the Gas Department being burdened with a share of the cost of the promotion of the Greater Dunfermline Bill. Commenting upon this announcement in a column of "Notes and Suggestions" published in the "Dunfermline Press" to-day, the following statement is made: "The Manager of the Corporation Gas Department and the Convener of the Gas Committee are to be congratulated on the financial working of the concern. A year ago, the price of gas was reduced by 3d. per 1000 cubic feet; bringing down the charge for ordinary consumers to 2s. 3d.—one of the lowest rates in Scotland. Mr. Stewart (the Convener) indicated that there might be a further reduction this year; and this forecast would have been realized but for the view of the financial experts of the Town Council that the Gas Department should bear part of the cost of promoting the Burgh Bill. It is, of course, immaterial to the ratepayers how the parliamentary inquiries are paid for; but those responsible for the management of the Gas Department have a grievance. They are being robbed of some credit that they would have



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been in a position to claim if Greater Dunfermline had paid for its greatness out of something else than gas."

The installation of high-pressure gas lighting which the Town Council of Dunfermline two or three months ago gave their sanction to be introduced into High Street and Bridge Street of the burgh has been completed. The work has been done to the order of Mr. Alex. Waddell, the Gas Engineer. The plant employed is that of the James Keith and Blackman Company. There are twenty lamp-standards. Of these, four, placed at the Cross and at street corners, carry lights of 1500-candle power each; and the remainder have lights of 1000-candle power each. All the lamps have been fitted with a supplementary low-pressure lamp, for use after midnight. It is regarded with satisfaction locally that in Dunfermline they have had erected the first complete and permanent system of high-pressure street lighting which has been introduced in Scotland.

Mr. J. Clark, the Convener of the Gas Committee of the Perth Town Council, has prepared a scheme in which it is proposed to introduce mechanical stoking into the gas-works, at an estimated cost of £3900. The power proposed to be used is electricity.

The Cupar Fife Town Council on Monday agreed to the introduction of an automatic system of lighting and extinguishing the public lamps. The cost of the work is estimated at £580; and it is anticipated that by it there will be an annual saving of about £90.

The work of the removal of the chimney at the now disused gas-works in Edinburgh has been entrusted to Messrs. J. Dennis and Co., Limited, of Dalkeith; and it is being proceeded with as rapidly as possible.

A new water supply for Grangemouth, and intended also to serve the central district of Stirlingshire, was formally inaugurated yesterday. The works have been under construction for nearly six years. There was considerable difficulty in the making of the embankment for the reservoir which impounds the water of the Bannock Burn, on account of volcanic ash being found in the rock at a considerable depth. The ash being porous, it was necessary to dig the trench to a depth of, in some places, 116 feet, before a solid foundation was reached. The reservoir is of a capacity of 450 million gallons. It is about a mile in length, and has a width, in some parts, of about half-a-mile. The top water-level is 583 feet above sea-level; and the depth of water is 42 feet. The gathering-ground extends to about 2500 acres. The water supply in Grangemouth will now be equal to 2,200,000 gallons per day. On account of the difficulties that were encountered in the course of the work, the original estimate of £65,000 has been more than doubled; the cost of the completed works having been almost £150,000. The Engineers for the undertaking were Messrs. Warren and Stuart, of Glasgow; and the Consulting Engineer, Mr. J. Watson, of Bradford. The water was turned on at the reservoir by Mrs. Mackay, the wife of the Provost of the burgh.

The annual conference of the Scottish Sanitary Inspectors' Association was held in Dundee yesterday. In the course of his presidential address, Mr. T. Bishop, of Leith, dealing with smoke prevention, said

it was strange that users of power plants had not given more time and study to methods for preventing the terrible fuel waste now caused by defective combustion. It had been estimated by an eminent American authority that 8 per cent. of all coal used for making light, heat, and power went up the chimneys in smoke. On this extremely moderate estimate, the annual loss in Great Britain alone must amount to some millions of pounds sterling. The serious damage done to property must also be taken into account. It would pay owners and operators of steam and power plants to unite in founding and maintaining an experimental plant, where new methods of combustion could be tested.

CURRENT SALES OF GAS PRODUCTS.

[For Table of "Tar Products Prices," see p. 66.]

LONDON, July 3.

Tar Products.

The markets for tar products continue firm. There has been a little more inquiry for pitch during the past week, next season's delivery, and in some quarters improved prices are reported to have been paid. Benzol 90 per cent. is steady, though there is not very much business doing. Solvent naphtha is quiet; but there is a fair demand for heavy naphtha. Crude carbolic is very firm; and there is more inclination to do business for forward delivery. There has been a little more business in creosote at improved prices; and there is still inquiry for delivery to the end of this year and into the first few months of next.

The average values during the week were: Tar, 18s. to 22s., *ex works*. Pitch, London, 36s. to 37s.; east coast, 36s. to 36s. 6d.; west coast, Manchester, 35s. 6d. to 36s., Liverpool, 36s. to 36s. 6d., Clyde, 36s. to 36s. 3d. Benzol, 90 per cent., casks included, London, 9d. to 9½d.; North, 9d.; 50-90 per cent., casks included, London, 8¾d. to 9½d.; North, 8½d. to 9d. Toluol, casks included, London, 9¾d. to 10d.; North, 9¼d. to 9½d. Crude naphtha, in bulk, London, 4d. to 4½d.; North, 3¾d. to 3½d.; solvent naphtha, casks included, London, 11d. to 11¾d.; North, 10d. to 10½d.; heavy naphtha, casks included, London, 11½d. to 1s. 0½d.; North, 10d. to 10½d. Creosote, in bulk, London, 2½d. to 2¾d.; North, 1¾d. to 2d. Heavy oils, in bulk, 2½d. Carbolic acid, 60 per cent., casks included, east coast, 1s. 9¾d. to 1s. 10d.; west coast, 1s. 8½d. to 1s. 9½d. Naphthalene, £4 10s. to £8 10s.; salts, 40s. to 42s. 6d., bags included. Anthracene, "A" quality, 1½d. per unit, packages included and delivered.

Sulphate of Ammonia.

This article is again very firm; and considerable business has been done for delivery to the end of this year and the first few months of next. Actual Beckton is quoted £13; outside London makes, £12 15s.; Hull, £13 5s.; Liverpool, £13 7s. 6d. to £13 8s. 9d.; Leith, £13 10s.; and Middlesbrough, £13 5s.

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MANCHESTER.

COAL TRADE REPORTS.

Northern Coal Trade.

Both production and distribution of coal have been interfered with by the labour dispute of the last few days; but in the northern coal-field the output is nearly normal again. In the steam coal trade, best Northumbrians are from 10s. 7d. to 10s. 9d. per ton f.o.b.; second-class steams from 9s. 3d. to 9s. 6d.; and steam smalls from 5s. to 6s. These prices, however, are subject to fluctuations due to the changes in the labour position. In the gas coal trade, the changes are not so rapid. Durham gas coals are generally steady; and the output is fair. Second-class coals are from 9s. 6d. per ton f.o.b.; best Durhams are from 10s. 3d. to 10s. 4½d.; and "Wear specials," from 10s. 9d. to 10s. 10½d. Some of the largest of the gas-coal producers have given wage-advances to the seamen, and their steamers are now running freely. There is little decided as to contracts; but several of moderate size are in course of negotiation. One, for about 20,000 tons at near 9s. per ton f.o.b., is settled for Belgium; and another, for about 9000 tons, for the same country, is reported for a higher quality at about 9s. 7½d. In coke, the market is quiet. Good gas coke is quoted at 14s. to 14s. 6d. per ton f.o.b. Tyne or Wear.

Scotch Coal Trade.

The most that can be said of trade is that it has not gone back during the week. There is very little that is encouraging in current business, except the view be taken that any further movement downwards is inconceivable, and therefore upwards is expected. The prices now quoted are: Ell, 8s. 3d. to 9s. 9d. per ton f.o.b. Glasgow; splint, 9s. 3d. to 9s. 6d.; and steam, 8s. 9d. to 9s. The shipments for the week amounted to 332,651 tons—a decrease of 40,027 tons upon the previous week, but an increase of 11,820 tons upon the corresponding week last year. For the year to date, the total shipments have been 7,603,112 tons—an increase of 9446 tons over last year.

Aldershot Electricity Supply and the Gas Company.—In the course of a Local Government Board inquiry into an application by the Aldershot Urban District Council for sanction to borrow £2500 for extensions of plant at the electricity works, the Clerk (Mr. W. E. Foster) said the Council were advised by their Committee that if they had oil-engines they could produce electricity more cheaply. They had very strong opposition in Aldershot, where there was a large Gas and Water Company who supplied the whole district around; and they were at the present time enabled to furnish gas in Aldershot at the unusually low rate of 2s. 6d. per 1000 cubic feet. Though the cheapness of gas benefited the general public, it affected the working of the Council's electricity supply to a certain extent. But for all this they found their supply was gradually increasing. The Council fully realized that it behoved them to make every effort to produce electricity as cheaply as they could, and to give as efficient a supply as possible, in order to compete with such a formidable opponent.

Fylde Water Supply.—The Fylde Water Board, on the report of their Engineer, Mr. Edward Garlick, are considering the question of constructing a new trunk water-main. The last trunk main laid for the storage reservoirs was one 24 inches diameter in 1899; and in the past ten years the number of consumers and average daily consumption have increased from 21,082 and 3,118,292 gallons to 29,105 and 4,355,681 gallons.

Alexandra Water Company.—In their report for the year ended the 31st of March, the Directors of this Company comment favourably on the satisfactory and continued progress of the business. They state that the total number of consumers was 27,989, compared with 25,295 in the previous year; representing an increase of 2694. The total receipts, which amount to £124,969, show an increase of £7041, and the working expenses an increase of £1058. The Directors have written off £10,780 as depreciation—making, with the amount already written off, a total of £66,680; and they recommend the shareholders to fix the dividend at 9s. 3d. per share. With the interim dividend of 2s. 6d. paid on Dec. 15, this makes a dividend for the year of 11s. 9d.

Fraserburgh Gas Arbitration Award.—In "Notes from Scotland" in the last number, reference was made to this matter, and some round figures were given. We learn from the Gas Company's Manager and Secretary (Mr. H. G. Ritchie) that the findings of the Oversman (Mr. A. Yuill, of Dundee) issued to the parties, but not yet final, are as follows: The Town Council are to pay for the Company's undertaking, business, works, &c., £26,961; and for stocks taken over, £647—total, £27,608. As mentioned last week, the Company retain the profits to, and the accounts outstanding on, April 30 last; the total amounting to £1415. The Arbitrator for the Company was Mr. Adam MacPherson, of Kirkcaldy; for the Town Council, Mr. W. B. M'Lusky, of Perth.

Birmingham Water Supply.—In his epitome of the accounts for the year to March 31, Mr. T. H. Clare, the City Treasurer of Birmingham, says the revenue account of the water undertaking for 1910-11 shows a balance of income in excess of expenditure of £213,671, carried to profit and loss account. The profit and loss account shows a loss of £75,083, which has been provided for as follows: Contribution from the borough rate, £65,000; transfer from capital under section 22 of the Birmingham Corporation Water Act, 1902, £7131; balance carried forward, £2952. The amount of capital expended during the year under the 1892 Act was £13,280. The total expenditure on capital account to March 31 under the 1875 and 1879 Acts was £2,097,860; and under the Act of 1892, £6,218,849. The gross amount of loans negotiated, including annuities, under the 1875 and 1879 Acts, was £2,097,860; and under the 1892 Act, £6,232,500. The amount provided from revenue for redemption of debt during the year, under the 1875 and 1879 Acts, was £23,574; and under the 1892 Act, £5028. The gross amount provided for redemption of debt to the end of 1910-11, under the 1875 and 1879 Acts and the 1892 Act, was £270,141. The balance of loans to be provided for, under the 1875 and 1879 Acts, was £1,865,710; and under the 1892 Act, £6,194,509.

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Domestic Hot-Water Heating by Gas.—At Northampton, last Wednesday, before the fitters and staff of the Gas Company, a lecture on domestic hot-water work was delivered by Mr. Frederick Dye, on behalf of Messrs. John Wright and Co. The meeting was presided over by the Engineer and Manager of the Company (Mr. G. S. Eunson), who was supported by Mr. W. J. Barker, the chief of the staff. The audience numbered about fifty. The subject was dealt with fully, both generally and in relation to the use of gas-boilers; and a demonstration of the action of a thermostat was given.

Diss Water Supply.—An inquiry was held at Diss last Tuesday, by Dr. A. W. Brightmore, into an application by the Urban District Council for sanction to borrow money for purposes of water supply. There was no opposition to the scheme, for which it is calculated that about £6500 will be required. Mr. W. H. Booth, the Engineer, stated that the existing water supply was entirely from wells. It was proposed to lay 5 miles of mains, and erect a water-tower to hold 30,000 gallons. Boring to a depth of 400 feet they got well into the chalk, and tests showed that there was a plentiful supply of water. The scheme would provide 20 gallons per head per day for 4000 people.

Okehampton Gas Company.—At the recent annual meeting of this Company, the report showed that the total revenue was £1440 and the expenditure £1062—a difference of £378. The sum of £75 was written off for depreciation, and £21 was allowed for bad debts; leaving a profit of £282. The balance brought forward increased this to £299, which was available for distribution. The Directors recommended the declaration of a dividend of 6½ per cent., and the placing of £70 to the reserve fund, making it £200. A suggestion was made that only 5 per cent. should be paid and the price of gas (4s. 7d.) reduced. It was not, however, acted upon; and the report and accounts were adopted.

Paignton Water Undertaking.—Members of the Paignton District Council last Tuesday paid their annual visit to the water-works, which are situated at Holne Moor, on the southern border of Dartmoor. They were accompanied by the members of the Brixham District Council, as well as by Mr. J. C. Hawkins (the Water Engineer), Mr. J. R. Mill (the Clerk), and other officials of the Paignton Council. In the course of the proceedings, there was a luncheon; and Mr. W. J. Ham (the Chairman of the Paignton Council), who presided, referred to the assistance given by the Brixham and Teignmouth Councils in the passing of the Bill which the Paignton Council have promoted this session for the extension and improvement of the water-works. He said that when the second main was laid, they would be in a position to improve the supply. Mr. F. W. Puddicombe (the Chairman of the Water Committee) stated that the duplicate main would be 12 miles in length, and an additional installation of Candy filters was also to be put down. The water-works was a good asset for Paignton; and if they were going to sell it, there would be plenty of companies who would pay twice the amount the works cost the Council. The Clerk remarked that they already had an offer. Mr. Puddicombe said they did not want any offers; they were content with things as they are.

Improved Street Lighting by Gas for Kensington.—The London County Council will to-day be asked to agree to an application from the Kensington Royal Borough Council for sanction to the borrowing of £3800 (repayable within five years, on the instalment system) for the improvement of street lighting by gas within the borough, by the substitution, for Kern burners, of inverted incandescent burners. The Finance Committee make the proposal.

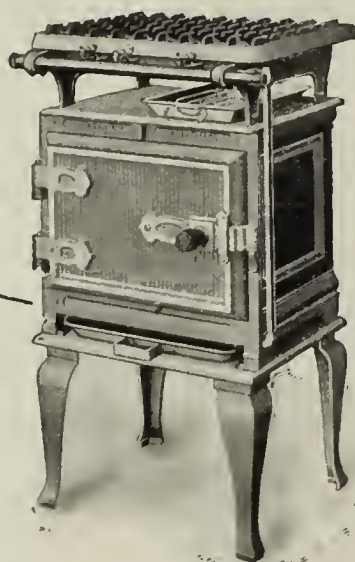
Kinder Valley Water-Works of the Stockport Corporation.—The Water Committee of the Stockport Corporation hope to complete by next month the construction of their new works in the Kinder Valley, upon which so much money has been spent in consequence of the first part of the scheme having to be abandoned owing to the failure to find a safe foundation for the huge masonry dam that was to be built. Under the original scheme, three reservoirs were to be constructed; and the contract for the one at Kinder was let for £248,000 in the latter part of 1902. The limit depth of excavating for the dam was 50 feet; but, owing to the nature of the strata, consisting mostly of shale, it was found necessary to go still lower. When the excavating had been carried to a depth of 70 feet, greater difficulties were encountered; and the Council decided upon a modified scheme, and the building of an earth dam, which is now practically completed. It stretches across the Kinder Valley; and the embankment is said to be the highest of its kind in existence. It measures 125 feet from the level of the stream to the top, and is 1150 feet in length. The holding capacity of the reservoir is 600 million gallons; and the filter plant put down will deal with about 5 million gallons per day. The modified scheme, which was commenced in 1907, was estimated to cost £244,000; and the work has been carried out by administration.

A New Reservoir for Cardiff.—A large party journeyed from Cardiff to Llwyn-On last Wednesday to witness the laying of the key-stone of the first masonry work in connection with the reservoir embankment to be constructed there for the Cardiff Corporation water supply. The ceremony was performed by Alderman C. H. Bird, Lord Mayor of Cardiff, and Chairman of the Water Committee, who was presented with a silver trowel by Mr. Louis P. Nott (the Contractor), and with an ivory-handled mallet by Mr. C. H. Priestley (the Water Engineer). The reservoir is the last of the series of three to be constructed by the Cardiff Corporation under their Act of 1886, and will more than double Cardiff's present water storage. Originally designed for a capacity of 640 million gallons, it was subsequently decided to make fuller use of the capacities of the drainage area; and when the reservoir is completed, it will have a capacity of over 1200 million gallons, whereas the total storage at all the present existing reservoirs is 1065 million gallons. The drainage area comprises 10,400 acres; but the compensation water to be allowed to the Taff Fawr River (the waters of which are impounded for the scheme) is 7½ million gallons a day. The contract was let to Mr. Nott at £201,000 (though the total cost, from road diversions, &c., will be about £300,000) on Nov. 28 last; and the work, which will necessarily occupy a long time, was commenced some six months ago.

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The European Gas Company, Limited, have declared a final dividend of 12s. 6d. per share, free of tax.

Under date of June 30, Messrs. John Aird and Sons have issued an intimation that, in consequence of the death of the late Sir John Aird, Bart., the firm have incorporated their business with that of the Westminster Construction Company, Limited, of 22, Queen Anne's Gate, Westminster, S.W. (of which the late Sir John was Chairman), under the style of "Airds Limited."

In the second week of February a temporary show-room was opened in Stafford by the Cannon Ironfoundries, Limited, for the purpose of canvassing the district for cookers, &c., and the result has been that 300 cookers and 41 grillers have been placed out. The Gas and Electricity Department of the Corporation (of which Mr. W. M. Valon is the Engineer and Manager) have now 4560 gas-cookers in use, with a total of 5426 consumers. This ranks among the highest proportions in the country.

Coalexld Limited, of Lancaster, have taken out a patent (No. 14,634) for a machine for the purpose of measuring the given weights of chemicals into packets for the various sizes of charges of coal. The machine was designed to minimize labour in charging retorts with the chemicals. They have lately been experimenting with a machine on the same principle, but of a larger capacity, for the purpose of weighing or measuring 28 lbs. of coke for the paper-bag delivery; and we are informed that the result of the provisional testing has been so successful that a permanent fully equipped machine for power use is now being built. The average result of weighings by the machine is stated to be more accurate than when hand weighing is in operation. The speed of the machine can be arranged so as to fill three or four bags per minute; and it should prove useful in works in which the paper-bag system of sale has been adopted.

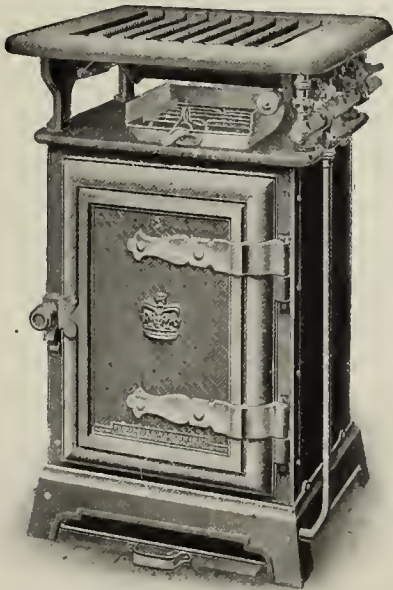
To commemorate the Jubilee of Messrs. George Glover and Co., Limited, the Chelsea employees had on the 24th ult. a special outing and dinner at Great Yarmouth, where they were joined by the firm's employees from the branch works in Leeds and Manchester. In responding to the toast of "Success to the Firm," the Managing-Director (Mr. James W. Glover), who presided, gave some interesting reminiscences of his association half-a-century ago with Dr. George Glover, who superintended the construction of the test gasholders for the Standards Department of the Board of Trade; these instruments being necessary under the Sale of Gas Act, which in 1859, for the first time, fixed a standard measure for gas. In 1861, Dr. Glover took out a patent for, and started the manufacture of, dry gas-meters, which at the International Exhibition in 1862 gained the medal for "superior construction and sound workmanship." The Chairman also referred to the firm's recent successes with their "Standard" automatic attachment. He was supported by his son, Mr. Albert W. Glover, by the representatives of the firm (Messrs. Hudson, Lyon, and Laughton), and by other members of the staff.

APPLICATIONS FOR LETTERS PATENT.

- 13,912.—DEMPSTER, R., AND SONS, LIMITED, and TOOGOOD, H. J., "Vertical gas-retorts." June 12.
- 13,919.—WELSH, E. W., "Opening and shutting the doors of coal-trucks." June 12.
- 13,963.—DUTCHMAN, E., FAWCETT, A. S., JESSOP, S., and TRAVIS, W. J., "Gas-burners." June 12.
- 14,003.—SKINNER, R. J., "Automatically controlled gas-valve." June 13.
- 14,020.—HESKETT, T. J., "Working gas-furnaces." June 13.
- 14,061.—MATTHEWS, W. C., "Mantles." June 13.
- 14,065.—CLARKE, H., and CAMPBELL, J. A., "Discharge of tar and liquor from hydraulic mains." June 13.
- 14,079.—KOLLER, K., "Gas-producers." June 13.
- 14,115.—JENNINGS, F. W., "Control valves." June 14.
- 14,131.—RIGBY, T., and TESTRUP, N., "Supply of heat in wet carbonizing installations." June 14.
- 14,137.—SPERRY, G. N., and WOOD, W. H., "Gas-burners." June 14.
- 14,183.—HEATH, A. W., and HARRISON, C. H., "Globe or shade holders." June 15.
- 14,218.—FIMON, C. F., "Automatic recording apparatus for measuring gaseous fluids." June 15.
- 14,230.—RYSMAN, E. R., "Acetylene generators." June 15.
- 14,231.—SEYD, F. O., "Gas illuminated advertising apparatus." June 15.
- 14,232.—BINGHAM, C., "Gas-generators." June 15.
- 14,277.—WING, J., JUN., and BURNETT, J. R., "Gas-heated furnaces." June 16.
- 14,394.—BREEDEN, J., AND CO., LIMITED, and BREEDEN, F., "Gas-lamps." June 17.
- 14,427.—BOULT, A. J., "Control of gas-valves." A communication from H. H. Kanugy and G. W. de Smet. June 17.
- 14,440.—BURSTALL, F. W., "Treating gases in the production of sulphate of ammonia." June 19.
- 14,530.—OPITZ, C. J., "Expansion joints." June 19.
- 14,548.—BARKER, J., "Spirally-guided gasholders." June 20.
- 14,552.—GEAIRNS, A. D., and BOOTHROYD, A., "Conveying hot coke." June 20.
- 14,560.—SHORT, A. J., "Gas-pressure governors." June 20.
- 14,616.—PIPER, E. J., "Acetylene generator." June 20.
- 14,628.—TEED, F. L., SULMAN, H. L., and PICARD, H. F. K., "Recovery of sulphur from gases." June 20.
- 14,629.—TILLÉ, G., "Joints for pipes." June 20.
- 14,762.—CHANCE, K. M., and BRITISH CYANIDES COMPANY, LTD., "Manufacture of cyanide." June 21.
- 14,767.—KUNZE, E. A., "Gas-generators." June 21.
- 14,774.—DOR-DELATTRE, E., "Gas-producers." June 21.

PARKINSON'S POINTS.

IMMEDIATE DELIVERY.



INTERCHANGEABLE
PARTS.

PERFECT FITTING
RENEWALS.

THE PARKINSON
STOVE COMPANY, LD.

BIRMINGHAM
AND LONDON.

WANTED, FOR SALE, CONTRACTS, &c., ADVERTISEMENTS IN THIS WEEK'S "JOURNAL."

Situations Vacant.

DRAUGHTSMAN. Box 5953, Willing's, Strand, W.C.
FOREMAN. No. 5421.

Situations Wanted.

CLERK. No. 5420.
ENGINEER (DESIGNING AND CONSTRUCTING). Z., care
of Streets, Cornhill.

Plant, &c. (Second-Hand), For Sale.

GASOMETER, &c. Great Central Railway. Tenders
by July 7.
METER AND RETORT-HOUSE GOVERNOR. Newcastle
(Staffs.) Gas Department.
RETORT MOUTHPIECES, PIPES, VALVES, &c., AND
STEAM ENGINE. Smethwick Gas-Works.

Patent Licence, &c.

OBTAINING GAS FROM TAR IN GAS PRODUCER PLANT.
Gardner and Son, Fleet Street, E.C.

Meeting.

EUROPEAN GAS COMPANY. London Offices, July 11,
Two o'clock.

Stocks and Shares.

BROADSTAIRS GAS COMPANY. By Auction. July 6.
EAST GRINSTEAD GAS AND WATER COMPANY. July 11.
GRAVESEND AND MILTON WATER COMPANY. July 11.
REDHILL GAS COMPANY. July 11.
SOUTHEND WATER COMPANY. July 11.
SUTTON GAS COMPANY. July 11.
WEST SURREY WATER COMPANY. By Tender. July 17.

TENDERS FOR

Coal and Cannel.

BURY CORPORATION. Tenders by July 10.
GLOSSOP GAS COMPANY. Tenders by July 8.
RADCLIFFE AND PILKINGTON GAS COMPANY, Tenders
by July 12.

Fire-Clay Goods.

LISBURN URBAN DISTRICT COUNCIL. Tenders by July 20.

Iron and Steel Work, required in the Con-
struction and Erection of Various Plant.

LISBURN URBAN DISTRICT COUNCIL. Tenders by July 20.

Meters.

BELFAST GAS DEPARTMENT. Tenders by July 13.

Pipes, &c.

CHORLEY GAS DEPARTMENT. Tenders by July 11.

Tar.

HEREFORD GAS DEPARTMENT. Tenders by July 10.
HEYWOOD GAS DEPARTMENT. Tenders by July 18.

TAR PRODUCTS PRICES.

Representative manufacturers give the following as fair current values for the week ending July 1. Prices are net, and they include the usual packages and delivery f.o.b., f.a.s., or f.o.r., as customary.

Article.	Basis.	London.	North-East Coast.	East Coast, Yorks.	West Coast.		Glasgow.
					Liverpool.	Manchester.	
Tar, crude	per ton	—	18/6 21/3	19/6 23/-	19/- 22/-	19/- 22/-	—
Pitch	"	38/- 38/6	36/3	37/6	36/6	36/-	36/6
Benzol, 90%	per gallon	—	-9 1/2	-9	-9 1/2	-9 1/2	-9 1/2
Benzol, 50-90%	"	—	-9 1/2	-9 1/2	-8 1/2	-8 1/2	—
Toluol, 90%	"	—	-9 1/2	-10	-10	-10	-10
Crude naphtha, 30%	"	—	-3 1/2	-4	-3 1/2	-3 1/2	—
Light oil, 50%	"	—	-3 1/2	-3 1/2 -1/4	-3 1/2	-3 1/2 -1/4	—
Solvent naphtha, 90-160	"	—	-10	-10	-10	-10 1/2	-11
Heavy naphtha, 90-190	"	—	-11	-11 1/2	-11 1/2	-11 1/2	-11
Creosote in bulk	"	-2 1/2	-2 1/2	-2	-2 1/2	-2 1/2	-1 1/2
Heavy oils	"	—	-2 1/2 -1/2 5/8	-2 1/2	-2 1/2	-2 1/2	-2 1/2
Carbolic Acid, 60's	"	—	1/10	1/10	1/7	1/7 1/2	1/10
Naphthalene, crude drained salts	per ton	—	43/9	41/3	47/6	48/9	—
" pressed	"	—	60/-	63/-	60/-	60/- 72/6	—
" whizzed	"	—	—	—	71/3	60/- 75/-	60/-
Anthracene	per unit	-1/2	-1 1/2	-1 1/2	-1 1/2	-1 1/2	—

GAS COMPANIES' STOCK AND SHARE LIST.

Referred to on p. 16.

Issue.	Share.	When ex- Dividend.	Dividend or Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Invest- ment.	Issue.	Share.	When ex- Dividend.	Dividend or Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Invest- ment.
£	Stk.	p.c.			£ s. d.			£	Stk.	p.c.			£ s. d.		
1,551,868	Stk.	Apl. 12	5	Alliance & Dublin Ord.	82-85	-1	5 17 8	4,940,000	Stk.	May 12	9	Imperial Continental	184-186	-1	4 16 9
374,000	Stk.	Jan. 13	4	Do. 4 p.c. Deb.	95-97	..	4 2 6	1,235,000	Stk.	Feb. 10	3 1/2	Do. 3 1/2 p.c. Deb. Red.	92-94	..	3 14 6
200,000	5	May 12	7	Bombay, Ltd.	64-67	..	5 3 8	200,242	Stk.	Mar. 10	6	Lea Bridge Ord. 5 p.c.	119-121	..	4 19 2
40,000	5	"	7	Do. New, £4 paid.	54-57	..	4 17 5	561,000	Stk.	Feb. 24	10	Liverpool United A.	214-216	..	4 12 7
50,000	10	Feb. 24	15	Bourne-) 10 p.c. . .	28 1/2-29 1/2	..	5 1 8	718,100	"	"	7	Do. B.	163-165	..	4 4 10
311,810	10	"	7	mouth Gas } B 7 p.c. .	16 1/2-16 3/4	..	4 3 0	306,083	"	June 30	4	Do. Deb. Stk.	102-104	..	3 16 11
75,000	10	"	6	and Water } Pref. 6 p.c.	14 1/2-15	..	4 0 0	75,000	5	June 15	6	Malta & Mediterranean	48-48 1/2	..	6 3 1
380,000	Stk.	"	12 1/2	Brentford Consolidated	257-262	..	4 15 5	560,000	100	Apl. 1	5	Met. of } 5 p.c. Deb.	100-102	..	4 18 0
330,000	"	"	9 1/2	Do. New	203-208	..	4 11 4	250,000	100	"	4 1/2	Melbourne } 4 1/2 p.c. Deb.	100-102	..	4 8 3
50,000	"	"	5	Do. 5 p.c. Pref. . .	122-124	..	4 0 8	541,920	20	May 31	3 1/2	Monte Video, Ltd.	123-124	..	5 5 8
206,250	"	June 15	4	Do. 4 p.c. Deb. . .	97-99	..	4 0 10	1,775,892	Stk.	Feb. 24	4 1/2	Newcastle & Gt. Tesh'd Con.	102 1/2-103 1/2	..	4 4 6
220,000	Stk.	Mar. 10	11	Brighton & Hove Orig.	217-220	..	5 0 0	529,705	Stk.	June 30	3 1/2	Do. 3 1/2 p.c. Deb.	87 1/2-88 1/2	..	3 19 1
246,320	"	"	8	Do. A Ord. Stk. . .	157-160	..	5 0 0	55,940	10	Mar. 10	7	North Middlesex 7 p.c.	15-16	..	4 7 6
490,000	20	Apl. 12	11 1/2	British	44-45	+ 1/2	5 4 6	300,000	Stk.	Apl. 27	8	Oriental, Ltd.	137-139	..	5 15 1
120,000	Stk.	June 30	4	Do. 4 p.c. Deb. Stk.	94-96	..	4 3 4	60,000	5	Apl. 12	8	Ottoman, Ltd.	6 1/2-7 1/2	..	5 10 4
109,000	"	Feb. 10	6	Bromley, A 5 p.c. . .	116-118	..	5 1 8	31,800	53	Feb. 24	13	Portsea Island A . .	135-140	..	4 18 4
165,700	"	"	4 1/2	Do. B 3 1/2 p.c. . .	87-89	..	5 1 2	60,000	50	"	13	Do. B	—	..	—
82,278	"	"	5 1/2	Do. C 5 p.c. . . .	106-108	..	5 1 10	100,000	50	"	12	Do. C	120-125	..	4 16 0
55,000	"	June 30	3 1/2	Do. 3 1/2 p.c. Deb. .	82-84	..	4 3 4	114,800	50	"	10	Do. D and E . . .	—	..	—
250,000	Stk.	"	4	Buenos Ayres 4 p.c. Deb.	95-97	..	4 2 6	398,490	5	May 31	8	Primitiva Ord. . . .	7 1/2-7 3/4	..	5 3 3
100,000	10	"	—	Cape Town & Dis., Ltd.	24-34	- 1/2	—	796,980	5	June 30	5	Do. 5 p.c. Pref. . .	5 1/2-5 3/4	..	4 10 11
100,000	10	"	—	Do. 4 1/2 p.c. Pref. .	6-6 1/2	..	—	488,900	100	June 1	4	Do. 4 p.c. Deb. . .	97-99	..	4 0 10
50,000	50	Nov. 2	6	Do. 6 p.c. 1st Mort.	—	..	—	312,650	Stk.	June 30	4	River Plate 4 p.c. Deb.	95-97	..	4 2 6
100,000	Stk.	June 30	4 1/2	Do. 4 1/2 p.c. Deb. Stk.	86-88	..	5 2 3	250,000	10	Mar. 24	9	San Paulo, Ltd. . . .	20-21	+ 1/2	4 5 9
157,150	Stk.	Feb. 24	5	Chester 5 p.c. Ord. . .	109-111	..	4 10 1	115,000	10	"	6	Do. 6 p.c. Pref. . .	12-12 1/2	..	4 16 0
1,513,280	Stk.	"	5 9/4	Commercial 4 p.c. Stk.	114-116	..	4 14 3	125,000	50	July 1	5	Do. 5 p.c. Deb. . .	49-50	..	5 0 0
560,000	"	"	5 1/2	Do. 3 1/2 p.c. do. . .	108-110	..	4 16 11	135,000	Stk.	Mar. 24	10	Sheffield A	235-237	..	4 4 5
475,000	"	June 15	3	Do. 3 p.c. Deb. Stk.	75 1/2-77 1/2	..	3 17 5	209,934	"	"	10	Do. B	235-237	..	4 4 5
800,000	Stk.	May 31	4	Continental Union, Ltd.	92-95	..	4 4 3	523,500	"	"	10	Do. C	234-236	..	4 4 9
200,000	"	"	7	Do. 7 p.c. Pref. . .	134-136	..	5 2 11	70,000	10	June 15	7	South African . . .	8 1/2-9 1/2	..	7 7 4
492,270	Stk.	"	5 1/2	Derby Con. Stk. . . .	122-124	..	4 8 9	6,429,895	Stk.	Feb. 10	5 9/4	South Met., 4 p.c. Ord.	119-121	..	4 10 3
55,000	"	"	4	Do. Deb. Stk. . . .	104-105	..	3 16 2	1,895,445	"	Jan. 13	3	Do. 3 p.c. Deb. . .	80-82	..	3 13 2
148,995	"	Apl. 12	5	East Hull 5 p.c. Ord.	—	..	—	209,820	Stk.	Mar. 10	8	South Shields Con. Stk.	154-156	..	5 2 7
840,150	10	Jan. 27	10	European, Ltd. . . .	19-20	..	5 0 0	605,000	Stk.	Feb. 24	5 1/2	S'th Suburb'n Ord. 5 p.c.	119-121	..	4 13 6
16,179,445	Stk.	Feb. 24	4 1/2	Gas-) 4 p.c. Ord. . .	106 1/2-107 1/2	+ 1/2	4 7 0	60,000	"	"	5	Do. 5 p.c. Pref. . .	118-120	..	4 3 4
2,600,000	"	"	3 1/2	light) 3 1/2 p.c. max. .	85-87	..	4 0 6	117,058	"	Jan. 13	5	Do. 5 p.c. Deb. Stk.	123-125	..	4 0 0
4,062,235	"	"	4	and) 4 p.c. Con. Pref.	103-105	..	3 16 2	502,310	Stk.	May 12	5	Southampton Ord. .	109-111	..	4 6 11
4,531,705	"	June 15	3	Coke) 3 p.c. Con. Deb.	78 1/2-80 1/2	..	3 14 6	120,000	Stk.	Feb. 10	7	Tottenham A 5 p.c.	147-150	..	4 13 4
258,740	Stk.	Mar. 10	5	Hastings & St. L. 3 1/2 p.c.	95-97	..	5 3 1	483,940	"	"	5 1/2	and) B 3 1/2 p.c.	116 1/2-118 1/2	..	4 12 10
82,500	"	"	6 1/2	Do. do. 5 p.c. . . .	—	..	—	149,470	"	June 15	4	Edmonton) 4 p.c. Deb.	96-98	..	4 1 8
70,000	10	Apl. 27	11	Hongkong & China, Ltd.	17 1/2-17 3/4	..	6 3 11	182,380	10	June 15	8	Tuscan, Ltd.	8 1/2-9 1/2	..	8 13 0
131,000	Stk.	Mar. 10	7 1/2	Ilford A and C . . .	147-150	..	4 18 4	149,900	10	July 1	5	Do. 5 p.c. Deb. Red.	96-98	..	5 2 0
65,780	"	"	5 1/2	Do. B	118-121	+1	4 17 1	236,476	Stk.	Feb. 24	5	Tynemouth, 5 p.c. max.	115-117	..	4 5 6
65,500	"	June 30	4	Do. 4 p.c. Deb. . . .	94-96	..	4 3 4	255,636	Stk.	Feb. 24	6 1/2	Wands-) B 3 1/2 p.c.	141-143	..	4 14 5
								85,766	"	June 30	3	worth) 3 p.c. Deb. Stk.	71-73	..	4 2 2

Prices marked * are "Ex. div."

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No notice can be taken of anonymous communications. Whatever is intended for insertion in the "JOURNAL" must be authenticated by the name and address of the writer; not necessarily for publication, but as a proof of good faith.

COPY FOR ADVERTISEMENTS for the "JOURNAL" should be received at the Office NOT LATER than TWELVE O'CLOCK NOON ON MONDAY, to ensure insertion in the following day's issue.

Orders for Alterations in, or stoppages of, PERMANENT ADVERTISEMENTS should be received by the FIRST POST on SATURDAY.

Wanted, For Sale, and Tender Advertisements, Six Lines and under, 3s.; each additional line, 6d.

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Resists 4500° Fahr. Best for GAS-WORKS.

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Albert Chemical Works, BRADFORD,
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Pitch, Creosote, Brick and Fuel Oils, Benzol, Solvent Naphtha, Carbolic, Sulphate of Ammonia.

ENQUIRIES SOLICITED.

FOR Gas-Works Plant of Every Description; also SULPHATE OF AMMONIA and SULPHUR RECOVERY PLANTS,

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DONNINGTON, NEWPORT, SALOP.

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SPECIALLY prepared for Sulphate of AMMONIA Makers by

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SPENCER'S PATENT HURDLE GRIDS.

THE very best Patent Grids for Holding Oxide Lightly.

See Illustrated Advertisement, June 20, p. 801.

HYDRATED OXIDE OF IRON.

PREPARED from Pure Iron.

Twice as rich as Bog Ore.

Gives no back Pressure.

The Cheapest in the Market.

READ HOLLIDAY AND SONS, LTD., HUDDERSFIELD.

JOHN RILEY & SONS, Chemical Manufacturers, Hapton, near Accrington, are MAKERS of Special SULPHURIC ACID, for Sulphate of Ammonia Making. Highest percentage of Sulphate of Ammonia obtained from the use of this Vitriol, which has now been used for upwards of 50 years. References given to Gas Companies.

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SPENT OXIDE PURCHASED IN ANY DISTRICT.

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NYMEGEN, HOLLAND.

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FIRTH BLAKELEY, SONS, AND COMPANY, LIMITED, Church Fenton, near LEEDS.

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MEADE-KING, ROBINSON, & CO.,
Represent the Strongest Independent Refineries in America; also Petroleum Spirit for Gas Enrichment. 18, EXCHANGE STREET, MANCHESTER, and TOWER BUILDING, 22, WATER STREET, LIVERPOOL.

SULPHURIC ACID for Sale, specially suitable for making Sulphate of Ammonia.

BROTHERTON AND CO., LTD., Chemical Manufacturers. Works: BIRMINGHAM, LEEDS, SUNDERLAND, AND WAKEFIELD.

"GUIDE to Patents, Trade Marks and DESIGNS," 1910. 4th Edition. Contains concise information on British, Colonial, and Foreign Patents, &c. All Inventors and those interested should send for free copy to J. S. WITHERS & SPOONER, Chartered Patent Agents, 323, High Holborn, LONDON. 'Phone. 480 HOLBORN. Telegrams: "Improvahly, London."

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J. E. C. LORD, Ship Canal Tar-Works,
Waste, Manchester. Pitch, Creosote, Benzol, Toluol, Naphtha, Pyridine, all kinds of Cresylic Acid, Carbolic Acid, Sulphate of Ammonia, &c.

AMMONIA.

Consumers in any form are invited to correspond with CHANCE AND HUNT, LTD., Chemical Manufacturers, OLDBURY, WORCS.

AMMONIACAL Liquor wanted.

CHANCE AND HUNT, LTD., Chemical Manufacturers, OLDBURY, WORCS.
Telegrams: "CHEMICALS."

PATENTS AND TRADE MARKS

PUBLICATIONS, "MERCHANDISE MARKS ACT, and Decisions thereunder," 1s.; "TRADE SECRETS v. PATENTS," 6d.; "DOCTRINE of EQUIVALENTS, Mechanical and Chemical," 6d. "SUBJECT-MATTER of PATENTS," 6d.

MEWBURN, ELLIS, & PRYOR, Chartered Patent Agents, 70 & 72, Chancery Lane, London, W.C. Telegrams: "Patent London." Telephone: No. 243 Holborn.

OXIDE OF IRON.

SPENT OXIDE PURCHASED.

BALE'S FIRE CEMENT.

PAINT FOR GAS-WORKS.

"KLEENOFF," THE COOKER CLEANER.

BALE & CHURCH,

5, CROOKED LANE, LONDON, E.C.

SULPHURIC ACID.

SPECIALLY prepared for the Manufacture of SULPHATE OF AMMONIA.

SPENCER CHAPMAN & MESSEL, LTD.,

with which is amalgamated WM. PEAROE & SONS, LTD., 96, Mark Lane, LONDON, E.C. Works: SILVERTOWN.

Telegrams: "HYDROCHLORIO, LONDON."

Telephone: 341 AVENUE.

AMMONIA Waste Liquor Disposal.

Purification Plant.

Results Guaranteed. No Working Costs.

JOHN RADCLIFFE, Chemical Engineer, EAST BARNET.

GAS-WORKS requiring Extensions should Communicate with FIRTH BLAKELEY, SONS, AND CO., LIMITED, Dewshury, who make a Speciality of Catering for the Smaller Gas Concerns. Prices Reasonable; quality and results, the best. Satisfaction Guaranteed.

COAL TAR wanted.

BROTHERTON AND CO., LTD., Tar Distillers.

Works: BIRMINGHAM, GLASGOW, LEEDS, LIVERPOOL, SUNDERLAND, AND WAKEFIELD.

"GAZINE" (Registered in England and Abroad). A radical Solvent and Preventative of Naphthalene Deposits, and for the Automatic Cleaning of Mains and Services.

It is also used for the enrichment of Gas.

Manufactured and supplied by C. BOURNE, West Moor Chemical Works, KILLINGWORTH, or through his Agent, F. J. NICOL, Pilgrim House, NEWCASTLE-ON-TYNE.

Telegrams: "DORIO," Newcastle-on-Tyne. National Telephone No. 2497.

SULPHURIC ACID—Specially prepared for Sulphate of AMMONIA and BENZOL Recovery Plants. JOHN NICHOLSON & SONS, LTD., Hunslet Chemical Works, LEEDS. Tele.: "NICHOLSON, LEEDS." Telephone: (Two lines), Nos. 2420 and 2421.

WANTED—Tar and Ammoniacal

Liquor. Any Quantity.

GRINDLEY AND COMPANY, LIMITED, Rawcliffe, near Goole, YORKSHIRE.

SULPHATE OF AMMONIA SATURATORS and all LEAD and TIMBER WORK in Connection with Sulphate Plants.

We guarantee promptness with efficiency for Repairs.

JOSEPH TAYLOR AND CO., CENTRAL PLUMBING WORKS, BOLTON.

Telegrams: "SATURATORS, BOLTON." Telephone 0848.

FOR Instructions on Polishing and Cleaning Gas-Cookers and Gas-Fittings, read Canning Handbook on Polishing, Electro-Plating, and Lacquering. Fully illustrated. Price 2s. 3d., post free; abroad, 2s. 6d.

W. CANNING AND CO., BIRMINGHAM, and 18 to 20, St. John's Square, Clerkenwell, LONDON, E.C.

CLERK, with several years' experience in large Gas Company, desires CHANGE. Expert Shorthand-Typist. Sound knowledge of Accountancy and Book-keeping. Experience in Drafting Reports, &c. Capable correspondent. Age 26. Highest Credentials.

Address, No. 5420, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

AN English Engineer having Special

Experience in DESIGNING and CONSTRUCTING one of the most Modern Types of RETORT CHARGING MACHINES, also Patentee of important Improvements, is open to an ENGAGEMENT to Design and to Superintend the Construction of Stoking Machinery, either at Home or Abroad.

Address, "Z," care of STREETS, 30, CORNHILL, E.C.

ROBERT DEMPSTER & SONS, Ltd.
Contractors for Complete CARBONIZING PLANTS and every description of GAS APPARATUS, ELEVATING, CONVEYING, and TELPHERAGE PLANTS, also STOKING MACHINERY, ROSE MOUNT IRON-WORKS, ELLAND.

EXPERIENCED Draughtsman, well
up in practical Details of Coal and Coke Conveyors and Telpher work, required for Westminster Office.

Apply, by letter, stating Age, Experience, and Salary required, to Box 5953, WILLING'S, 125, STRAND, W.C.

FOREMAN wanted, immediately, in
a 90 Million Cubic Feet Gas-Works (South-West of England). Must be good Carbonizer and Fitter. Able and Experienced in the Control of Workmen. Carburetted Water Gas and Sulphate of Ammonia made on the works. House, with Garden, Gas, and Coal provided free. Profit Sharing and non-contributory Pension Scheme in Existence.

Apply, stating Age, Experience, and Wages required, with copies of Three recent Testimonials, to No. 5421, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

FOR SALE.

RETORT Mouth-pieces and Fittings of
Four through Beds in Settings of Eights, consisting of 64 Mouthpieces 22 in. by 15 in. with Tangye Self-sealing Lids, and 64 Ascension Pipes Taper 6-inch to 5-inch. Dry Mains, Valves, Bridge Pipes, and other Connections. All in good working condition. Also one STEAM ENGINE, Horizontal, High-Pressure, 14-inch bore by 20-inch stroke, to work with 80 lbs. Steam pressure. Splendid Condition.

A low price to clear will be taken for the whole or part of the above.

Apply to VINCENT HUGHES, Engineer, Gas-Works, SMETHWICK.

THORP'S Recording Meter For Sale.

Capacity up to 15,000 Cubic Feet per hour, 9-inch Disc Valves, Bye-Pass Valve, and Connections; also COWAN'S RETORT HOUSE GOVERNOR; two 10-inch Valves and Connections, in excellent Condition.

For further Particulars, Apply to FRANK L. WIMHURST, General Manager, Corporation Gas Department, Newcastle, STAFFS.

FOR SALE.

DISUSED GASOMETER.

THE Directors of the Great Central
Railway are prepared to receive TENDERS for the Purchase of a GASOMETER, now standing on the Company's premises at New Holland, where it can be inspected upon Application.

The Plant comprises:—

GASOMETER or BELL, about 29 ft. 9 in., diameter by about 12 ft. deep, built up of plates riveted together, 2 ft. by 4 ft., the crown being of similar plating, approximately ½ inch thick.

Four CAST-IRON COLUMNS, having Channel Guides for the Guide Rollers.

Four COLUMN HEAD BRACKETS and Pulleys, with the counterbalance weights and chains.

The Columns are secured together at the top by means of four Tie Rods, having right and left hand adjusting screws.

There are four Guide Brackets with Rollers on the Gasometer, also four Channel Guides on the wall below water level.

The level of the water in the Gasometer stands 1 ft. 7 in. below ground level.

Form of Tender with Conditions of Sale may be obtained upon Application to the undersigned, or to the Stores Superintendent, Great Central Railway, Gorton, near Manchester, and must be returned to the Secretary, in envelope marked "Tender for Gasometer," by 9 a.m., Friday, July 7, 1911.

O. S. HOLT,
Secretary.

Marylebone Station, London, N.W.

BOROUGH OF HEYWOOD.

THE Gas Committee invite Tenders
for the Purchase of Surplus TAR.

Specification and Form of Tender may be obtained from the Gas Manager.

Sealed Tenders, endorsed "Tar," to be sent to me not later than Tuesday, July 18, 1911.

By order,

GEO. G. BOUCHIER,
Town Clerk.

Municipal Buildings, Heywood,
June 27, 1911.

LISBURN URBAN DISTRICT COUNCIL.

THE above Council are prepared to
receive TENDERS from Experienced Firms for the following:—

CONTRACT No. 2.—The Sundry CAST-IRON, STEEL, and FIRE CLAY WORK required in the Construction and Erection of a RETORT STACK, RETORT STACK MOUNTINGS, CONDENSERS, EXHAUSTER and ENGINE, BOILER, WASHER, WASHER-SCRUBBER, PURIFIERS, METER, GOVERNOR, ROOFS, and CONNECTIONS.

The Specification and Drawings may be seen at the Town Hall, Lisburn, and at the Offices of the Engineers, Messrs. Thomas Newbigging and Son, 5, Norfolk Street, Manchester.

Copies of the Bill of Quantities may be obtained from the latter on deposit of Two Guineas, which will be returned on receipt of a bona-fide Tender.

Tenders, addressed to the undersigned, Town Hall, Lisburn, and to be endorsed "Contract No. 2," are to be sent so as to reach him not later than noon on Thursday, the 20th day of July, 1911.

The Council do not bind themselves to accept the lowest or any Tender.

Town Hall, Lisburn,
July 4, 1911.

T. WILSON,
Town Clerk.

COUNTY BOROUGH OF BURY.

THE Corporation of Bury are prepared
to receive TENDERS for the Supply of about 40,000 Tons of GAS COAL, 1200 Tons of BOILER SLACK, 500 Tons of BURGY, 400 Tons of HOUSE COAL.

Forms of Tender and Conditions may be obtained on Application to the Engineer and General Manager, Gas Works, Bury.

Tenders, duly sealed and endorsed, to be Delivered to the TOWN CLERK, Bury, not later than Monday, July 10, 1911.

CITY AND COUNTY BOROUGH OF BELFAST.

THE Gas Committee invite Tenders
for the Supply of DRY METERS (Ordinary and Prepayment) for One Year from the 1st of October, 1911.

Conditions and Forms of Tender may be had on Application to the Engineer and Manager at the Gas-Works.

Tenders, endorsed "Tender for Meters," should be lodged in the Office of the undersigned not later than July 13, 1911.

The lowest or any Tender not necessarily accepted.

R. MEYER,
Town Clerk.

CITY OF HEREFORD.

TENDERS FOR TAR.

THE Gas Committee invite Tenders
for the Purchase of their Surplus TAR for Twelve Months from July 30 next.

The Tar will be loaded into buyer's Tank Waggon, at the Gas-Works.

Further Particulars from the undersigned.

Tenders, addressed to the Chairman of the Gas Committee, Town Hall, will be received up to the 10th of July.

W. W. TOWNSEND,
Engineer and Manager.

RADCLIFFE AND PILKINGTON GAS COMPANY.

TENDERS FOR COAL.

THE Directors invite Tenders for a
Twelve Months' Supply of COAL.

Particulars may be obtained from the undersigned, by whom Tenders will be received until Wednesday, July 12.

JAMES BRADDOCK,
Manager and Secretary.
Gas Offices, Radcliffe,
June 29, 1911.

BOROUGH OF CHORLEY.

(GAS DEPARTMENT.)

THE Chorley Corporation invite Ten-
ders from Makers of STEEL TUBES for the Supply and Delivery of

About 1000 Yards 2-inch internal bore Tubes, and About 2000 Yards 3-inch internal bore Tubes.

Specification and any other Details can be obtained on Application to Mr. J. W. Allin, Gas Engineer, Chorley.

Tenders, endorsed "Steel Tubes," must be delivered to me not later than Tuesday, July 11, 1911.

The Corporation do not bind themselves to accept any Tender.

JNO. MILLS,
Town Clerk.
Town Hall, Chorley,
June 30, 1911.

THE Directors of the Glossop Gas
Company invite TENDERS for the Supply, during the Year commencing August 1, 1911, of about 6000 Tons of Good GAS COAL and 500 Tons of CANNEL, which must be Delivered, Carriage Paid, at the Great Central Railway Station, Glossop.

Forms of Tender may be obtained at the Company's Office.

Sealed Tenders, Specifying the Description of the Coals and the pit from which they are to be raised, must be sent to the Chairman of the Company not later than Saturday, the 8th of July next.

The Directors do not bind themselves to accept the lowest or any Tender.

J. SIDEBOTTOM,
Secretary.
Gas Offices, Glossop,
June 26, 1911.

EUROPEAN GAS COMPANY, LIMITED.

NOTICE is Hereby Given that the
ANNUAL GENERAL MEETING of the Shareholders will be held on Tuesday, the 11th day of July next, at Two p.m. precisely, at the Offices, Finsbury House, Blomfield Street, London, pursuant to the Regulations of the Company.

The Directors who retire by rotation are H. C. Smith, Esq., and R. Hesketh Jones, Esq., and the retiring Auditors are J. Reeson, Esq., and H. J. Luff, Esq., who, being eligible for re-election, offer themselves accordingly.

The Accounts to be submitted to the Shareholders will be open for inspection at the Company's Offices on and after the 3rd of July next.

NOTICE IS ALSO GIVEN, that the TRANSFER BOOKS WILL BE CLOSED from the 15th to the 31st of July next, both days inclusive.

By order of the Board,

W. B. BRADY,
Secretary.

Finsbury House, Blomfield Street,
London, E.C., June 30, 1911.

In accordance with Clause 48 of the Company's Articles of Association, "The bearer of a share warrant may, on depositing his warrant at the Office not less than forty-eight hours before the time of holding any meeting of the Company, with a statement in writing of his name and address, be present at such meeting and vote thereat in respect of the shares included in such warrant."

SALES BY AUCTION OF GAS AND WATER STOCKS AND SHARES.

MESSRS. A. & W. RICHARDS beg to
notify that their SALES BY AUCTION OF NEW CAPITAL ISSUED UNDER PARLIAMENTARY POWERS, and of STOCKS and SHARES belonging to EXECUTORS and other PRIVATE OWNERS in LONDON, SUBURBAN, and PROVINCIAL GAS and WATER COMPANIES, take place PERIODICALLY at the Mart, TOKENHOUSE YARD, E.C.

Terms for Issuing New Capital, and also for including other Gas and Water Stocks and Shares in these Periodical Sales, will be forwarded on Application to Messrs. A. & W. RICHARDS, at 18, FINSBURY CIRCUS, E.C.

By order of the Directors of the
SOUTHEND WATER-WORKS COMPANY.

NEW ISSUE OF £5000 FOUR PER CENT.
PERPETUAL DEBENTURE STOCK,

AND
500 £10 NEW ORDINARY FIVE PER CENT.
MAXIMUM SHARES.

MESSRS. A. & W. RICHARDS will
SELL THE ABOVE BY AUCTION, at the Mart, E.C., on Tuesday, July 11, at Two o'clock, in Lots.

Particulars of the AUCTIONEERS, 18, FINSBURY CIRCUS, E.C.

By order of the Directors of the
GRAVESEND AND MILTON WATER-WORKS COMPANY.

NEW ISSUE OF 500 £20 FOUR-AND-A-HALF
PER CENT. PREFERENCE SHARES.

MESSRS. A. & W. RICHARDS will
SELL THE ABOVE BY AUCTION, at the Mart, E.C., on Tuesday, July 11, at Two o'clock, in Lots.

Particulars of the AUCTIONEERS, as above.

By order of the Directors of the
SUTTON GAS COMPANY.

NEW ISSUE OF £6500 FOUR-AND-A-HALF
PER CENT. MORTGAGE DEBENTURES.

MESSRS. A. & W. RICHARDS will
SELL THE ABOVE BY AUCTION, at the Mart, E.C., on Tuesday, July 11, at Two o'clock, in Lots.

Particulars of the AUCTIONEERS, as above.

By order of the Executors of the late W. V. K. Stenning, Esq., and another Owner.

EAST GRINSTEAD GAS AND WATER COMPANY.

52 £10 "A" SHARES AND £316 "A" STOCK,

AND
94 £10 "B" AND "C" SHARES.

REDHILL GAS COMPANY.

54 £5 ORDINARY SHARES,

AND

£100 ORDINARY "B" STOCK.

MESSRS. A. & W. RICHARDS will
SELL THE ABOVE BY AUCTION, at the Mart, E.C., on Tuesday, July 11, at Two o'clock, in Lots.

Particulars of the AUCTIONEERS, as above.

To Investors.

BROADSTAIRS GAS COMPANY.

ISSUE OF NEW CAPITAL.

MESSRS. HINDS & SON have been
favoured with instructions from the Directors of the above Well-Known and Highly Successful Local Company to SELL BY PUBLIC AUCTION On Thursday, July 6, 1911, at the Bull and George Hotel, High Street, Ramsgate, at Three o'clock in the Afternoon, exact time,

£3500 NEW ORDINARY "D" STOCK,
OFFERED IN 175 LOTS OF £20 EACH, AND

£1000 FOUR PER CENT.

PERPETUAL DEBENTURE STOCK,
OFFERED IN 50 LOTS OF £20 EACH.

The Stock offered for Sale forms part of an issue of new Capital which is required for the purpose of extending the Buildings and Plant of the Company owing to their large increase in Business. These will be erected upon their new site at St. Peter's near the Electric Power Station.

The Business of the Company has practically Doubled in the last Ten years.

Particulars and Conditions of Sale and further Information may be obtained of Mr. F. HIGGINSON, the Manager, Gas Offices, Alexandra Road, BROADSTAIRS, or at the Offices of the AUCTIONEERS, 57, Queen Street, RAMSGATE.

WEST SURREY WATER COMPANY.

NOTICE is hereby given that the
Directors of the above Company intend to offer for SALE BY TENDER 300 ORDINARY SHARES of £10 each, nominal value (Maximum Dividend 7 per cent. per Annum), in lots of Five or more Shares.

The Maximum Dividend of 7 per cent per Annum has been paid for the past eleven years upon the 7 per cent. Ordinary Share Capital, and the Maximum Dividend of 10 per cent. per Annum has been paid for the past four years upon the 10 per cent. Ordinary Share Capital.

Under the provisions of the Trustee Act, 1893, the Debenture Stock or Preference Shares of the Company may be considered a Trust Security.

The District supplied by the Company comprises Walton, Otlands, Hershaw, Weybridge, Addlestone, Byfleet, and Chertsey in Surrey, and Shepperton in Middlesex; Cobham in Surrey and Littleton in Middlesex are also embraced in the Company's Parliamentary Limits.

Tenders, to be in a Sealed Cover, addressed to the Directors of the West Surrey Water Company, at the Office of the Company, will be received not later than the 17th day of July, 1911.

Forms of Tender and Particulars and Conditions of Sale may be obtained from the Secretary at the Offices of the Company, 38, Parliament Street, Westminster, London, S.W.

By order of the Directors,

WALTER COLBROOK,
Secretary.

June 13, 1911.

TO Gas Companies, Gas Appliance
Manufacturers and Others.—The owners of British Patent No. 10,422, of 1908 (Rincker and Wolter), for "IMPROVED METHOD OF, AND MEANS FOR, OBTAINING GAS FROM TAR IN GAS PRODUCER PLANT" are desirous of entering into some Arrangement with British Manufacturers or others for properly EXPLOITING the Invention and practically WORKING same in this Country, either by License or otherwise.

Apply to H. GARDNER AND SON, Chartered Patent Agents 173, and 175, Fleet Street, LONDON, E.C.

Price 8s. (free delivery in United Kingdom).

A HISTORY OF THE INTRODUCTION OF GAS LIGHTING.

By CHARLES HUNT, M.Inst.C.E.,

Past-President of the Institution of Gas Engineers.
Author of "Gas Lighting," which forms the Third Volume of Groves and Thorpe's "Chemical Technology."

A frontispiece the book has a photographic reproduction of the portrait of William Murdoch in the Edinburgh Art Gallery. There are also portraits of the Hon. Robert Boyle, F.R.S., James Watt, Philippe Lebon, Frederick Albert Winsor, &c.; a reproduction of the picture of "Scientific Celebrities in 1800," in the National Portrait Gallery, in which James Watt, Boulton, and Wm. Murdoch are included; and numerous illustrations of various apparatus used in the early Manufacture of Gas, &c., with Three folding plates.

LONDON:

WALTER KING, 11, Bolt Court, FLEET STREET, E.C.

BIRTLEY IRON COMPANY,

ESTABLISHED 1820,

Owners of the Birtley Iron Works and
Pelaw Main Collieries,

GENERAL ENGINEERS & IRONFOUNDERS.

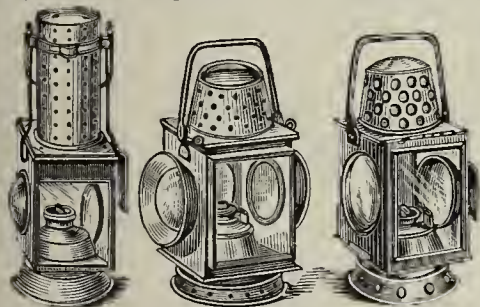
Makers of Cast-Iron PIPES and CONNEC-
TIONS for Gas, Water, Steam, Electrical,
Sanitary, and other purposes; also TANKS,
COLUMNS of every description, Hydraulic,
Gas, and Colliery PLANT, &c.

Illustrated Catalogue, giving complete list of
our Manufacturers, on Application.

Works: BIRTLEY, CO. DURHAM.

Newcastle-on-Tyne Offices: MILBURN HOUSE.

ARMSTRONG'S PATENT CANDLE SAFETY LAMPS.



No. 1. No. 2. No. 3.

43, MANCHESTER STREET, GRAY'S INN ROAD, W.C.

JAMES OAKES & CO.,

ALFRETON IRON-WORKS, DERBYSHIRE,
AND

Wenlock Iron Wharf, 21 & 22, Wharf Road,
CITY ROAD, LONDON, N.

Manufacture and keep in Stock at their Works
(also large Stock in London)

PIPES and CONNECTIONS, 1½ to 48 inches
in diameter, and make and erect to order
RETORTS, PURIFIERS and TANKS, with
or without planed joints, COLUMNS,
GIRDERS, SPECIAL CASTINGS, &c., re-
quired by Gas, Water, Railway, Telegraph,
Chemical, Colliery, and other Companies.

NOTE.—Makers of HORSLEY SYPHONS.
These are cast in one piece, without Chap-
lets; doing away with Bolts, Nuts, and Covers,
and rendering Leakage impossible.

TROTTER, HAINES, & CORBETT, BRETTLELL'S ESTATE, LIMITED, FIRE-CLAY & BRICK WORKS, STOURBRIDGE.

Manufacturers of GAS RETORTS, GLASSHOUSE
FURNACE & BLAST-FURNACE BRICKS, LUMPS,
TILES, and every description of FIRE-BRICKS.
Special Lumps, Tiles, and Bricks for Regenerative
and Furnace Work.

SHIPMENTS PROMPTLY AND CAREFULLY EXECUTED.

LONDON OFFICE: E. C. BROWN & CO.,
LEADENHALL CHAMBERS, 4, ST. MARY AXE, E.C.

THOMAS TURTON AND SONS, LIMITED,

SHEAF WORKS, SHEFFIELD,

MANUFACTURERS OF
FILES OF BEST QUALITY
FOR ENGINEERS.

STEEL OF ALL DESCRIPTIONS.

SCREW STOCKS, TAPS AND DIES,
SPANNERS, RATCHET BRACES, LIFTING JACKS,
ANVILS, VICES,
AND ENGINEERS' TOOLS GENERALLY.

London Office:

90, CANNON STREET, E.C.

ALL the BOYS CALORIMETERS

which have been in daily use in
all the Official Testing-Stations in
London for the last Five Years

WERE MADE BY
JOHN J. GRIFFIN & SONS,
— LIMITED —
KINGSWAY, LONDON, W.C.

Those desiring to obtain Gas Calorimeters
as used in the Official Testing Places
should see that the apparatus bears the
name of the Original makers.

Descriptive Catalogue on Application.

MIRFIELD GAS COAL UNEQUALLED.

Sperm Value 878·85 lbs. per ton.

Please apply for Price, Analyses, and Report to the

MIRFIELD COLLIERY COMPANY,
RAVENSTHORPE, near DEWSBURY.

KOPPERS' PATENT CHAMBER OVENS.

Results obtained which have never been Sur-
passed by any other System of Carbonization.
Plants at Work and under Construction for
the production of 18,000,000 cubic feet
of Gas per Day.

See our large Advertisement appearing in
alternate Issues of the "JOURNAL."

The KOPPERS'
COKE OVEN AND BYE-PRODUCT CO.,
301, Glossop Road, SHEFFIELD.

Its' not the time you buy, but the time you get that counts.

¶ No one would continue to pay £5 a week
to a traveller who never sent in an order,
but many an employer continues to pay a
great deal more for time he never gets.
¶ Many an employer loses 10% of the time
he buys. ¶ Think of it! It means, if he
got it, a 10% lower wage bill, or a 10%
greater output.

If you are interested in the saving of time,
in the reduction of manufacturing costs,
in economy of labour, and in adding to
your profits, you should make a point of
investigating the

INTERNATIONAL SYSTEM
OF
AUTOMATIC TIME RECORDING
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JOB COSTING.

INTERNATIONAL
ROCHESTER
BUNDY.

Write to-day.

Our hooklets on Timekeeping, Job Costing
and Organization are free.

International Time Recording Co.,

Oldest and Largest Makers of Time Recorders in the World,
Makers of Rochester and Bundy Time Recorders,
151, 153, 155, City Road, London, E.C.

THOMAS DUXBURY & CO.

16, DEANSGATE, MANCHESTER,
Best Gas Coal and Cannel, giving High Illu-
minating Power, Large Yield per ton, and
reasonable in Price.

Telegrams: "DARWINIAN, MANCHESTER."
Telephone 1806.

NEWBATTLE CANNEL.

Highest Results In Gas, & Excellent Coke.

QUOTATIONS ON APPLICATION TO
THE LOTHIAN COAL COMPANY,
— LIMITED, —

NEWBATTLE COLLIERIES,
NEWTONGRANGE, MIDLOTHIAN.

REALISTIC FOOD MODELS FOR GAS COOKERS.

(Suitable Sizes.)

As supplied to leading Gas Companies, &c.

FIGURES OF CHEFS, &c.

Apply **GODFREY SUTCLIFFE,**
Studio, Alexandria Hall,
WEST EALING, W.

HEATHCOTE GAS COAL

from the

Grassmoor Collieries
CHESTERFIELD.

Rich In Illuminating Power and Yield of Gas.
Above the Average in Weight and Quality
of Coke.

Maintains a High Standard In Residuals.

COAL TAR PRODUCTS.

Benzol, Toluol, Solvent Naphtha, Creosote Oils, Grease Oils, Carbolic Acid, Dark Cresylic Acid, Granulated (Crude) and Sublimed Naphthalene, Anthracene, Refined Tar and Pitch. Sulphate of Ammonia containing a Guaranteed Minimum of 25 per cent. Ammonia.

For Prices apply to the **SOUTH METROPOLITAN GAS COMPANY,**

Works: **ORDNANCE WHARF,**

709, OLD KENT ROAD, LONDON, S.E.

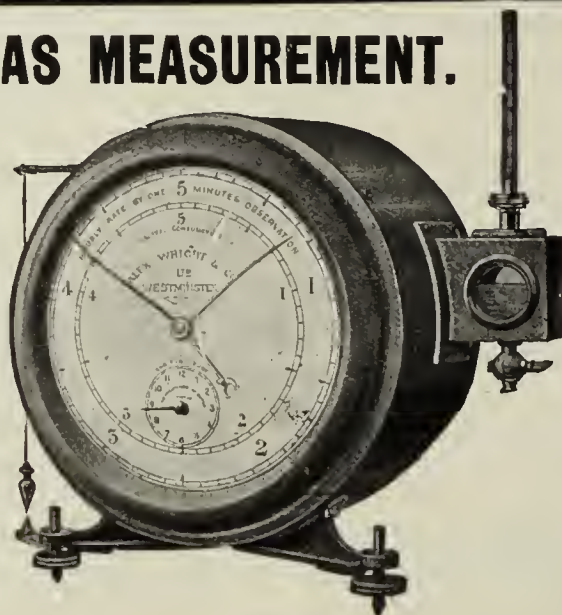
EAST GREENWICH, LONDON, S.E.

Telegraphic Address: "METROGAS, LONDON."

AIR OR GAS MEASUREMENT.

C.C.'s or
1000ths of
Cubic Feet.

**ALEX.
WRIGHT
& Co., Ltd.,
WESTMINSTER.**



TO GAS ENGINEERS

NAPHTHALENE SOLVENT.

Are you troubled with **NAPHTHALENE** in your
MAINS? If so, try our special

"SOLVENE."

THE FINEST NAPHTHALENE SOLVENT.
ENQUIRIES SOLICITED.

BROTHERTON & Co., Ltd.,
CITY CHAMBERS, LEEDS.

**"THE
PARKINSON"**



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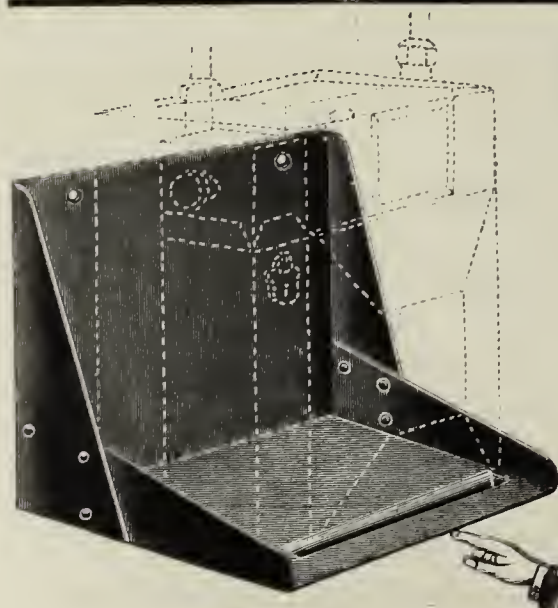
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PARKINSON AND W. & B. COWAN, LTD.,
LONDON, EDINBURGH, BIRMINGHAM, MANCHESTER, BELFAST, SYDNEY, N.S.W.



That
Groove
denotes
strength.

HULETT'S METER SUPPORT

(PATENT No. 16,646).

A **SPLENDID IMPROVEMENT** has now been made but
NO INCREASE IN PRICE.

NO SAGGING! FIRM AND STRONG!

Made of **STEEL SHEETS** and **FIXED WITH TWO NAILS.**

Adopted by over **300 Gas Companies.**

D. HULETT & CO., LTD., **GAS ENGINEERS**
55 & 56, High Holborn, LONDON.

GRAETZIN LIGHT.

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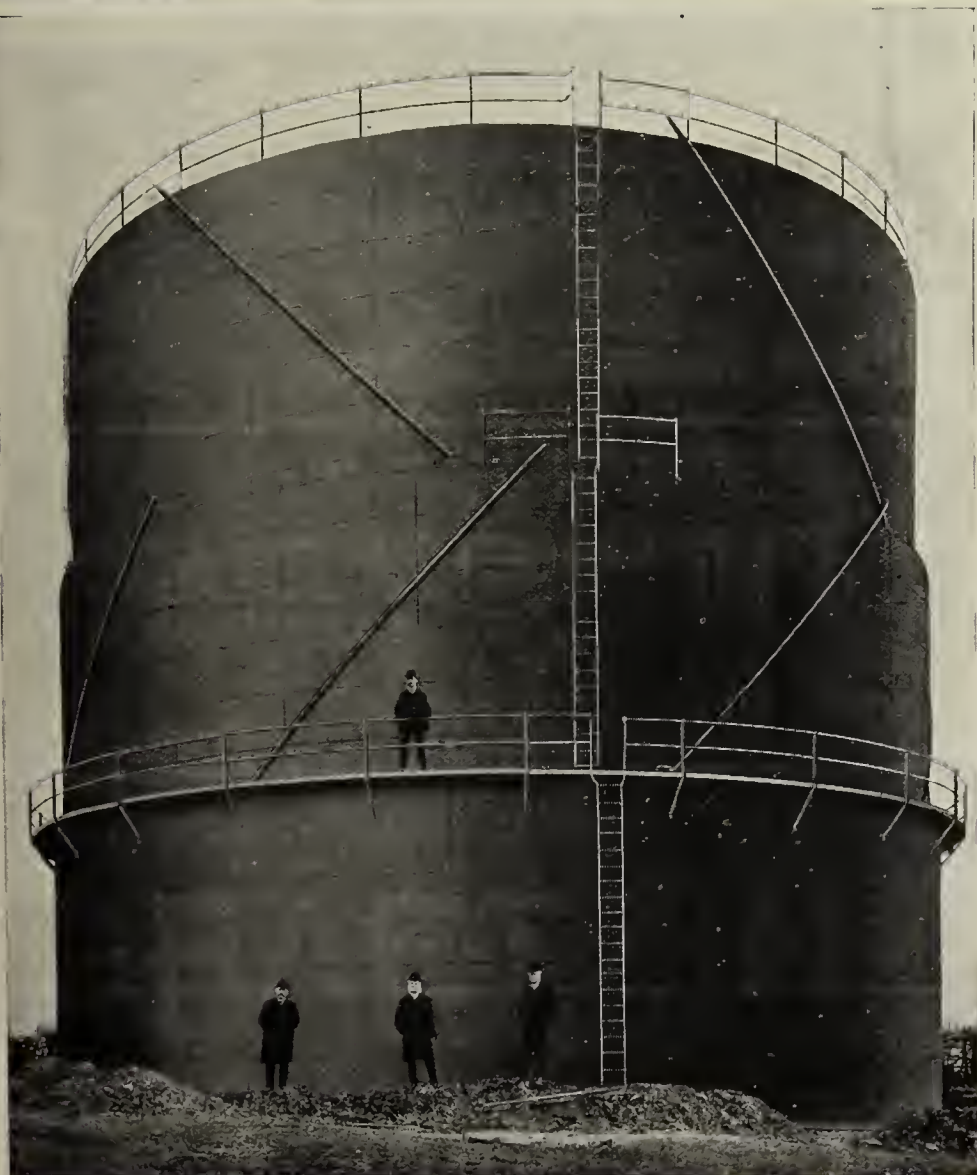
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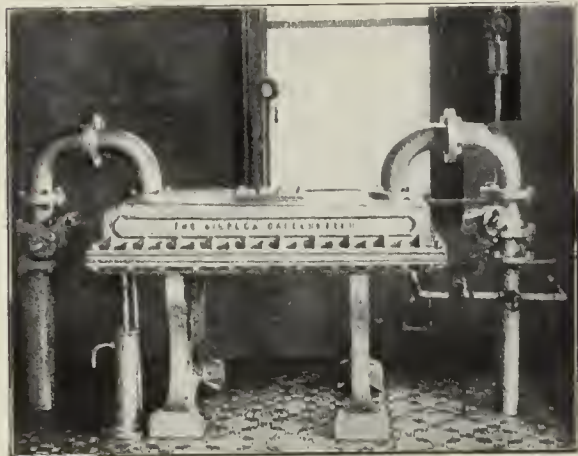
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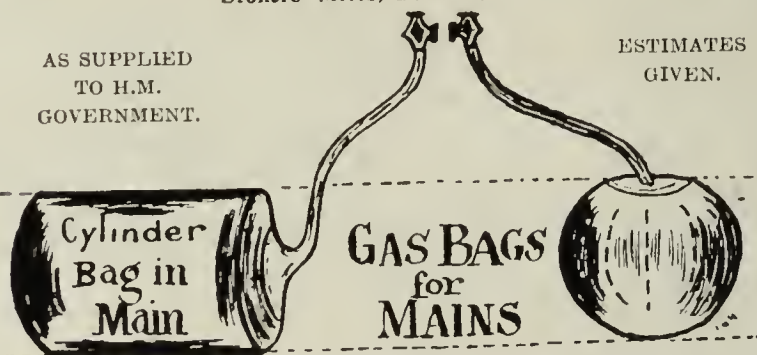
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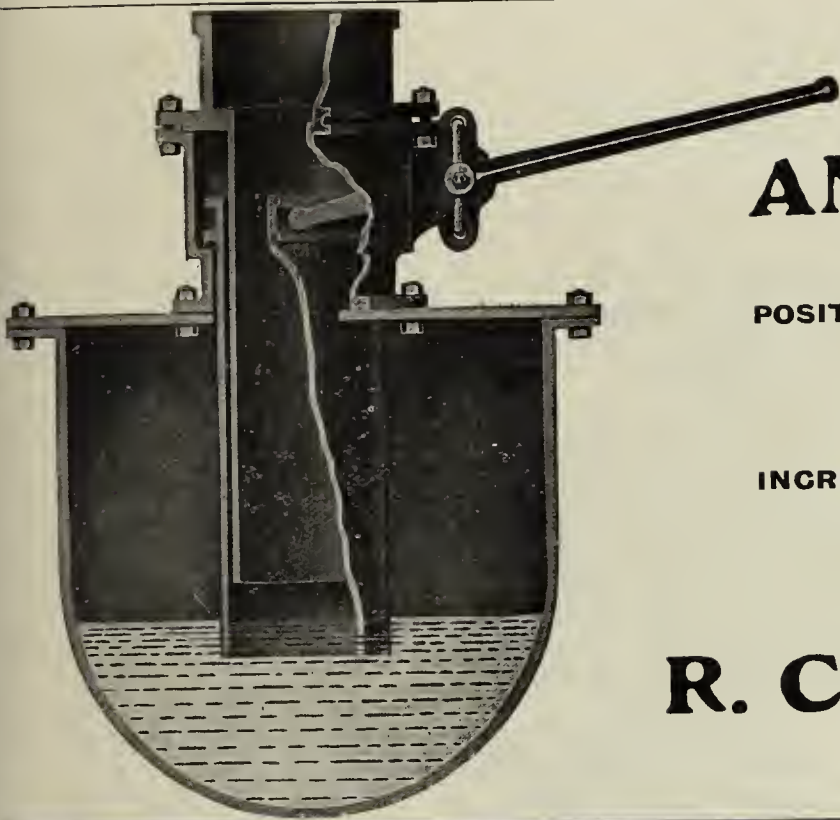
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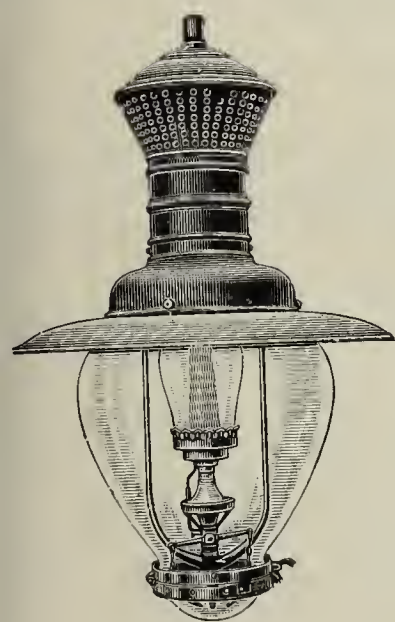
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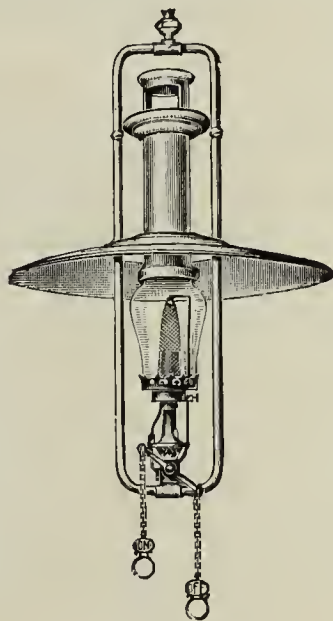
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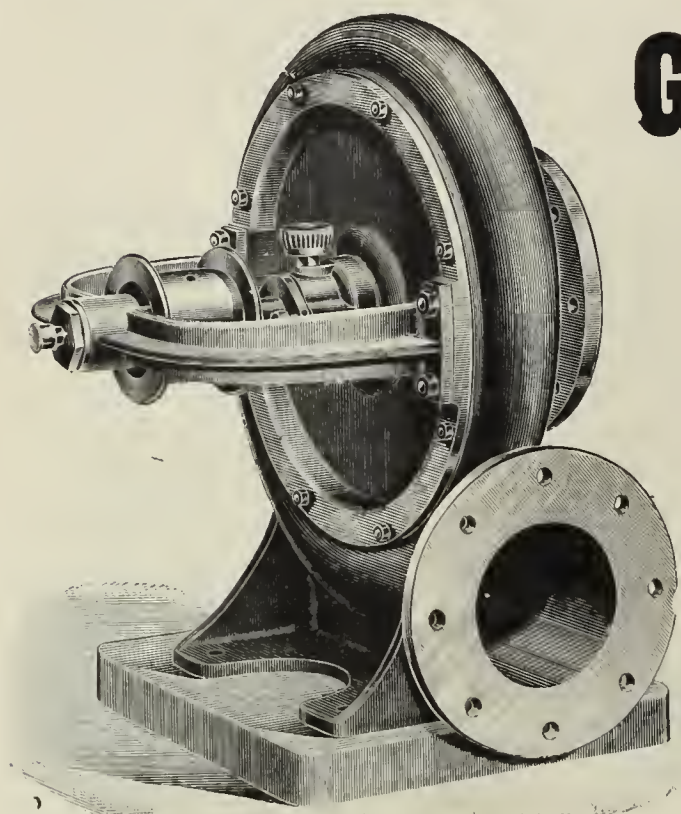
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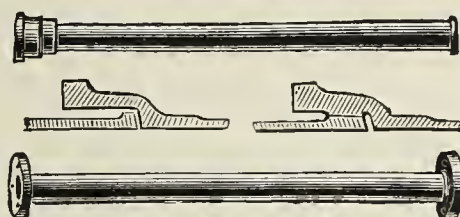
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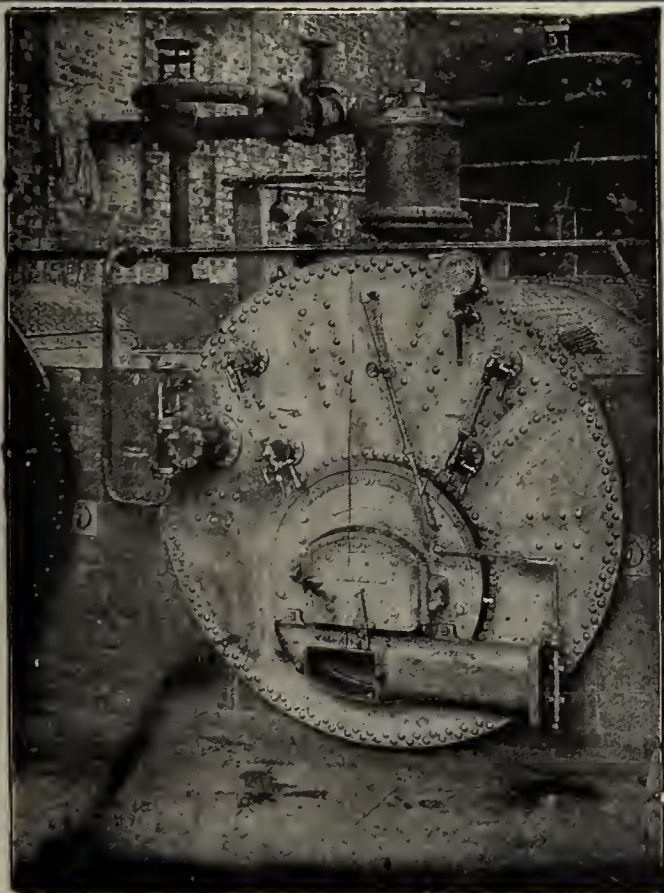
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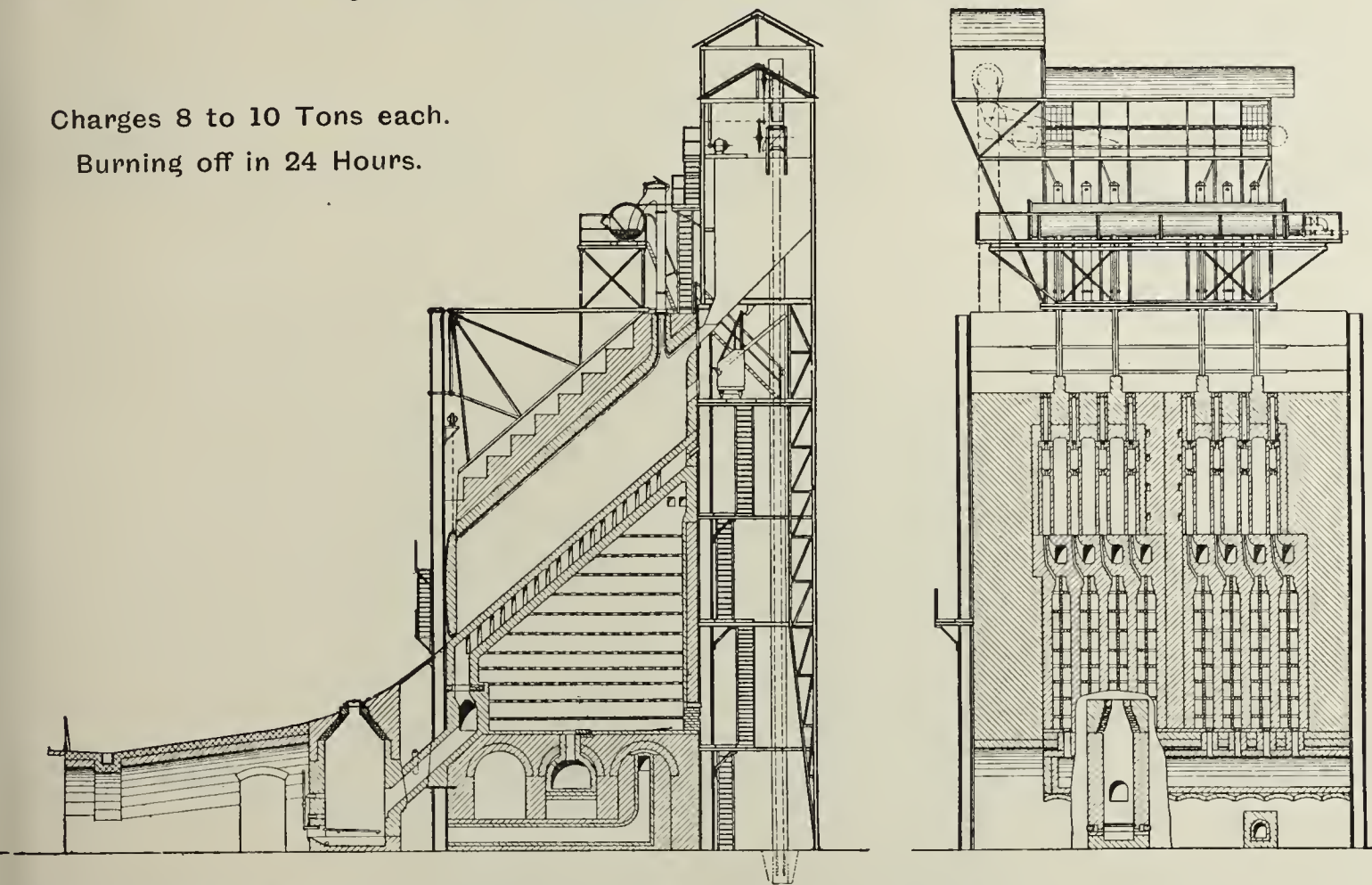
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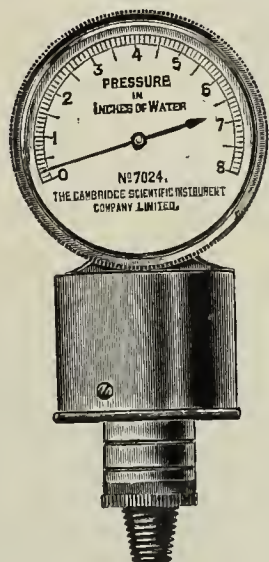
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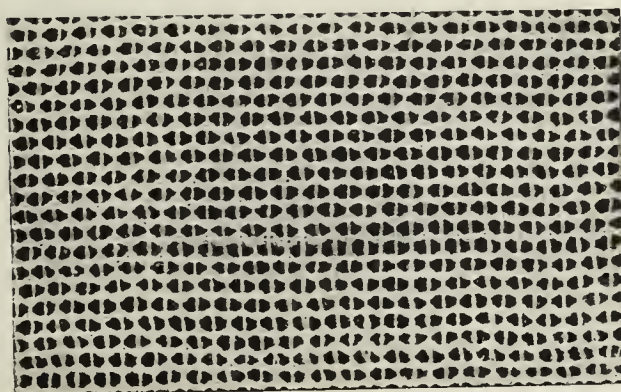
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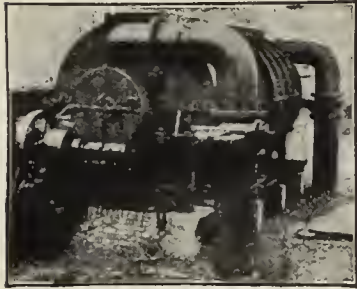
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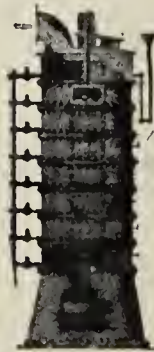


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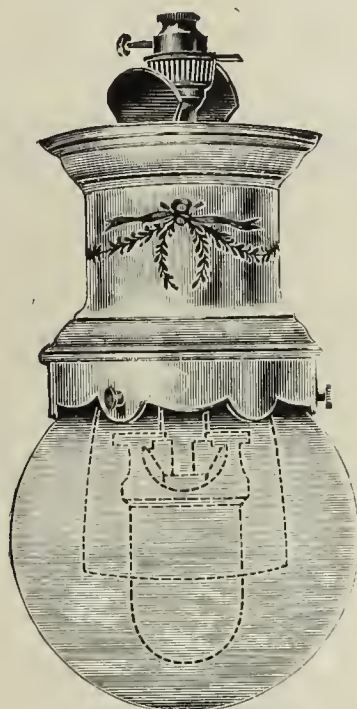
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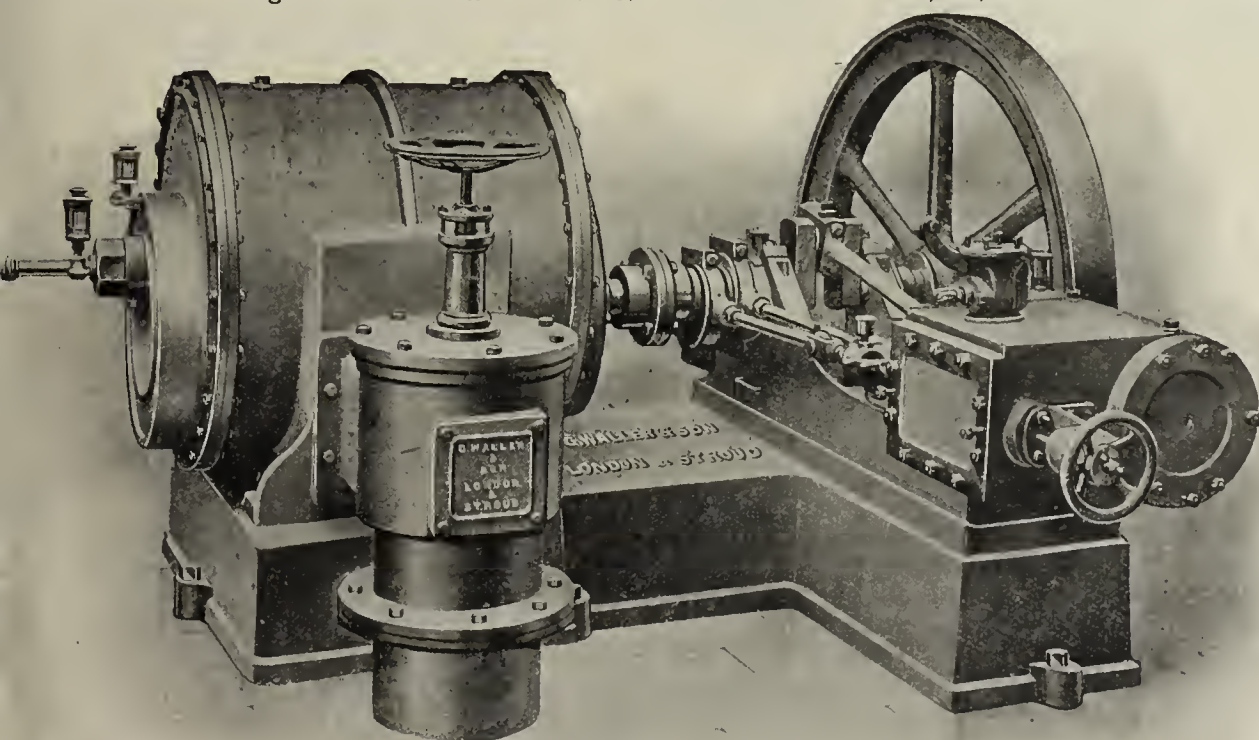
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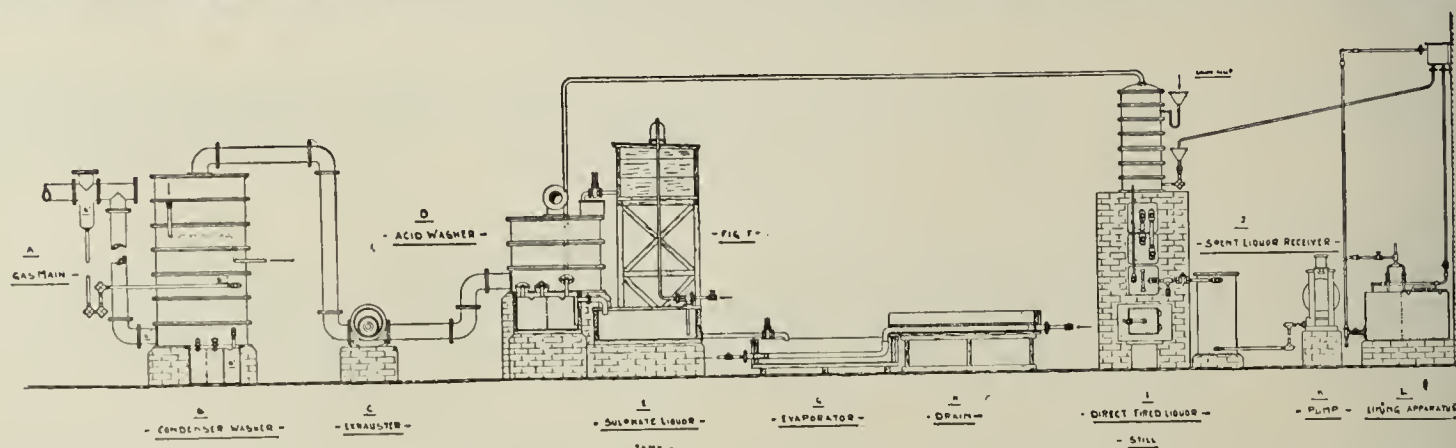
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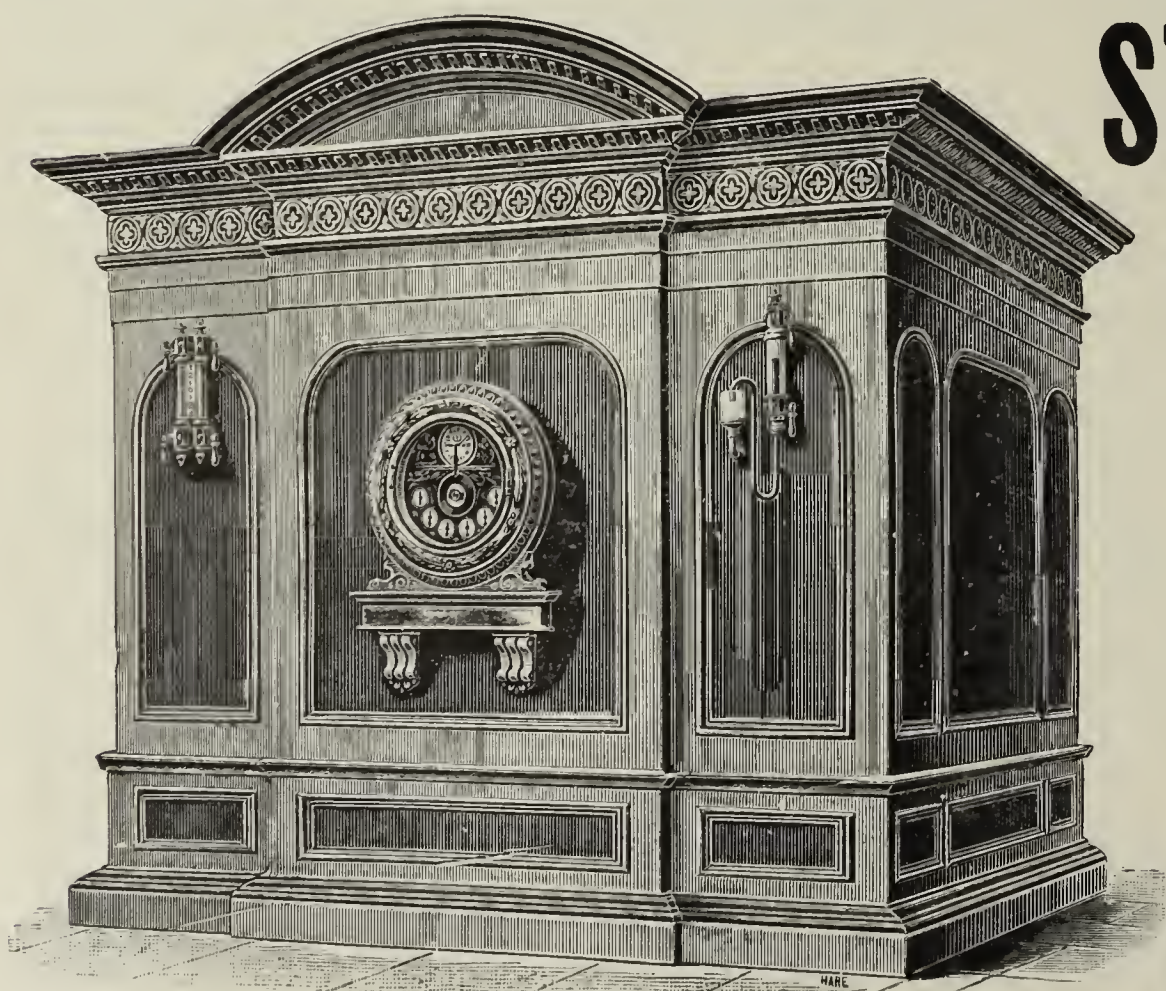
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VOL. CXV., No. 2513.—TUESDAY, JULY 11, 1911.

EDITORIAL NOTES—GAS, &c.

Higher Premiums and Lower Benefits.

THE Insurance Bill, by the application of various parliamentary expedients, is making progress through the Committee stage in the House of Commons; but it is hoped it is not too late for someone to raise in the House, in the interests of already well-provided-for workmen, the points made in the letter that the Chairman of the South Metropolitan Gas Company (Mr. Charles Carpenter) has addressed to the Daily Press, and which is reproduced in our columns to-day. The letter points out a weakness of the State insurance scheme against sickness; and indirectly it illustrates the uneconomical character of the scheme, inasmuch as it shows the existence of private and voluntary systems to-day conferring, at a less cost to workmen and employers, benefits alike in nature with, but greater in amount than, those proposed in the Government measure. If we remove all the quite necessary argument in Mr. Carpenter's letter, and get straight at the cardinal point, it amounts to this: If the State considers (the Company do not want to shirk any responsibility in respect of statutorily imposed contribution) that the contributions of workmen and employers should be greater than in the case of existing funds, then, holds Mr. Carpenter, the workmen's benefits should also be raised and not reduced. If the Bill passes as it stands, what is going to happen in the case of the South Metropolitan Company? The difference between the contributions suggested by the Bill and those paid under the existing system, if dealt with under the Company's system, would enable the first three months' benefit to be raised from 12s. to 16s. per week, whereas under the measure, if passed without amendment, the 12s. will be reduced to 10s. If this does not show conclusively that the Company can manage this particular business more economically than the vast machinery proposed by the Government, then we are dense, and fail completely to understand the import of the figures presented by Mr. Carpenter.

We can quite understand the objection of the co-partner employees of the Company to themselves and their employers paying more for lessened benefits, and appreciate their feeling that, if Parliament cannot do better than this for them, then Parliament had better give them an opportunity for continuing to manage their own affairs by legislating for the application of similar provisions to approved sick funds as have application in the case of accident funds under the Workmen's Compensation Act of 1897—that is to say, provisions for contracting-out by mutually managed and approved Societies. There are no doubt many gas and other undertakings who, under their present funds, make at less cost superior provision for the workmen than under the scheme of the Chancellor of the Exchequer; and it will be a deplorable thing if they are injured by the scheme now before the country. Why should not this matter be considered in connection with the "exception" to which reference was made in our editorial columns on May 16 last? The "exceptions" are to be found in the first schedule to the Bill; and the one specially in mind reads: "Employment under the Crown or any local or other public authority" where the Insurance Commissioners certify that the terms "of the employment are such as to secure provision in respect of sickness and disablement on the whole not less favourable than the corresponding benefits conferred by Part I. of this Act." We asked at the time, and we ask again, Why should there be (if we interpret the meaning of the quoted words correctly) any such distinction, say, between the gas-trading department of a local authority and a gas company, or between a municipal electricity department and a competing gas company's undertaking? The Chairman of the South Metropolitan Company shows that their provision in respect of sickness and disablement is more favourable than the benefits proposed to be conferred by the Bill. We hope, therefore, that Mr. Lloyd George

will not ignore Mr. Carpenter's letter; and, if he cannot see his way to concede the request as to provision being made for a regulated contracting-out, that he will at all events tell us what there is to justify several thousands of men paying more under the State scheme for less benefits than they are receiving under existing schemes.

Indirectly Applying the Closure.

THERE are two ways—the direct and indirect—of applying what has come to be known in parliamentary parlance as the "closure;" and in technical discussions it is a pity for it to be applied either one way or the other. We do not believe that, on the part of anyone concerned with the government of the Institution of Gas Engineers, there exists a desire at any time to apply the closure in any way whatever. But indirectly it is done; and we want, as the subject is at the present time exciting some amount of interest, to point out certain ill-effects, in the hope that something will be done to effect a remedy.

It can hardly be possible, after the compulsory shortening of the discussions at the recent meeting, the squeezing up into a corner of the authors of the carbonization papers in the matter of replying to their critics and commenters, and the hasty despatch of the papers and discussions at the third sitting, that the Council will face another annual meeting without legislating for improvement. What was done at the meeting represents the direct, and at the time the unavoidable, application of the closure. But there is also the indirect application of it, which is an effect of present procedure. At the meeting, the President suggested that, if the authors of the carbonization papers had any points which, under the circumstances of the hour, they had left untouched in their hurried replies, they might communicate them to the "Transactions." Mr. C. F. Broadhead's reply to the discussion on his paper is also reserved for the "Transactions." And now, much to our regret, there is a letter in our "Correspondence" columns, announcing the intention of Mr. E. W. Smith to reply to all criticisms on his paper *en bloc* in time to be included in the "Transactions." Now, all this suggested burying-away of important matter in the annual volume of the Institution must have a very bad effect on the discussion of subjects of the hour. It is nothing less than an indirect method—not in all cases an intentional one—of applying the closure.

What is meant is readily explained. The "Transactions" for 1910 were not published until January this year; so that it may be anticipated that it will be January, 1912, before we learn whether the authors of the carbonization papers have added to their replies on the discussion, before we learn the nature of Mr. Broadhead's answer to those who discussed his paper in June, 1911, and before we can learn what Mr. Smith has to say to the critics of his paper who have arisen outside the Institution meeting. Postponement of the kind means an indirect closing at once of all further discussion; for all support to criticism or comment is lost if the party chiefly concerned is silent for months. Then when eventually his reply is published, interest in the subject may have so far cooled down that those who might be willing, or might be tempted, to discuss it now will not return to it. This is an effect of the application of the indirect closure that is to be deplored. Take, for example, Mr. Broadhead's paper. If his reply to the discussion was published at once in the Technical Press, it is just possible that it might produce some further inquiry or discussion. But will it do so if it only sees the light of day next January?

There is yet another aspect of the subject. An Institution paper receives wide publicity within a few days of the reading of it at the meeting. It obtains a larger audience than it was honoured with at the meeting; and among that extended audience there may be some who can add valuable comment or usefully criticize methods, opinions, or conclusions. It would be a pity not to obtain the utmost from competent sources of the kind. But this is certain not to be done by the process of deferring until the issue of the

"Transactions" the replies of authors. In a letter from Mr. Alfred Mansfield published this week, there appear passages which emphasize this point. He remarks: "The reading of a paper at the annual meeting of the Institution of Gas Engineers may have its advantages. But, although many gas managers are interested in the uses of high-pressure gas and the design of atmospheric burners, I think Mr. Smith will agree with me that the major portion of those who investigate these subjects do not belong to the Institution." Mr. Jacques Abady makes a similar point in a communication also published to day. There is no encouragement to those who are competent, as the result of special research, to take part in discussion, if there is no one to draw or with whom to argue. In taking up this matter, it is hoped that no one will be discourteous enough to think that we have any selfish interest in the matter. There is constantly an abundance of material for our pages. But clearly one of our duties is to encourage and stimulate discussion on contemporary questions, and to protest against any manner of procedure that may (probably will, on this occasion) have the effect of stifling such discussion.

Reverting to the question of the economizing of the time at the annual meetings of the Institution, it will be observed from our "Correspondence" columns that Mr. W. H. Wayte, of Norwich, endorses the suggestion made in the first editorial article on June 20 last as to sectionizing the contributions and discussions into two parts—manufacture and distribution. It would be useful to have the views on this head of others engaged in the distribution department. It might assist in helping forward the movement for broadening the basis of the Institution.

Near Extinction of Coalite Hope.

FOR the Directors and most of the shareholders of the British Coalite Company, the adjourned ordinary general meeting last Thursday had something of a funereal character about it. If there is one man more than any other for whom we are sorry in connection with this business, it is Sir William Preece, K.C.B., F.R.S. He has stuck to the Board and the concern when others who accepted directorial office simply fled on the detection by them of the hopeless state to which the Company had been reduced, both commercially and technically. It is clear, from Sir William's words, tired tone, and attitude, that his faith in coalite has shrunk to practically the infinitesimal. On this occasion, too, Mr. Herman Clarke, the Managing-Director, did not appear to be so buoyantly confident as previously; and he certainly had less to say about patents, though he uttered the usually potent word. We will not add to the difficulties of the situation by asking him to explain what there is in the plant at Barking, employing clay retorts, that represents anything to which the Company have any sole title.

We should, naturally, like our curiosity satisfied on the point. Mr. Clarke, however, has not been inclined to notice it since the previous comment on the matter; and he has quite enough to worry him at the present time in trying to bring to a conclusion the negotiations for (can we believe our eyes?) a further £50,000 of capital. He declines to divulge the names of the people who, it is understood, appear willing to advance the money on certain conditions; and he also retains as private the question of the proposed rate of interest upon it. If the money is obtained, it will be one of the first things that has surprised us in the history of the ill-fated concern. From its origin we felt fairly confident that things would turn out pretty much as they have done—even to what one of the shareholders terms the "miserable fiasco" on the technical side. There is a point of current importance that the existing shareholders appear to have overlooked. Supposing (there is difficulty in repressing a smile as we write this) the process, as altered, is found to be commercially workable, and supposing (if other people do not also work it) some profit is made, what earthly chance will the existing shareholders have of participating in the profit, with a heavy mortgage hanging over the concern and interest on an additional capital of £50,000 to be provided? Much of the money that has been spent is absolutely dead so far as the Company is concerned. For the present shareholders, it can never earn a dividend. With such hard facts facing them, there are still a few existing shareholders who cherish the hope that some of the old winged promises may still come home to roost. There is virtue in human tenacity—up to a point.

Hostility of Household Coals.

WHEN we are sitting, with windows wide open, reading about heat waves and hundreds of deaths from excessive heat, the time seems hardly appropriate for talking about gas-fires. But there is an excuse. These are the days when the retailers of coal are actively engaged in trying to persuade householders to replenish their cellars at "lowest summer prices;" and, from a circular that has reached us, we see that one well-known firm of household coal dealers have taken it into their heads to make a vigorous attack on the gas-fire, after the manner of the electricians in connection with lighting. But the electricians will be deeply pained to see that the coal merchants regard electric radiators as being beneath their notice, owing to their costliness and uselessness as heating agents. This is contemptuous treatment. But, as the circular under notice has received wide distribution, it will be useful to gas people, as indicating that the gas-fire is the better of the two forms of heater that have not the disadvantages and labour attaching to the coal fire, being always ready for use without any cleaning up or re-laying, and that the gas-fire is the only competitor that the coal dealers really take seriously. This attention on the part of the coal dealers is gratifying to the gas industry, as it conclusively proves that they are feeling its competition. Naturally, in consequence, they want to do their little part in the attempt to stem the tide of gas-fire popularity that set in two or three years ago, and which tide season by season grows in strength. Now this popularity with the latter-day types of gas-fires would not increase at the pace it has done without householders found, from the experience of themselves and their friends, some real solid advantages from their use, as well as that the "noxious smells and gases" of which we read in the circular are merely the fictions of interested parties—such as coal dealers.

The circular tells us that the gas companies flood the market with a mass of unsubstantiated testimonials from nameless medical men. It is a wonder the firm did not say "from bogus medical men;" but had they done so, seeing that the circular refers to a district of London in which the price of gas is 2s. 2d., and has been distributed in that district, they might have been called to account by the gas company concerned. The circular goes on to advise the recipient to ask his own doctor if he regards gas-stoves as healthy; and there is assurance that a different statement will be heard. But what is a householder to do if he knows that his own doctor already patronizes the gas-fire? It happens that, apart from public experience with the gas-fire (an experience enabling many people to promptly consign the circular in question to the waste-paper basket), several trials have been scientifically made of gas-fires, the results of which refute the contentions of the coal-retailing firm. The firm have made certain crude experiments of their own as to cost; other people, as said, have made scientific experiments. For heating a room of 2108 cubic feet capacity, the coal retailers found that, with coal at 25s. per ton, the quantity used during a twelve-hour day would cost 5d. No temperatures are given; nor do we see that any radiation tests were made periodically throughout the day. For comparison, a large gas-fire (16 burners) was used in a room of 2898 cubic feet capacity (790 cubic feet more than the capacity of the room in which the coal fire was employed); and this voracious gas-fire burned 516 cubic feet of gas in twelve hours, though the gas, it is stated, was not turned on full the whole time—the consumption averaging 43 cubic feet per hour, which, at 2s. 2d. per 1000 cubic feet, represent for twelve hours 1s. 1½d. Again no temperature tests are supplied; nor is anything said about the comparability of the conditions under which the coal and the gas fires were used. But one thing we are told; and it is that the gas-fire that consumed an average of 43 cubic feet an hour and 516 cubic feet in twelve hours, was "the most modern" the gas company could supply." We have good grounds for doubting the assertion.

Our household coal friends may not be aware that, in the Department of Gas Engineering and Fuel at the Leeds University, scientific tests have been carried out with all types of modern gas-fires, with Mr. E. W. Smith, M.Sc., as the Research Chemist. In Mr. Smith's 1910 report, it is found that, in nineteen experiments made with gas-fires, the highest rate of consumption per hour was 30.96 cubic feet, thirteen trials were with fires having a rate of consumption below 25 cubic feet, and seven under 20 cubic feet. We may turn also to the Glasgow tests with coal and gas fires

the results of which were published in the first number of the "JOURNAL" in 1910), and which tests were scientifically carried out in rooms similar in architectural feature and cubical capacity. In these tests, the consumptions of the gas-fires tested ranged from under 20 to 40 cubic feet per hour. In none of these classical tests did the consumption run up to the average of 43 cubic feet over twelve hours. We are not going to say the gas-fire our household coal friends used did not burn 516 cubic feet in a day. One can use a wasteful gas-fire, the same as a wasteful coal-grate. One can use a gas-fire rationally or irrationally, the same as a coal-grate. The human factor has an important bearing in these matters. The difference between the tests on which we rely and those of our household coal friends is that the former were carried out in a proper scientific manner, while the latter were conducted in a very crude fashion. But it comes to this: Taking gas at 2s. per 1000 cubic feet, and coal at 17s. 6d. per ton in the Glasgow tests, the consumption of gas (under the conditions specified in the report) in six hours cost 4.29d.; while the coal cost 2.9d. Multiplying these costs by two, to obtain figures for twelve hours, gas cost 8.5d.; coal, 5.8d. Between these figures, there is a difference of only 2.7d. in favour (on the fuel cost only) of coal. This is somewhat different from the 8½d. variation between gas and coal costs as represented in the circular before us. Many people are found who are quite willing to pay the difference per day to save the labour of cleaning up grates, of laying fires, of lifting coal, of frequently replenishing the fuel, and of cleaning the furniture and the room from the dust created by the coal fire, as well as to have the enjoyment of the convenience of the ever-ready fire.

But we are faced with another so-called "striking fact." It is that "house coal and anthracite fires radiate their heat to a far greater distance than gas or electricity, which only warm the space immediately in front of the stove." The most "striking" thing about the latter part of this statement is that, so far as the gas-fire is concerned, it is untrue. Mr. Smith, at the meeting of the Institution of Gas Engineers last month, stated that, with modern 16-inch gas-fires, he found, in his researches at the Leeds University, that some gave as high as 60 per cent. radiation efficiency, to say nothing of the convected heat. There is the further point that the radiant heat of the gas-fire can be maintained at a constant level; whereas, in the case of a coal fire, the dying-down of the fire, the replenishing with fuel, the gradual ascent to an incandescent state again, and the repetition of the cycle of actions, all mean wide fluctuations in radiant heat, and a considerable range of chemical change between incipient and ultimate combustion. None of these wide temperature and chemical variations can be alleged against the gas-fire, excepting at the times when the temperature requirements call for regulation of the supply of the gas. In the Glasgow experiments, it was further found that as much as 75 per cent. of the total heat generated by the combustion of the coal in an ordinary domestic grate was lost in the form of flue heat. Not more than a third of this need be lost with a modern gas-fire. In the case of the rooms, too, in which the coal fires were tested, changes of the air were effected ten times an hour; in the case of the gas-fire, 5.2 times, which is all-sufficient. If household coal dealers are going to open a hostile campaign against gas-fires, they had better be sure of their "facts"—striking or otherwise—before proceeding any farther. Perhaps Messrs. Charrington, Sells, Dale, and Co., will make a note of this advice. It may be useful.

Strikes and Gas Coal Supplies.

THE turmoil in the labour world of the last week or two appears to be fortunately drawing to an end. At the same time, the strike of seamen, dockers, and others, with the open influence that was being brought to bear upon other labour engaged in the transit of materials and goods, has been a little disconcerting to the managers of not a few gas undertakings—not so much in regard to any immediate effect, as in respect of possibilities that threatened at one time to materialize. Our Northern coal trade report last week stated that both coal production and distribution had been interfered with by the disputes of the preceding few days; but in the Northern coal-field the output was again nearly normal. It was also mentioned that some of the largest of the gas coal producers had given wage advances to the seamen; and their steamers were then running freely.

So far so good; but there are some gas undertakings the

managers of which were watching curiously, not unmixed with a little anxiety, the heavy drafts that were being made on their stocks. The possession of good stocks, however, has enabled them to tide over the period of short deliveries without any undue extra cost. There is no question about it that an occasion of this kind has the salutary effect of keeping prominently in mind the value of a good coal reserve within the walls of the works. The condition of the labour world makes such a good reserve more essential than ever; and combining with that the fact that the summer day consumption has expanded to such respectable proportions, it follows that some of the old ideas as to stocks at this period of the year must be ruled-out as obsolete. Though in consequence of the possession of good stocks at the works, there has not been much actual inconvenience felt, colliery owners and agents had signs of gas undertakings looking around to ascertain where they could, if actual necessity compelled, amplify their deliveries. For there is no doubt that, if the trouble with the seamen and dockers had continued, the pressure would soon have been acute in places. We know, for example, that one firm (and no doubt others also) had inquiries from gas companies who were anxious to learn how they could promptly obtain supplies in the event of deliveries by water becoming totally impossible or insufficient. We hear, on the other hand, from another firm, that none of their customers experienced any difficulty, as the stocks held by them in London have proved sufficient to obviate any inconvenience.

The three large London Gas Companies with their considerable requirements appear to have ridden the storm in comparative comfort. How much has co-partnership to be thanked for this? The Gaslight and Coke Company, the General Manager (Mr. D. Milne Watson) informs us, have experienced no difficulty with regard to the delivery of coal. The Company are not shipping coal from Hull at the present time; and the Tyne does not seem to have been affected in the way that other ports were. In regard to the South Metropolitan Gas Company, the Chairman (Mr. Charles Carpenter) tells us that all that has happened to them in respect of coal deliveries has been that one or two ships have been delayed for twenty-four hours or so; and it may be taken that the Company's deliveries, as a whole, are in practical agreement with their schedule quantities. The Commercial Gas Company own four collier steamers. The majority of the officers and crews come under the co-partnership scheme; and Mr. Stanley H. Jones informs us that they have stood by the vessels, and continued to work them throughout the trouble. The Directors of the Company have, however, now granted the men the increase in pay which appears to have been generally conceded. This is all very satisfactory. It is something to be thankful for that such little inconvenience has been felt by gas undertakings. At the same time, the experience and the effects (such as they were) have their lessons.

A Pipe Contract Dispute.

A case is being heard at Lincoln which, though it refers to a water-works contract, will also be of interest to those connected with the gas industry. The proceedings, so far as the matter has yet gone, are reported at length under the "Legal Intelligence" heading in to-day's issue; and from these it will be seen that the action, which has arisen out of the new water-works scheme of the Lincoln Corporation, is being heard by Mr. Edward J. Pollock, one of the Official Referees of the Supreme Court. The plaintiffs are the Staveley Coal and Iron Company, Limited; and they claim from the Lincoln Corporation a sum of nearly £16,000 under a contract to supply cast-iron water-mains. The defence of the Corporation, it seems, is that the pipes which form the subject of the claim were some which had been rejected, but had been re-numbered and sent back, "with a view of deceiving the Engineer and inducing him to accept them as having been duly passed by the Inspector." In opening the case for the plaintiffs, Sir Edward Carson admitted that if this allegation were true, it would be a justification for putting an end to the contract; but at the same time he added that to make an imputation of this kind against such a firm as the plaintiffs (for the very small and trivial profit upon such a contract as this), if it was untrue, was outrageous. The total amount of the contract was something over £28,000; and Counsel pointed out that the profit on the whole of the work would only come to £1,400. In

the concluding portion of his address, Sir Edward said the Corporation had had the pipes in question in their possession for fifteen months. They ought, when they brought the charge, to have got their evidence; otherwise they certainly never should have made the accusation. For the whole of the fifteen months, however, they had retained the pipes. They had no right to touch one of them in view of the seriousness of the charge, unless in the presence of the plaintiffs' witnesses; but they had tampered with the pipes, as would be visible, he was told, to anybody who saw them now. This was a matter of the gravest impropriety where an action was pending. He was told that many of the pipes had been chiselled. First, the blacking had been taken off, the pipes filed, and marks put upon them of various characters; and in some cases it had been attempted to cover up what they had done by putting on some sort of imitation blacking. He characterized the whole of this operation, from beginning to end, as being a scandalous one in a case of this kind, when a charge was pending. It altered the whole appearance and character of the pipes; and he was told there were marks upon them which were never there when they were in plaintiffs' possession. Plaintiffs challenged the whole of the case as being got up on grounds of suspicion entertained towards them.

Gas Publicity and Labour.

The Salford Corporation, by their vote last Wednesday, have given a splendid lead to those municipalities who have not yet made up their minds on the subject of contribution to the gas publicity movement; and the fact that the Council passed, by a large majority, the recommendation of the Gas Committee, that the contribution of the department should be on the basis of 2s. 6d. per million cubic feet, is a matter upon which we can heartily congratulate the Chairman (Alderman F. S. Phillips, J.P., the Mayor) and his colleagues. There was a little sentimental talk about competition between the Gas Committee and the Electricity Committee; but not much. Just fancy anyone in Salford, whose very successes, industrial and commercial, are the outcome of the shrewdness of its men in competition with other large centres engaged in similar industry and trading, raising any objection to sound and fair competitive methods. It was a statesmanlike speech that came from Mr. Purcell, one of the Labour members; and we much like the tone of it. Its lines stand out strongly in contrast with the one or two opposing speeches. Mr. Purcell would go to greater lengths, if need be, in advertising the uses, and educating people up to the proper uses, of gas; for he sees in this work, business development that means lower prices for gas. This is the right spirit for anyone representing the interests of the working classes to take in the matter. Economical service on the part of a municipality, in respect of any commodity in which they trade, should be the aim of every Labour member. Cheaper gas lighting and cheaper gaseous fuel must follow expansion in the gas business; and the expansion of the gas business means more employment in connection with the Gas Department—especially outside the works in the distribution section. The Salford Corporation are thanked for their wise determination; and we shall look for many other local authorities now ranking themselves alongside Salford in this matter.

Street-Lighting Specifications.

The "Illuminating Engineer" has been making inquiries from recognized illumination authorities abroad as to their views on the subject of a street-lighting specification. It is interesting and instructive to have their views; but, if the replies so far published emphasize any one point, it is the difficulty that exists at present in getting the authorities on illumination under one hat. Their views are divergent and contradictory, even on the part of those who are specially identified with one of the only two suitable illuminants for street purposes, to the complete exclusion of the other. After reading these divergent views, one is possessed with the pious hope that, at the outset, any authoritative recommendation as to a street-lighting specification will be as simple and uncomplicated as possible. It should be rather of a tentative order, subject to improvement after longer experience. There has not been up to the present time sufficient experience with, or study of, street illumination, subject to set rules and regulation, to enable all matters to be irrevocably dealt with in a specification in a manner that will be equally fair to the competing illuminants. Practically all are agreed that in any specification the amount of

gas or electrical energy consumed and the candle power of the lamps should be stated; but there is contrary opinion as to whether illumination should be made the basis of contract for the payment for street lighting. For the measurement of illumination the horizontal plane at a stated height above the street is generally preferred; but there is not the same agreement as to whether it should be also measured in the vertical plane. For practical, as distinct from experimental, work, Professors Bunte and Drehschmidt consider that, if tests are made on the horizontal plane at a sufficient height from the street surface—say, about the height of the head—that will answer all purposes. The idea of measurement in some inclined plane is freely and properly rejected. There is nothing particularly settled by the contributors as to whether the mean spherical or mean hemispherical candle power should be tested in the street; but the question of time occupied and opportunity makes such work almost impracticable. There is just as much opinion in favour of the candle power being tested in specified directions. Favoured also by a majority, in the matter of procedure, is that laboratory tests should be supplemented by periodical tests *in situ*. But there is a majority against any test of the constancy of candle power of the lamps being at present prescribed. Arc lamps would show up badly under such a test. There are mixed views as to the introduction of stipulations regarding the efficient shading of lamps, height above ground, &c., with a view to the avoidance of glare; and only one man thinks that the specific colour of the lights should be prescribed. We pray that in this matter of a street-lighting specification we may be preserved from eccentricity and fads.

Municipal Gas-Works Results.

The report submitted to the Belfast Corporation Gas Committee by the Engineer (Mr. J. D. Smith) points out that the gross profit realized by the manufacture and sale of gas and residual products in the twelve months to March 31 was £64,568, which is an increase of £13,490 over the previous year. A sum of £12,000 is handed over to the Finance Committee in aid of the rates; and the dividends and sinking fund on new City Hall stock came to £11,397—making together £23,397. A balance of £24,888 is left at the credit of the profit and loss account. An interesting feature is a recommendation by Mr. Smith that vertical retorts should be installed capable of producing 2½ million cubic feet of gas per 24 hours, with the necessary coal and coke handling plant, machinery, and housing accommodation; and also that a spiral gasholder should be erected. An examination of the various systems of vertical retorts is to be made by the Committee. The record of the year's working placed before the Council was altogether a most satisfactory one. There is a gross profit at Kendal of £3667, and a net surplus of £864, out of which £400 has been voted in relief of the rates. The quantity of gas sent out, as indicated by the consumers' meters, shows an increase of 6½ per cent. A reduction in the price of gas last year from 2s. 8d. to 2s. 6d. per 1000 cubic feet, made a difference of about £700 in the receipts; and it is calculated that the abolishing of the cooker rentals also meant a loss of revenue of over £100. At Lincoln, after allocating £5000 to the relief of the rates and placing £630 to the reserve fund, the Committee have increased the carry-over from £1133 to £2368. The revenue for the current year will be affected to the extent of about £1000 by a reduction in the price of gas of 1d. per 1000 cubic feet and an increased discount of 2½ per cent. to prepayment consumers, which took effect as from Oct. 1. A gross profit has been realized at Mossley of £6015, and a net profit of £1673. The make of gas per ton of coal carbonized was raised from 10,666 cubic feet in 1908-9 to 11,691 cubic feet in 1909-10, and 11,735 cubic feet last year; the quantity sold per ton for the three years being respectively 9684 cubic feet, 10,413 cubic feet, and 10,714 cubic feet. At Oldbury, the total quantity of gas sold by meter in the past financial year was 119,506,600 cubic feet, or an increase of 6,306,900 cubic feet on the sale in 1909-10. The make per ton of coal was 12,439 cubic feet. A net profit of £465 was realized; and this added to the balance brought forward makes a total of £9037.

The Eleventh Hour Contract.

One view taken in the criticism recently made in "Electricity Supply Memoranda" of the public lighting contract entered into, by a sort of back-door manoeuvre, by the Caversham District Council with the Reading Electricity Company was that,

seeing the likelihood of the Reading Corporation succeeding in Parliament with their extension scheme, so absorbing Caversham, the District Council were not acting rightly in committing their successors to any such contract for a matter of ten years. The District Council have changed their minds about the extension scheme, and have considered the wisest course is to withdraw opposition, and to make the best terms possible. This has been done. But what is the position in regard to public lighting by electricity? It is that the Corporation will have to take over a contract, entered into in the dying hours of the District Council, which contract does not start until after the Council in its corporate capacity is extinct, and then binds the Corporation for the space of ten years. This is not right; and it is not a creditable piece of work for the District Council to have left behind them, knowing well at the time the uncertainty of their position.

Results of a Progressive Policy.

It was a remarkable story of progress that the Chairman of the San Paulo Gas Company, Limited (Mr. D. M. Fox) laid before the shareholders at an extraordinary meeting held last Friday to consider a question of fresh capital authorization. It is only due to shrewd financial management that the Board have not had to ask for more capital powers before this. There are not many undertakings that can stand an increase of business to such an extent as this one has done with an expansion of capital that shows up modestly in comparison with the growth of the business. But the circumstances have been exceptional. The present Board, with Mr. Fox at its head and Mr. A. F. Phillips as Managing Director and Consulting Engineer, had as a legacy from their predecessors a concern heavily saddled with capital as measured by the business done, works that were not up to date, and a business that had not been conducted with any conspicuous commercial sagacity. The existing Board set to work to amend all this. They had to start working from the rough until now they can show the shareholders a finished and flourishing commercial machine, on a solid base, and effecting progress at a remarkable rate.

A Decade's 164 Per Cent. Increase.

The good result has been accomplished by sound consideration for financial stability, and by progressive, liberal, and conciliatory business policy. Of course, the capital expenditure per million cubic feet of gas sold, largely as it has been reduced, is even now in excess of what it would be for such a concern in this country. But the undertaking is in South America; and for that part of the earth, the capital is not excessive. The commercial results are seen in the extraordinary increase in consumption in the past decade. The demand for gas for public lighting has increased by 69 per cent.; for private lighting, by 115 per cent.; and for cooking, by 1000 per cent. The total amount of gas sold in the period has advanced from 3,840,000 cubic metres (135,617,664 cubic feet) to 10,140,000 cubic metres (358,115,394 cubic feet), or 164 per cent. This is a notable expansion of business in such a period; and the increments enlarge year by year. In this country, there is little opportunity for keeping a strict separate account of the consumption of gas for cooking purposes. In the case of this Company, seeing that differential prices obtain, they are able to do so. The result shows the potent influence of the cooking load upon the fortunes of the Company. Whereas in 1902, the sale for cooking was 249,300 cubic metres (8,804,552 cubic feet), in 1910 it was 2,478,000 cubic metres (87,515,743 cubic feet), which is an increase in the eight years of about 1000 per cent.! As a matter of fact, last year the sale for cooking represented 64 per cent. of the total gas sold in 1900. Two more comparative figures. Since 1900 the receipts have risen from £89,800 to £203,350 in 1910, an increase of 126 per cent.! The proprietors unanimously conferred upon the Board the extended capital authorization for which they asked.

The Gas-Furnace Book.—Under this title, Messrs. John Wright and Co. have just brought together, in a well-printed pamphlet of about 140 pages, a very comprehensive collection of gas-heated furnaces and other gas appliances suitable for workshop, laboratory, and scientific and technical purposes. In the prefatory remarks, it is stated that the designs are the outcome of many years of practical experience in close contact with users of such apparatus in a wide variety of trades and professions. Included in the pamphlet are some remarks, with illustrations, on the Féry pyrometer.

GAS STOCK AND SHARE MARKET.

(For Stock and Share List, see p. 130.)

HARASSED as the Stock Exchange was already, there were further trials in store for it last week; and on the Pelion of persistent depression was heaped the Ossa of fresh alarms. Foreign affairs were now the storm-centre. First, German action in Morocco, a tremendous factor for possible trouble, and then—quickly following upon this—warlike movements in Montenegro, to say nothing of Portugal. Happily, alarm was mitigated on Thursday by authoritative pronouncement; but mischief had been done. The opening day was weak, quite unable to bear up against the Agadir incident. Prices were put down freely in expectation of large sales. Government issues were, of course, hard hit, and Consols fell $\frac{1}{4}$. Railways, with rare exceptions, were lower; and the Foreign and American Markets were flat. Tuesday became calmer, and markets in general made some recovery; Rails being hopeful of a settlement of the labour difficulties. On Wednesday, everything was thrown down again by army preparations in that powder magazine, the near East. All markets relapsed freely; Americans having also a special trouble of their own in regard to crop prospects. On Thursday, there was some recovery from the abyss of apprehension. Cheap prices brought in buyers of gilt-edged things. Consols rose, and Railways, although queer at first, improved later. The Foreign Market was calm. Business became rather more animated on Friday, and markets had some improvement, though some of the cream of it was taken off before the close by the usual realizations. Saturday was very quiet, and there was not much movement perceptible. In the Money Market, the supply was in excess of the demand, and rates closed easier. Business in the Gas Market was fairly brisk; and the general tone was as bright and cheerful as ever. In Gaslight and Coke issues, the ordinary was quite active and a little stronger still. Prices were uniformly higher, ranging from $106\frac{3}{4}$ to $107\frac{1}{2}$; but the quotation was only advanced $\frac{1}{4}$. In the secured issues, the maximum was done at $86\frac{1}{8}$ and 87, the preference at from 104 to 105, and the debenture at $78\frac{3}{4}$ and $79\frac{1}{2}$. South Metropolitan was quieter at 119 to $120\frac{1}{4}$. The debenture marked from $80\frac{1}{4}$ to $80\frac{7}{8}$. In Commercial, the 4 per cent. changed hands at 114 and $114\frac{1}{2}$, and the debenture at $77\frac{1}{2}$. Among the Suburban and Provincial group, Alliance and Dublin showed dealings at from 83 to $84\frac{1}{2}$, Bournemouth preference at $14\frac{5}{8}$ and $14\frac{3}{4}$, Brentford new at $205\frac{1}{2}$, ditto preference at $123\frac{1}{2}$, Ilford "B" at from $120\frac{1}{2}$ to $120\frac{7}{8}$, and Tottenham debenture at $97\frac{1}{2}$. In the Continental companies, Imperial fell another $\frac{1}{2}$, with transactions at from 184 to $185\frac{1}{2}$; Union was done at 92; and European at from $19\frac{1}{8}$ to $19\frac{3}{8}$. Among the undertakings of the remote world, there were transactions marked in Bombay at $6\frac{1}{4}$ and $6\frac{1}{8}$, Buenos Ayres debenture at $96\frac{1}{2}$, Cape Town at 2 (a fall of $\frac{1}{2}$), Monte Video at $13\frac{1}{8}$, Oriental at 138 and 139, Ottoman at $6\frac{1}{8}$, Primitiva at $7\frac{3}{8}$ to $7\frac{9}{8}$, ditto preference at $5\frac{1}{8}$ to $5\frac{1}{2}$, ditto debenture at $97\frac{1}{4}$ and $97\frac{1}{2}$, and San Paulo at $21\frac{3}{4}$ and 22—a rise of $1\frac{1}{2}$.

ELECTRICITY SUPPLY MEMORANDA.

Municipal Electrical Association—Presidential Philosophy—A Shop-keeper's Choice—Choice and Cost—A Proposed "Entente"—Candid Testimony and Embarrassing Flattery—Fire Precautions—Wheels within Wheels at Hastings.

THE proceedings at the meeting of the Incorporated Municipal Electrical Association at Brighton have had a varied reception. Perhaps the reason is that there was too much candid speaking there to please those who, week by week, have to endeavour to sustain the pretence that flows with peculiar ease from pens and pencils accustomed to it by long practice. The President for the occasion was Mr. J. Christie, the Brighton Corporation Electrical Engineer; and his address, which should be awarded something or other for its modesty and its advocacy of a retiring disposition in electrical commercial affairs, has not raised any glowing enthusiasm. The "Electrician," too, says that "the papers have been possibly below the average of past years." The "average of past years." It cannot mean what it says; and there is no indication as to whether our contemporary intends the word "average" to be applied to quantity or quality. However, enthusiasm over both the technical and the business proceedings has certainly not been great.

There are two or three other matters than those that will be dealt with to-day that may be reserved for future "Memoranda;" the questions of interest that we will use for topic this week, being, to our readers, the more important. In Mr. Christie's address, there is reminder that the maximum demand system of charging had its birth in Brighton; and the maximum demand system added temporarily sparkling glory to its inventor, Mr. Arthur Wright, until consumers got so disgusted with its complications that many electricity concerns had in self-protection to revert to the alternative of a flat-rate. Since then the fearful and wonderful schemes that have been devised with the view of coaxing in new consumers have been more than we have been able to keep intimately in touch with. But they all pale before a new idea. If Mr. Arthur Wright was not in jocular mood when he met the President a short time since, and told him of what he imagined

would be the character of the charges of the electrical industry in future, then Mr. Wright's friends will have cause to think of him with saddened heart and moistened eye. Mr. Christie seriously said that, in discussing the matter of charges with Mr. Wright, that gentleman "put forward the belief that we might ultimately come to a fixed charge per square foot of floor area, on the basis of a given number of watts per square foot, have no meters, and allow the consumers to use the supply for any purpose without restriction." How many hearty laughs there must have been in the Brighton hotel lounges over this proposal! Where, too, is the caricaturist who can depict the householder measuring up the areas of his rooms to ascertain what will be the fixed cost for an unrestricted use of electricity, or whether the electricity purveyors are cheating him. No meter, no restriction, no anything, other than the fixed price per square foot of floor area, which basis of charge has not even remote connection with the services for which the charge is made! The scheme wants some thinking over, and thinking out.

It is also noticed that Mr. Christie considers it wrong of municipalities engaging in trade to compare themselves absolutely with gas and electricity supply companies. These concerns, he says, are in business primarily to obtain the biggest dividends they can possibly earn for their shareholders, irrespective of all other considerations. Has Mr. Christie never heard of the sliding-scale of price and dividend as applied to gas supply, and of how in most cases, of the total sum represented by a reduction of price to the consumer and the increase of dividend, five-sixths is the portion of the consumers, and one-sixth that of the shareholders? He ought to find in this something to assist him to modify his statement. It is further seen that Mr. Christie is not in sympathy with municipal authorities carrying on the work of wiring, supplying, and selling electric fittings. "If we embark in this retail trading, carrying out wiring installations, &c., to justify the existence of this new branch of our business, we must at times have to go into the highways and by-ways to obtain fresh consumers; and I fear that, by so doing, we will only boost-up an artificial and temporary demand, necessitating the raising of additional capital to meet it, seldom finding that it will yield an adequate return on the outlay incurred, and in the end doing our undertakings no real lasting good." Well said, excepting that the highways ought to be all right, if the by-ways are not.

A few remarks appeared in a paragraph given in last week's "JOURNAL" (p. 14) upon one aspect of the discussion raised by Mr. A. H. Seabrook, Chief Electrical Engineer to the Marylebone Borough Council, on the subject of the competition of high-pressure gas-lamps for shop-front lighting. After reading what Mr. Seabrook and those of his fellow electricians who took part in the discussion have to say, we are afraid that they have not inspected the matter in a sufficiently broad spirit, or, if they have done so, they do not state all that they have seen as a result. It is not merely a question of the terms on which high-pressure gas-lamps are supplied for what is known as "parade" or "scale" lighting, nor is it owing solely to the fact that the business departments of most gas undertakings are well organized, nor, again, is it due to gas companies having any superior powers to electricity undertakings, that so much success has attended this particular branch of the gas business. In addition to all this, there is the question of the superior quality of the "article" supplied. A good, steady light is produced by the high-pressure gas-lamp; and with it the shop-keeper does not suffer from that awful catastrophe (for him) of an extinction just when he is in the midst of his evening trade. Mr. A. C. Cramb, of Croydon, frankly said, in the discussion, that "the feeling of the average user of arc lamps for outside shop lighting was that they were very fine lights when they were new; but, after two or three months, there were troubles with carbons, and all sorts of things. *The lamps wanted new carbons just in the middle of the busy part of the trade of the evening; and they were always going wrong.*" That is the feeling of the shop-keeper—a feeling that has attained to the dignity of positive knowledge by having been generated by experience. There is also the light afforded by the electric arc lamps. Shop-keepers know nothing much about photometrical values. Their judgment is based on visual comparisons; and they are, as a rule, able to arrive at a very good verdict.

That is a point upon which there are a few words of criticism to be made of Mr. Seabrook's utterances. He, Mr. Cramb, and other electricians admit that the competition of high-pressure gas-lighting is serious, and they confess its success among shop-keepers. All this is out of countenance with Mr. Seabrook's facile assurances that the electric arc lamp is incomparably the cheaper of the two forms of illuminant. Those who have not the capacity for critical examination, and so have to take very much for granted many things that Mr. Seabrook has to say, should on this occasion be exceedingly cautious. In this instance, he says high-pressure lamps are out of the running for shop lighting purposes on the light-for-light cost basis. Shop-keepers who have adopted high-pressure gas-lamps are, therefore, in Mr. Seabrook's eyes, a champion lot of fools. Let us see. At 3½d. per unit, a set of four arc lamps giving a total of 10,000 to 11,000 candle power (fortunately salt is cheap) can be supplied to the shop-keeper for a total of £30 per annum (900 hours' lighting), inclusive of everything, except the hire of the installation and the wiring. The exception here is the first point to be noted. High-pressure gas-lamps are supplied at a price that includes everything. The next point is, Are the four lamps really of a photometrical value of 2500 to 2750 candles each? We know something about the gulf

existing between the nominal and the actual candle powers of arc lamps. The Engineering Correspondent of the "Daily Telegraph," in an article towards the end of last month on the subject of illumination, said: "It is perhaps well to issue a word of warning that many of the arc lamps sold as being of a certain candle power only give that amount of illumination in one special direction." We question the validity of the 2500 to 2750 candle power of Mr. Seabrook's arc lamps, at the price named.

There interest does not cease. The worthy Mr. Seabrook calculates that it will require ten high-pressure gas-lamps at 30s. per quarter each (or a total of £60 per annum) to equal the four electric arcs at a total of £30 per annum. In parade lighting, for the purpose of the high-pressure gas-lamps, gas is distributed at such a pressure that, at each burner it has to be governed-down, so that every lamp is furnished with gas at uniform pressure. Thus it comes about that the consumption and the candle-power—no matter the size of the unit, no matter whether it be 60 or 4500 candle power—can be regulated to a nicety. Now seven high-pressure lamps of 1500-candle power would be the equivalent of Mr. Seabrook's so-called aggregate of 10,000 to 11,000 candle power from four arc lamps; and at 60 candles per cubic foot of gas, the cost of the gas, at (say) 2s. 6d. per 1000 feet for 900 hours, would work out to £19 13s. 9d. There are other costs; but that is the chief item in the total, and it only averages £2 16s. 3d. per 1500-candle power lamp per annum (900 hours) with the full profit on gas at 2s. 6d. included. The illumination that would be afforded would be actual, and not purely nominal. Mr. Seabrook's figures want revising. If any electrician follows the lead of a much-respected electrical contemporary, and adopts Mr. Seabrook as an electrical evangelist whose words and views are firmly composed of, and embedded in, truth so much the worse for the electrician and his undertaking.

Let it pass, however, in the hope that electricians generally are not going to allow themselves to be beguiled by crude argument and calculation. At the same time, there is no necessity to be too hard on the electricians who spoke at Brighton. As mentioned last week in the note already referred to, there was talk as to whether, apparently in the interests of the electrical industry, there should not be some attempt at arriving at an *entente* with the gas industry. The gas industry has never before had so many kind things said about it at a meeting of electricians as on this occasion. Mr. Seabrook was loud in his praise of the business instinct and commercial organization of the men of the gas industry; and he trampled vigorously under foot the mediocre capacities in this respect of the electrical industry. He did not give any inkling as to whether he included Marylebone in his expansive condemnation, although Marylebone has been much vexed and sorely perplexed over the sweeping movement of high-pressure gas-lamps in the lighting of shop frontages, notwithstanding that they are 100 per cent. dearer than electric arcs according to the Seabrookian gospel. However, the gas industry must blush before the copious downpour of flattery from the electricians assembled at Brighton. Mr. Cramb, of Croydon, bore testimony to the commercial zeal and ability displayed by his gas opponents. Others followed on the same lines.

But the most eloquent testimony of all came from Mr. Haydn Harrison; and surely it will only be right for us to in future view this gentleman in a new light. He stated, on the point of the *entente*, that, in connection with the Holborn public lighting contract, where the Gaslight Company had worked in conjunction with the Electric Light Companies, "it had been found that gas managers were sound business men, doing the very best they could for their shareholders. They were perfectly straightforward; and why electricians should hold them at arm's length, he did not know. He thought it was a distinct sign of fear on their part, more than anything else." In regard to the early part of this testimony to good character, we hope Mr. Harrison does not mean that, until the Holborn affair, he had been living under the impression that gas managers were not sound business men; but clearly it was then that he "found" them to be so. The discovery we hope was as interesting as it was instructive. So it is seen there is a division of opinion over the *entente*. Some are for taking the gas industry by the hand of friendship; while others, like the valiant Mr. Seabrook, are for keeping the competitor at arm's length. He wants to know as little about the gas industry as possible; and he evidently regards the administrators of it as a lot of prowling thieves who are not to be trusted. Different men, different manners and opinions. Thank goodness for that. But as was said last week, free competition is the better of the two ways. Indeed, we do not see what the electrical industry has to offer to induce the gas industry to enter into any understanding that would make competition less free or less intensive than it is to-day. But the most interesting thing is that the idea of an amicable understanding has sprung into life in the electrical industry. The gas industry is highly honoured and gratified.

A knowledge of the propensity of electricity for generating fires at unexpected and inconvenient times is spreading among hotel keepers. In one hotel that has lately been largely modernized and extended at a popular seaside resort, the following is a clause from the announcements exhibited in all the bedrooms: "Fire Precautions: The electric light is switched off at midnight; but the gas is left burning on each landing and in each corridor." Candles are also provided in each bedroom. Those who have had experience of the vagaries and dangers of the electric light are thankful to the management for these precautions, and are able to go to bed with a fair amount of confidence of being undis-

turbed in the night by the dread cry of "Fire," and without themselves taking the precaution of having their clothes handy for a hasty garbing, as we were told, at an inquest some time since, was the case, at certain drapery establishments, where the young lady assistants "live in."

We remember a Parliamentary Committee not long ago stating that all municipal trading undertakings ought to be run entirely distinct from all other local considerations; and it is a pity that Parliament does not insist on this being done. What happens when the same, or some of the same, municipal representatives have control of the electricity department, public lighting, workhouse, and so forth, has been seen over and over again at Hastings; and another instance is now before us from the same quarter. We cannot see, in the interests of good government, why, if a director of a gas company as a municipal representative is debarred from voting on a contract in which his company are concerned, a member of a municipal electricity committee should not be prohibited from voting, as a representative on some other public body, on a contract in which the electric supply committee are interested. To the fact that they are in the position to so vote at present is due much of what appears to be of an intriguing nature so as to secure business for the Hastings Electricity Committee. The Education Committee have just decided to spend money in installing the electric light at the Clive Vale and Tower Road Schools. There does not seem to have been any inquiry as to whether or not an improvement in the lighting is required, nor as to whether the Gas Company could produce an improvement at a lower cost than the Electricity Committee. Nothing of the kind. Simply an estimate from the Borough Electrical Engineer as to the cost of installation; and it was agreed to instal. Need we say more than this, that the Building and Sites Sub-Committee of the Education Committee (who made the recommendation) consist of the Mayor (Alderman Mitchell), Mr. J. Stace, Aldermen Hutchings, Langham, and Coussens, Councillors J. N. & H. N. Collins, T. Reed, Dr. Grandy, and Mr. W. W. Jones. With the exception of Dr. Grandy, the Mayor, Mr. Jones, and Councillor J. N. Collins, the whole of these gentlemen have been or are at present members of the Electricity Committee of the Corporation. Is this fair? Is this in the interests of good administration? We say distinctly that it is not.

NOTES FROM WESTMINSTER.

THERE are a few points that have been raised in the Committee rooms within the last week or two upon which a few comments may be made.

A Question of Districting.

It was impossible many years ago, when areas were allocated to various gas undertakings, to say whether or not the boundaries were the best under circumstances that might arise thereafter. It is beyond the power of man to state definitely at any one period the direction in which the development of any town or district may take place in the days to come, and therefore the direction in which there will be an extension of a gas-distribution system. The distribution system must follow the development of building; to go elsewhere, may mean unprofitable investment in mains. There is the unfortunate result in this, that an out-shipment may be left without a supply of gas from the gas undertaking that has in some past time obtained its inclusion within its area of supply; while another gas undertaking has pushed out its mains from another direction to almost within touch of the township that has been left derelict, so far as gas supply is concerned, by the undertaking having powers of supply. It would, in such circumstances, appear to be the correct thing, whenever opportunity offers, for a rearrangement of boundaries to be effected. It was under some such circumstances as this that the St. Helens Corporation, in the gas section of their Bill, asked for their action to be legalized in the matter of supplying small areas, by consent, that were within the statutory supply limits of other concerns. But the other concerns, although consenting parties to the supply by St. Helens, wanted to retain their areas intact, though the portions concerned are at present of little account from the revenue-producing point of view. Their contention is that the time may arrive when they themselves will be in a position to undertake the supply of the areas concerned, and that then they will have to do will be to buy out the portion of the distribution plant of St. Helens, and enter into possession. This is the business point of view; but it is not altogether just. It is true that the St. Helens Corporation are supplying the areas in question on sufferance as it were; but it is also equally true that they have afforded, by agreement, the convenience of a gas supply, when the rightful suppliers were unable to do so. However, the Committee before whom the matter came decided not to legalize the position of St. Helens; but to allow the respective parties to remain in their present relative positions. No real harm is done by this; but the position of St. Helens is an uncertain and unsatisfactory one. They have had the work of pioneering and developing the gas business in areas which, at some unknown time, they may have to relinquish at mere pipe values. In this same Bill of the St. Helens Corporation, there was an instance, to all intents and purposes, of the boot being on the other leg. The Corporation have unexercised powers of supply in the gas-supply area of Ashton; and the Ashton District Council, with similar rights, asked

that St. Helens should be deprived of these powers. The answer of St. Helens was that, to do this, the Ashton Council must come to Parliament with a Bill of their own, and not try to alter a parliamentary right through a Bill that has no reference to the matter, and in the promotion of which they have had no hand. The Committee took the opinion of Mr. Ernest Moon, K.C., the Speaker's Counsel, with the result that they decided against the Ashton Council. The St. Helens Corporation obtained the other powers they sought in relation to the gas undertaking, including a stand-by clause.

Inconsistency.

In connection with Private Bill legislation, the parliamentary authorities can be very inconsistent if they choose. We know, for instance, how consistently for years a stand-by clause was allowed to electricity concerns, and how inconsistently with that procedure the same form of clause was refused to gas suppliers. This has now been remedied; and yet the Local Government Board are constantly, in their reports on measures containing gas clauses, showing objection to gas suppliers being invested with the protective power—fortunately, however, without much success. Yet if the Local Government Board refer to municipal electric supply legislation, they will find a mass of precedent in favour of the power. They raised the question in connection with the St. Helens Corporation Bill, but the Committee allowed the clause. There is another piece of inconsistency. In the Chapel Whaley Gas Bill, a clause appeared asking that new issues of capital might be offered to consumers and employees, on certain conditions, before being submitted to public auction. This is a proposal that is very much in the commercial interests of an undertaking. Seeing that a gas undertaking is circumscribed in its primary business to a defined area, and that the spirit of the sliding-scale clauses is directed to furthering the principle of co-partnership, the ideal is encouraged by facilitating the taking up of capital by those immediately interested in the concern. The immediately interested ones are the consumers and employees. The provision has been granted to companies in the past; but when the Chapel Whaley measure was before the Unopposed Bills Committee, Mr. Moon held that the provision was against the Standing Orders of the House, which provide that new capital must be submitted to public auction. As a result, the Committee disallowed the clause. Now Mr. Moon can do the gas industry a real practical service by seeing whether something cannot be done to so modify the Standing Orders that this highly desirable power may not be denied to gas companies. It is a pity for obstacles of the kind to stand in the path of genuine benefit. With all this we feel quite confident Mr. Moon will agree.

Cannock Purchase.

There has been much effort on the part of the local authority to obtain possession of the property of the Cannock and District Gas Company by agreement; and at length, in connection with the Company's Provisional Order, now part of a Confirmation Bill, an arrangement has been effected for the inclusion of a purchase clause, operative next session. It is understood that £72,000 is the price agreed upon for the purchase of the undertaking. If there is failure, from any cause, on the part of the Council to succeed with a Purchase Bill, the Company will revert to the position occupied before the agreement, plus the possession of the powers conferred by the Provisional Order.

Chester Water.

The Bill of the Chester Water Company, it will be remembered, was vigorously opposed in the House of Lords. It is sailing with ease through the Lower House; the only change that has been made since the big contest being that the Birkenhead Corporation have secured a protective clause, prohibiting the Company from supplying water, without their consent, in any part of their area. Liverpool secured a similar clause, earlier in the career of the Bill.

Mr. RICHARD CHESTERS, a member of the Winsford (Cheshire) Urban District Council, and a Director of the old Winsford Gas Company, died on Monday night last week at his residence in the town, in his 67th year.

The Council of the Royal Society of Arts have decided to make the following awards in connection with the prize offered for the best portable apparatus or appliance for enabling men to undertake rescue work in mines or other places where the air is noxious: A gold medal to Mr. H. A. Fleuss, for the apparatus submitted by Messrs. Siebe, Gorman, and Co.; a gold medal to Mr. W. E. Garforth, in recognition of his efforts to perfect and secure the adoption of rescue apparatus in mines; a silver medal for the "Draeger" apparatus submitted by Mr. Richard Jacobson; and a silver medal for the "Meco" apparatus submitted by the Mining Engineering Company. Of the apparatus submitted to the Committee appointed to report upon the subject, four depended on the supply of compressed oxygen, one on the provision of air evaporated from liquid air, and one on the production of oxygen from "oxylith." The principal points of difference, apart from the fundamental principles on which the appliances are constructed, appear in the comparative lightness and convenience of carriage, and in the arrangements for enabling the wearer to breathe either by the use of a helmet or by means of mouthpieces of various construction. The Committee do not consider that the liquid-air apparatus sent in is as yet sufficiently perfect to justify its adoption in preference to the older systems, under which oxygen is supplied from a receptacle containing the gas in a state of compression.



THE NEW SHOW ROOMS OF THE TORQUAY GAS COMPANY.

RETIREMENT OF MR. S. W. DURKIN.

IN the last number of the "JOURNAL," it was mentioned that Mr. Walter W. Hutehinson had relinquished the position of Engineer, Manager, and Secretary of the Barnsley Gas Company, after fifty years' association with the Company. Another break in the link of officials who were connected with the pioneers of gas manufacture in the early part of the last century has now to be recorded. Mr. Samuel Westall Durkin, late Resident Engineer and Manager of the Southampton Gaslight and Coke Company, retired from his post on the 30th ult. Mr. Durkin's earliest recollections of gas manufacture date as far back as 1852, at which time he was a pupil of the late Mr. James Sharp, the then Engineer of the Gas Company, and the inventor of a gas cooking apparatus somewhere about the year 1836 or 1837. He was appointed Assistant-Engineer in 1857, and Resident Engineer and Manager ten years later, on the retirement of Mr. Sharp; his total term of service being 59 years, which is nearly, if not quite, a record of continuous service with one gas company. In 1852, the annual make of gas was 34 million cubic feet. For last year, the consumption was 750 millions, the number of consumers upwards of 26,000, and the length of mains nearly 200 miles; while the area of supply is about 100 square miles. Coal in 1852 was brought down by sailing vessels carrying about 300 tons. To-day steamers with more than 2000 tons of coal on board are berthed alongside the Company's wharf. Needless to say, Mr. Durkin has seen the whole of the present works built. The largest gasholder in 1852 had a capacity of 60,000 cubic feet; at the present time there are five holders ranging from 250,000 to 2,000,000 cubic feet.

In 1902, Mr. Durkin occupied the presidential chair of the Incorporated Gas Institute; and he was twice President of the South-West of England Association of Gas Managers, now merged in the Southern District Association. He is a native of Southampton, and prior to becoming pupil under Mr. Sharp he was with his brother, the then Manager of the Croydon Gas Company.

PERSONAL.

Mr. H. KING HILLER sailed last Wednesday for Canada to fulfil a business engagement.

Alderman Sir WILLIAM E. CLEGG, of Sheffield, has been elected Treasurer of the Derwent Valley Water Board, in succession to the late Sir Henry Bemrose.

Mr. W. E. FREE, of the Ipswich Gas Company, has (out of more than a hundred applicants) being appointed Secretary to the Windsor Royal Gaslight Company.

Mr. FRANK DURKIN, who for some years has been Assistant-Engineer of the Southampton Gas Company, has been appointed Resident Engineer, in succession to his father, Mr. S. W. Durkin, whose retirement as from the 30th ult. is noticed above.

Mr. ALWYNE MEADE, who is one of the staff of the Commercial Gas Company at their Poplar station, and a student of the Institution of Civil Engineers, has been awarded the Miller Prize of the Institution for his paper on "The Production of Water Gas," read at a students' meeting on the 17th of March last. A short reference to the paper appeared in the "JOURNAL" for the 28th of March (p. 924); the rules of the Institution precluding any fuller notice of it.

At the church of St. Paul's, Kingston Hill, last Saturday, the marriage was solemnized of Mr. ERNEST SCEARS, Assistant-Engineer of the Hampton Court Gas Company, and Hon. Secretary of the London and Southern District Junior Gas Association, and Miss Beatrice Marion Wood, eldest daughter of Mr. Charles E. Wood, solicitor, of Kingston Hill. After the ceremony, there was a reception at St. Paul's Hall, which was attended by a company numbering about a hundred. Among the numerous presents were a black marble clock from the staff, and a silver teapot from the employees, of the Gas Company.

A pleasing incident of the meeting of the Oldbury Urban District Council last Friday was the presentation to the Chairman of the Gas Committee (Mr. C. Thomlinson) of a testimonial on the occasion of the celebration of his golden wedding, and in recognition of his public services. The Chairman of the Council (Mr. E. W. Jackson) submitted the following resolution: "That the hearty congratulations of the Urban District Council of Oldbury be tendered to Councillor and Mrs. Charlie Thomlinson on the celebration of their golden wedding; and that they be asked to accept a silver rose-bowl subscribed for by the members and officers of the Council as a token of goodwill and appreciation of Councillor Thomlinson's services to the town on the Local Board and District Council during the past twenty-seven years." Several members of the Council having offered their personal congratulations, Mr. Thomlinson expressed his thanks and those of Mrs. Thomlinson for the gift. He said that what he had done in representing the ratepayers he had done as a duty to the town in which he lived; and as long as he was able he would continue to render similar service.

Ammonia Production from Peat.—According to an article in a recent number of the "Comptes Rendus," of which an abstract has appeared in the "Journal of the Society of Chemical Industry," further experiments by Herr Woltereck in the production of ammonia and the recovery of nitrogen from peat confirm others previously recorded. The treatment of peat by steam alone at 450° C. produces only about one-third of the quantity of ammonia obtained under the same conditions by means of a mixture of steam and air; and results show a recovery of 102.6 per cent. of nitrogen (referred to the nitrogen present in the original peat) by the latter method—no nitrogen being left in the residue. No acetic acid was obtained when peat was treated first with steam and then with a mixture of steam and air; but when the material was treated with the mixed steam and air, the yield of acetic acid amounted to 2.31 per cent.

Transmission of Gas at Raised Pressure.—We have received from Messrs. James Milne and Son, Limited, an illustrated pamphlet on this subject, in which the advantages to be gained by the adoption of high-pressure gas supply are concisely set forth. It is shown that by means of compression it is possible for an area of distribution to be greatly extended, existing low pressures to be supplemented, and consumers supplied with any pressure they may require or prefer for their high-pressure lighting. Illustrations are given of two of the firm's reciprocating compressors. In a separate leaflet, the importance of high-pressure lighting to employers is emphasized; and a comparison is made between ordinary incandescent and high-pressure incandescent gas lighting for a mill over a given period. The net result of the installation was a saving of £10 9s. 3d.; the upkeep of 30 burners was dispensed with; and a better light was obtained.

SUGGESTED STANDARD SPECIFICATIONS FOR STREET LIGHTING.

Some Replies to a Useful Circular of Inquiry.

THE current number of the "Illuminating Engineer" contains a special feature which bears testimony to its usefulness, as well as that of the Society of which it is the official organ. In May last, an article was published dealing with the various suggestions put forward during the past few years with reference to the adoption of standard specifications for street lighting. The article showed that there were certain points on which a distinct division of opinion seemed to exist; and as the matter was exciting much attention in this country, it occurred to the conductors of our contemporary that it would be of value to learn the views of authorities in the United States and on the Continent interested in the subject. With this object, the following list of queries was prepared and circulated:—

- 1.—Ought the specification to contain a statement of (a) the electrical energy or gas to be consumed; (b) the amount of light provided; or (c) both energy or gas consumed and amount of light?
- 2.—Should the amount of light supplied be specified in terms of (a) the provision of a certain actual minimum illumination in the street; or (b) the provision of lamps of a certified candle power?
- 3.—If illumination is to be measured, should this measurement be carried out (a) in a horizontal plane at a stated height above the ground; (b) in a vertical plane; or (c) in some other inclined plane, such as 45° ? (d) Should both the mean and the minimum street illumination be measured and specified?
- 4.—If candle power is to be tested in the street, should (a) the mean spherical or mean hemispherical candle power, or (b) the candle power in several specified directions be tested?
- 5.—Should the contract demand (a) actual measurements in the streets or (b) only laboratory tests of the competing lamps previous to the acceptance of a tender, or (c) preliminary laboratory tests supplemented by periodical tests of the actual lighting conditions when the lamp is in position?
- 6.—Should any test of the constancy of the candle power of the lamps be prescribed?
- 7.—Do you advocate the introduction of any stipulation regarding the efficient shading of lamps, height above ground, &c., with a view to the avoidance of glare, such as is recognized to be dangerous and inconvenient to traffic and pedestrians?
- 8.—Should any specific colour of the light be prescribed? If so, how should this be tested?
- 9.—What other clauses would you suggest being inserted?

Answers to these questions have been received from some of the gentlemen approached, all of whom are corresponding members of the Illuminating Engineering Society, and these are given in full. It is hoped to make the collection more complete as soon as others have come to hand. We give extracts from some of the replies; referring readers to the pages of our contemporary for further information as to the opinions expressed by the various experts, which are summarized in a table accompanying them.

Dr. Louis Bell, of Boston, Consulting Electrical Engineer of the Edison Electric Illuminating Company, Limited, and Past-President of the American Illuminating Engineering Society, is of opinion that the electrical energy or gas to be consumed should be directly stated in the specification, since this is a quantity which is susceptible of relatively accurate measurement, and the output of light is sometimes very sensitive to small changes in the energy or gas furnished. He does not believe in the specification of illumination in any form as the basis of payment in a municipal contract. If illuminating power is tested at all in the streets, as he considers it should be, from time to time, to see that the performance of the lamps is in accordance with the standard set, it should, in his opinion, be measured "in a single specified direction, the relation of which to the total flux of the lamp can be pretty definitely settled by laboratory tests." In Boston, the routine tests of the lamps are made at an angle of 25° below the horizontal. Dr. Bell says the contract should demand such photometric tests of the competing lamps as shall settle their average performance in light flux and nature of distribution. He thinks the process indicated in the fifth question will generally be efficient in meeting reasonably constant illuminating power. He is accustomed to specify the limit of heights within which the lamps shall be placed (varying, of course, according to the type of lamp), and the use of diffusing globes wherever the circumstances of use make such desirable to avoid glare. He always advises them for the more powerful illuminants, such as arc lamps and high-pressure gas-lamps, and occasionally, where the circumstances require, for ordinary incandescents, both gas and electric. He does not think a specific colour of the light should be prescribed, as this question can be settled in selecting the type of lamp to be used under the contract. Finally, Dr. Bell is of opinion that the thing really furnished and paid for in any municipal lighting contract should not be candle power, illumination, or energy, but "service with certain specified lamps operated under specified conditions of energy supply." He explains that the opinions he has enunciated are the result of experience under American conditions; and he says he does not consider himself competent to judge as to whether or not they will be applicable to England.

Dr. L. Bloch, of Berlin, is of opinion that the amount of energy

consumed by public lamps should be specified. With regard to the plane of measurement, height of observation, &c., he naturally abides by the German recommendations, inasmuch as these are the result of his own suggestions. He especially urges that the measurement of the maximum value of the horizontal illumination should not be disregarded, as it is necessary in determining the degree of uniformity, and possesses the greatest significance in the case of weakly illuminated streets. Dr. Bloch considers the proposal contained in the fifth question is most correct if lamps are tested for illuminating power in the laboratory, but the actual measurement takes place in the street. The point raised in regard to the constancy of light from street lamps bears mainly, in Dr. Bloch's opinion, on the fluctuations of short duration on the part of many arc lamps. He considers the time is not ripe for regulations on this matter, in view of the fact that no reliable means of measuring such variations can yet be said to exist. In the same way, precise recommendations can hardly as yet be made on such questions as the use of shades and reflectors, the desirable height of lamps, avoidance of glare, &c.

A joint reply to the questions was sent by Professor W. H. Bunte, of Karlsruhe, and Professor Dr. H. Drehschmidt, of Berlin. With regard to the first question, they say it does not suffice to specify either candle power or consumption of gas and electricity alone. They consider that both quantities should be stated, as the efficiency of different varieties of lamps varies within wide limits. As to the second question, they recommend that a certain minimum illumination in the streets should be specified and not the candle power of the lamps, since the latter would not indicate sufficiently the effect on the resultant illumination in the street of differences in the polar curves of light distribution. The answers to the next questions (Nos. 3, 4, and 5) are as follows:—

For the routine supervision of street lighting, measurement of illumination on a horizontal surface about the height of the head is sufficient; for when certain sources having a known polar curve of light-distribution are being used, the vertical illumination can be deduced from the horizontal. Yet in comparing the merits of the different methods of illumination, the brightness of the illumination in a vertical plane should be considered, as this is very essential in enabling the faces of people and surrounding objects to be clearly seen. In deciding upon the adoption of a certain system of illumination, the relation between the horizontal and vertical illumination should therefore be borne in mind. Measurements in a plane inclined at 45° present no advantages over vertical and horizontal determinations.

A determination of mean spherical or mean hemispherical candle power is surely not practicable (in the streets). Instead, measurements of illumination at specified distances from the foot of the lamp-post are desirable.

Preliminary measurement of candle power in the laboratory is to be recommended, but not mean lower hemispherical candle power alone. Tests of candle power in various directions are desirable, and the polar curve of light-distribution should be ascertained. The lamps should subsequently be tested in the open, to ascertain whether any defects in practical working will reveal themselves—e.g., as regards maintenance, protection against wind, steadiness of light, &c. When these tests have been passed satisfactorily, the installation of the lamps in the streets may be proceeded with, and their performances tested by periodical measurements on the spot.

Professors Bunte and Drehschmidt consider it is difficult, in the light of present experience, to prescribe numerical limits to the steadiness demanded from lamps. They say perfect constancy is not attained in the electric arc lamp, by reason of the etching of the glass and the deposit of fumes on the globe, nor in the case of the incandescent gas-lamp on account of the deterioration of mantles. They think possibly one might put forward the tentative suggestion that the limit of diminution should be not more than about 65 to 70 per cent. of the original candle power. Replying to the remaining questions, they say the height of the lamp cannot be rigidly specified, since this is naturally dependent on the kind of lamp used. A source of which the light is developed over a small area, and which has a high intrinsic brilliancy, must be hung at a greater height than one for which the intrinsic brilliancy is low. A certain colour of light cannot, they consider, be readily specified. One can only abstain from using lamps which give a very peculiar and undesirably tinted light. They think no special proposals need be added to lighting contracts.

Mr. P. S. Millar, of New York, thinks the electric energy or gas to be consumed should be stated. He favours the specification of a particular type of lamp, consuming a definite number of watts or cubic feet of gas. In answer to the second question, he considers that the minimum illumination, while important, is inadequate as a measure of illuminating effectiveness. He thinks tests of candle power on any single plane fail to tell the whole story. The horizontal plane on the surface of the street is most important; while vertical illumination 5 feet above the surface is not to be neglected. Considerations of practicability limit candle-power tests in the streets to measurements in certain directions. With regard to the ninth question, Mr. Millar thinks that, if photometric tests are involved in a contract, a competent independent third party should be named to conduct them.

Dr. B. Monasch, of Augsburg, replies as follows to the third question:

I believe those concerned with gas lighting were inclined to prefer

measurements of illumination in a vertical plane (whereas electrical engineers habitually make measurements horizontally), so long as only upright mantles were in use. But since inverted mantles, which give a very powerful light in the lower hemisphere, have been so largely adopted, the distinction between the distribution of light from the two illuminants has been less marked. In consequence of this, representatives of gas lighting seem disposed to reconsider their former position, and to view horizontal measurement in a more favourable light. Personally, I regard the vertical illumination as no satisfactory criterion, since the calculation and graphical determination of such values is so inconvenient.

Professor S. A. Rumi, of Genoa, considers that the specification should contain a statement of the amount of light to be provided, expressed as the mean hemispherical candle power, and of the quantity of gas consumed by each burner in the case of an incandescent gas-lamp, or the electric energy used and the pressure required across the terminals of an electric lamp. Lamps of specified candle power should be provided. As the actual outdoor illumination depends not only upon the illuminating power of the lamps used, but also on such circumstances as the mistiness of the atmosphere, Professor Rumi thinks it is not desirable to make illumination the subject of rigid specification.

Herr Max Sartori, of Vienna, considers that the specifying of the candle power of street illuminants, as well as the direction in which this should be measured, is somewhat objectless, for what is desired is not the power of the lamps, but the provision of a certain specified ground illumination.

Herr Max Scholz, of Berlin, is of opinion that a specification ought to contain a statement of the energy or the gas consumed and the amount of light produced; the proportion of the two to be the basis upon which the values of competitive illuminants may be compared. He found it difficult to give a definite answer to the second question. He remarks that when gas-lamps are in question, the candle power and the lamp will naturally change with the quality of the mantles used; and consequently the illumination of the street will also vary. As the quality of the mantles, even those of the same manufacturer, is not continuously the same, the statement of minimum illumination might be rather inconvenient in the case of gas-lamps. Moreover, local conditions have to be considered. For example, in many cases the height of the lamps is restricted, and existing lamp-posts must be used.

Herr Scholz says the natural thing would be to demand a certain proportion between minimum and maximum illumination, which should be kept as low as possible. If illumination is to be measured, it ought, in his opinion, to be carried out both in a vertical and a horizontal plane at about 5 to 7 feet above the ground. This is to ensure sufficient illumination to enable the public to recognize passers-by as well as signs on omnibuses, trams, house doors, &c. If illuminating power is to be stated in the specification, Herr Scholz is of opinion that the mean lower hemispherical candle power ought to be considered. The nature of the curve of light-distribution, therefore, must also be borne in mind. He is not in favour of measurements being taken when the lamp is in position; such tests never, he says, being reliable. For gas-lamps, the ever-changing quality of the mantles ought to be taken into account. Therefore all competitive lamps, electric as well as gas, ought to undergo laboratory tests, but under equally favourable conditions. He does not think the tests of the constancy of the candle power ought to be prescribed; but he says it must be required that lamps shall not be materially influenced by changes of atmospheric conditions, such as humidity, strong winds, &c. He does not advocate the introduction of any stipulation regarding the efficient shading of the lamps with a view to the avoidance of glare; but he considers the height of the lamps above the ground ought to be prescribed according to their candle power. He points to Berlin as furnishing clear evidence that 4000-candle power high-pressure gas-lamps can easily be hung up at about 17 feet above the ground without being a danger and inconvenience to traffic and pedestrians. Herr Scholz thinks there is no need to prescribe any specific colour of the light; but he says a stipulation ought to be made that the light must be of a tint convenient to the eyes. Lamps should be preferred which contain few ultra-violet rays, as energy of this kind has been proved to be injurious to vision.

Professor Dr. J. Teichmüller, of Karlsruhe, says he is in entire agreement, as are Dr. Bloch and Dr. Monasch, with the recommendations of the Verband Deutscher Elektrotechniker, in the framing of which he collaborated, and is still doing so. He considers that the work of the Commission appointed to deal with this subject has been most carefully carried out. He says practical experience of these recommendations has been so far quite satisfactory. As the current literature on the subject shows, they are rapidly becoming familiar to engineers, and receiving general recognition. He adds: "It is surely very desirable that international acts on these points should be agreed upon; and if the time for this is not yet quite ripe, I still feel that we should keep this aim in view. It would be very gratifying if the German recommendations could be approved by the British authorities, and be eventually adopted as the basis for agreement of this kind."

Among other communications on the subject was one from Professor Strache, of Vienna, who writes: "The question of framing a standard specification seems to me to be of such importance that I intend to put it before a Commission that is to be constituted for this purpose by the Institution of Gas Engineers in Austria-Hungary."

THE CASE AGAINST SOCIALISM.*

THOSE who from time to time, either from desire or from necessity, combat the claims of Socialism, will find some useful "wrinkles" in a handbook which has been compiled primarily for the use of the speakers on behalf of the Anti-Socialist Union of Great Britain. The area to be covered by such a volume is, of course, a wide one; and the numerous chapters include at least two in which "JOURNAL" readers have a keen interest, though all of them are more or less closely linked together. Firstly, there is the one on "Co-Partnership and Profit-Sharing;" and among the undertakings that have applied co-partnership to their employees, it is a pleasure to see that prominence is accorded to the gas industry. A few particulars are given of the South Metropolitan Company's scheme; and there is included the table from the last report of the Labour Co-Partnership Association, which has already been reproduced in the "JOURNAL." "There are," it is pointed out, "no co-partnership schemes in connection with municipal gas undertakings. Municipal Socialism is said to be in the interests of the working classes; here is one respect in which it is directly against their interests." The matter of profit-sharing and municipalities formed the subject of an article in our pages last week; and allusion was made to the fact that there is at any rate one municipal gas-works—that is Stafford—where a system of profit-sharing is in vogue. The writer there put forward a scheme with the object of enabling municipalities to more nearly reach the ideal of co-partnership. The other chapter in the book under review which may be referred to is that on the subject of "Municipal Trading;" and here gas is truly styled the most successful of all municipal trading concerns. By this time nearly all that can be said either for or against municipal trading must have been said; but it is nevertheless interesting to refresh one's memory occasionally by reference to a handy little volume of this character.

A LOCAL TAXATION RETURN.

The Lighting and Watching Act.

SOMEWHAT out of its turn, so far as numerical order is concerned—for several subsequent volumes have already been noticed in our pages—there has now been issued as a Blue-Book Part III. of the Local Taxation Returns for the financial year 1908-9, which contains abstracts of returns made by Rural District Councils, Parish Councils, Parish Meetings, Joint Committees appointed wholly by Parish Councils and Parish Meetings, and Inspectors and Committees under the Lighting and Watching Act, 1833.

At the commencement of the year beginning on April 1, 1908, there were 656 rural district councils in England and Wales; and their receipts (exclusive of borrowed money) amounted in the aggregate to £4478,891. Of this, £3,123,201 was from rates, and £1,353,905 under the Agricultural Rates Act. From water-works, there was a revenue of £178,531; and various other items made up the balance. A sum of £362 was received from an electric light undertaking; and £871 from a gas-works. The total receipts, when compared with the previous year, show an increase of £186,437. The expenditure not defrayed out of loans was £4,490,984, and included £311,124 for water-works; the total out-goings being £149,889 more than the year before. The expenditure on electric lighting (excluding the cost of public electric lighting) was £2728; on gas-works, £864; and on public lighting, £25,028 (including £3142 for public electric lighting). At the commencement of the year under review, the aggregate length of roads under the supervision of the rural district councils was 101,643 miles. The receipts from loans in the year 1908-9 totalled £517,505, of which £186,851 was for water-works purposes; and the expenditure out of loans was £436,385, of which £129,655 was for water-works. The total outstanding loans on March 31, 1909, were £5,960,067; that for water-works being £1,758,749. The rates raised to meet the general expenses of the rural district councils were equivalent to an average rate of 1s. 0½d. in the pound on the total assessable value for these purposes. Comparing the year 1904-5 with that of 1908-9, it is seen that the total receipts (other than from loans) of rural district councils were greater in the latter year than in the former by 6 per cent. The receipts from rates levied for general purposes, which decreased each year from 1904-5 to 1907-8, show an increase in 1908-9 over the amount raised in any of the previous years. The receipts from rates levied for special expenses exhibit a marked yearly increase. The total expenditure (other than out of borrowed money) was greater in 1908-9 than in any of the other four years; and by far the larger portion of the outlay annually is in respect of highways. The outstanding loans increased by nearly 19 per cent. in the period referred to.

The total number of rural parishes in England and Wales during the year 1908-9 was 12,929, of which 7236 were entitled to parish councils. But only 6355 parish councils had financial transactions during the year; and of the parish meetings in the 5693 rural parishes which were not entitled to parish councils, only 382 had financial transactions during the year. The number of parish

* "The Anti-Socialist Union Speakers' Handbook." London: The Anti-Socialist Union of Great Britain; 1911. (Price 2s.)

councils having transactions under the Lighting and Watching Act was 962; while the number of parish meetings similarly engaged was six. The total receipts under the Act were £80,710; and the expenditure, including loan charges, was £79,673. In parishes in which the Act was administered by inspectors and committees, sums amounting to £2764 were expended, in addition to the above-mentioned amount. Under the Act, rates were raised for 893 parish councils and three parish meetings. The rates raised for parish councils were equivalent to a rate in the pound on buildings and other hereditaments not being land or tithes of 3d. or under in 552 cases, over 3d. but not more than 9d. in 333 cases, and more than 9d. in eight cases. The highest were a rate of 1s. 6d. in the pound in the parish of Sandy (Beds), a rate of 1s. 1½d. in the parish of Market Deeping (Lincoln-Kesteven), and rates of 1s. in the pound raised for the expenses respectively of the parish councils of Potton (Beds) and Hauxley (Northumberland). The rates raised for parish meetings under the Act ranged from ¼d. to 2d. in the pound.

As to the accounts of inspectors and committees appointed to exercise the powers of inspectors, under the Lighting and Watching Act, it may be remarked that in April, 1908, there were 21 parishes in which lighting inspectors were still appointed under the Act; and there were also six joint committees appointed under the Local Government Act of 1894 to exercise the powers of lighting inspectors in areas comprised in more than one rural parish. In those parishes in which the Lighting and Watching Act was administered by inspectors and committees, the lighting rates made during the year varied from 1½d. to 9d. in the pound. The total receipts of these inspectors and committees amounted to £2790, of which £2156 was received from rates and £511 from constituent authorities of joint committees. The expenditure came to £2764. Adding to these totals the sums received and paid under the Act during the year by parish councils and parish meetings, the total rates raised under the Act in 920 rural parishes during the year 1908-9, came to £81,618. The total receipts were £82,989; and the expenditure, £82,437.

DESSAU RETORTS v. "FULL" HORIZONTALS.

By ANOTHER CARBONIZING ENGINEER.

YOUR contributor, "A Carbonizing Engineer," commences his article on Dessau retorts v. "full" horizontals by deprecating comparisons between the results obtained from "this modern system of carbonization" and those obtained from small charges of coal in horizontal retorts. It might be inferred from this that the case for Dessau verticals rests upon such comparisons. But this would be to ignore the investigations of Mr. J. Ferguson Bell and Mr. P. C. Holmes Hunt on the comparative merits of Dessau verticals and "full" horizontals.

Mr. Bell is a carbonizing engineer *par excellence*, and a recognized authority on "full" horizontals. He recently instituted a test for the express purpose of ascertaining if better results could be obtained from Derbyshire coal with verticals than with horizontal retorts; and what he has to say on the subject was related by himself in the course of the discussion on the four carbonizing papers at the recent meeting of the Institution of Gas Engineers in Glasgow. He says that

"when he started he was rather sceptical, because he thought they could get as good results with filled horizontal retorts as with verticals. But the result of the test, extending over the four days, had convinced him that they could get better results with verticals than with horizontals. In this case, it amounted to something like 1000 cubic feet of gas per ton. There was a decided increase in the quantity; and if they took the product of the cubic feet multiplied by the heat units, they found they had an increase of something like 18 per cent."

A result such as this is likely to be of no small advantage in the near future, having regard to the possibility of a calorific value test being applied to gas undertakings.

Mr. Hunt, who is also a "full" horizontal man, was over here for several months last year for the express purpose of investigating the various systems of carbonizing, with the intention of adopting that which he found was most suitable to his conditions in Melbourne. His paper on "Carbonizing Systems—A Review and a Selection" bears testimony to the thoroughness with which he fulfilled his mission, which included the conduct of tests of the various systems with the same coal. The figures relating to these tests are unfortunately not available; but Mr. Hunt says in his paper "that the results obtained in all three cases [*i.e.*, with verticals] were superior to those resulting from carbonization of the same coal in horizontals with full charges."

The conclusions arrived at by these two gentlemen, after a practical study of the question, are in conflict with the suggestion of "A Carbonizing Engineer" that there is no reason to believe that the actual make of gas per ton is any greater with verticals than with "full" horizontals; and the statement of the latter that in a good many works fully-charged horizontal retorts are giving yields of 12,500 cubic feet per ton of 15½-candle power gas (No. 2 "Metropolitan" burner) from second-class Durham coal, of a quality no better than that used at Sunderland, is at any rate not borne out by "Field's Analysis," where it is seen that the highest results, none of them equalling 12,500 cubic feet, are obtained in works having carburetted water-gas plant as an adjunct. It is doubtful, moreover, if any but the best of the "second-class"

coals used by Mr. Drury ever find their way into any of the gas-works referred to in the "Analysis."

It must not be forgotten that to the actual saving in carbonizing wages which is secured by the Dessau verticals as compared with "full" horizontals has to be added the saving in wear and tear and maintenance of machinery; and these two items are shown by Mr. Hunt in his paper to amount to 12·87 per cent. on the additional capital outlay which in his case appears to have mounted to £40 per ton—*i.e.*, £10,000 for a 250-ton plant. Adding this to his approximate cost for horizontals—*viz.*, £100 per ton, which is admittedly a fair figure—we get £140 per ton as the cost of his Dessau verticals, in place of the £180 mentioned by Mr. Drury, and repeated by your contributor, "R. W. E." This reduction in cost has apparently been brought about by the beds of eighteen retorts recently introduced, and to some extent perhaps by the Melbourne installation being upon a much larger scale than the Sunderland one. But however this may be, it seems to be established that, under favourable conditions, £140 (and not £180) per ton may now be regarded as the cost of Dessau verticals.

Mr. Hunt's figure of 12·87 per cent. shows that the saving in labour and upkeep of machinery is more than sufficient to counter-balance the extra capital cost of Dessau verticals. In addition to this and the extra yield of gas per ton, there are other important advantages which Dessau verticals possess over "full" horizontals that should not be lost sight of. These are a greater yield of tar of better quality, a greater yield of ammonia, practical freedom from naphthalene, no excess of sulphur compounds, and the absence of machinery for working the retorts.

It is well known that in at least one case lime purification has been reverted to since the adoption of "full" horizontals; and there is no evidence of any appreciable diminution of sulphur compounds, or practical freedom from naphthalene, having in any single case followed their adoption. Nor, so far as returns are available, is there any indication of an increased yield of tar having resulted from "full" horizontals, though there may have been a little improvement in quality. On the other hand, Mr. Drury can point to an increased yield of over one gallon per ton of coal carbonized, of greatly improved quality, both in fluidity and also as measured by percentage of free carbon.

Almost the same can be said of the yield of ammonia. At all events, no such increase as that obtained at Sunderland or the 20 to 25 per cent. stated to be obtained on the Continent, can be, or has been, claimed for "full" horizontals.

"A Carbonizing Engineer" has come to the conclusion that the balance of advantages is probably on the side of the Dessau system, "but not to an extent which would warrant its wholesale adoption in place of horizontals worked on up-to-date principles." In view of the most recent investigations quoted above, your readers will decide for themselves whether or not this statement is justified.

Junior Institution of Engineers.—The summer meeting of the Institution will be held in the Eastern Counties, in the week ending the 5th of August. According to the programme issued by the Secretary (Mr. Walter T. Dunn), the members will leave London on the morning of Saturday, the 20th inst., for Felixstowe, where Sunday will be spent. Next day they will start for Ipswich, and visit the works of Messrs. Ransomes and Rapier and Messrs. Ransomes, Sims, and Jefferies; going to Norwich in the evening. Tuesday morning will be occupied in inspecting the works of the British Gaslight Company, where they will have an opportunity of seeing Mr. Thomas Glover's system of carbonization by means of deep chamber retorts. The afternoon will be available for visiting the Cathedral, Castle, &c. Wednesday will be spent on the Broads. On Thursday morning the members will look over the works of Messrs. J. & J. Colman, and in the afternoon proceed to Cambridge, where Friday will be occupied in visiting the engineering laboratories and workshops and the colleges. In the evening, the members will dine together.

Cloudy Condensation.—A communication on "Some Nuclei of Cloudy Condensation" has been presented to the Royal Society of Edinburgh by Dr. John Aitken, F.R.S. The foundation of the paper was the results obtained from observations upon abnormal dust formations, made at Kingairloch, upon Loch Linnhe, in the north-west of Ross-shire. It was accepted that, as a rule, haze in the atmosphere is proportional to the number of dust particles in the air; and at Kingairloch, when the wind was in the north-west and the sky clouded, the number of those particles observed was small, and the air very clear, thus complying with the rule. But if there was much sunshine the numbers became very great, while the air did not lose its transparency. The source of these sun-formed particles was only discovered last year, while observations were being made at Appin, in Argyleshire. It was found that they were produced by the action of the sun upon the foreshores. Experiments were made, in which salt, iodine, and hydrochloric acid (three substances in the air of the seashore) were tested to see if any of them produced nuclei of condensation after being acted on by sunshine. Both salt and iodine gave great quantities of fine dust by its action; and both electricity and ozone increased the effect of the sunshine. All the observations at Kingairloch were affected by these sun-formed particles coming from the surrounding foreshores, as it required 26 per cent. more particles at that place when there was sunshine to form a haze of a certain amount, than at inland places, such as Alford, in Aberdeenshire, or Rigi Kulm, in Switzerland.

LONG DISTANCE GAS DISTRIBUTION: ITS APPLICATION AND ECONOMY.

By Geh. Baurat E. BLUM, Hon.D.Eng., of Berlin.

[Abstract Translation of a Paper read before the Meeting of the German Gas Association.]

A retrospect of the last decade discloses a remarkable development in it of the transmission of gas to a distance, whether for the supply of the suburbs of a large town, for linking several townships to a communal gas-works, or for some other purpose. Technically, as well as economically, the procedure is sound. Coal gas is the only fluid product which, at the present day, is transmitted large distances under low pressure. The old idea that the illuminating power of the gas suffered through high compression is no longer tenable. In 1900,* Mr. F. H. Shelton, of Philadelphia, pointed out how much the distributing costs of gas could be diminished by the employment of high-pressure. He argued, *inter alia*, that coal gas could be distributed without difficulty under a pressure of 1.4 atmospheres. Exhaustive investigations carried out on the long-distance main from Rohrschach to St. Gall proved that distribution under high-pressure and at great distances had no injurious effect on the calorific value and the illuminating power of the gas. High-pressure is no longer a bogey. In connection with the extension of the Lichtenberg Gas-Works of Berlin, there is being installed a compressor which will give a terminal pressure of 1.7 atmospheres over and above the atmospheric pressure. The greater number, however, of the existing long-distance installations have only an initial pressure of about 40 inches of water at the time of maximum consumption. At the No. IV. Gas-Works in Breslau, two blowers have recently been installed, each of about 425,000 cubic feet per hour capacity, which will give a maximum pressure of 80 inches of water. Both blowers are directly coupled with a direct current motor of 150 H.P. In order to meet fluctuations in the quantities of gas to be transmitted per hour, the motors are designed for a variation of 50 per cent. in the revolutions, the regulation being effected by hand. Another installation is being put in, in which the revolutions of the motors will be automatically controlled. At the Simmering Gas-Works in Vienna, the long-distance compressing plant consists of three blowers, each of a capacity of 265,000 cubic feet per hour, and designed to increase the pressure to a maximum of 80 inches of water. The number of revolutions is automatically controlled, so that the quantity of gas transmitted corresponds constantly with the consumption at the time. The regulation presents many interesting problems to the gas man and the mechanical engineer.

The two installations referred to have turbo-blowers, which admit of the number of revolutions of the blower being regulated within wide limits. When steam turbines or continuous current motors are used, any number of revolutions may be obtained. But in many cases it is preferable, on mechanical grounds, to use alternating current motors; and they have been adopted, where large quantities of gas have to be transmitted, at a relatively small increase of pressure, by means of turbo-blowers. Recently, however, great advances have been made in the regulation of alternating currents, to avoid the loss inseparable from the old method of regulating by resistances. The author proceeds to give a short description of the method employed to regulate, without loss, the number of revolutions, which is applicable to alternating currents.

The turbo-blower fulfils the latest requirements in respect of a gas transmitting machine. It admits of extremely good regulation, both of the quantity and of the pressure. The pressure increases as the square of the number of revolutions, and the quantity increases directly with the number of revolutions. The power required increases as the third power of the number of the revolutions. Facility of regulation is obtainable by a valve on the suction or pressure side. The pressure produced by the blower is proportional to the specific gravity of the gas, and therefore in the same conditions blowers give a higher pressure when driving air than when driving gas. Of other gas transmitting machines, gas-compressors are the most generally used. They have the advantage that they can be constructed for any pressure. At Rio de Janeiro three twin gas-compressors, each of 176,500 cubic feet per hour capacity, have been adopted to give an increase of pressure of 2.1 atmospheres. The regulator or governor constitutes an important item of the compressing plant for long distances. Its function is to give a constant pressure or a pressure increasing as the consumption increases, notwithstanding great fluctuations in the anterior pressure. It is not merely a case of the anterior pressure being constantly high, but that it may vary between wide limits. Many long-distance supply plants are worked so that the main is under high-pressure for only a few hours; and at the time when the consumption is small, the holder pressure only is available for transmitting the gas. The regulator, having two throttle valves or taps one after the other, has behaved perfectly in the most varied working conditions. It is specially constructed for direct attachment to the high-pressure main. As a rule, the final pressure required is only about 4 inches, but cases occur where a pressure of from 25 to 40 inches of water is used at the burners—e.g., for boiler-firing. A regulator must be provided

in one case which will never allow gas to pass back from the gas-holder to the long-distance main, while a second regulator must give a free-way from the holder to the long-distance main as soon as the pressure in the main has fallen to a certain minimum.

These two gas regulators are characteristic of the different conditions of particular installations. The question of an equalizing or relief gasholder cannot be treated in general terms. An installation with branches, which works without an equalizing gasholder, is to be found at Heidelberg. In such installations it is highly essential that the regulators should require no watching, even when an increased pressure, corresponding to an increase in the output of gas, is required. This condition has been fulfilled in practice. In recent installations, an advance has been made in the direction of accomplishing the ignition and extinguishing of lamps in a distant district from the central governor-house. There is in this case a small supplementary governor, as well as a cut-out valve. The ignition and extinguishing then happen automatically at the times set. It is only necessary that the clock should be set from time to time as times for lighting and extinguishing are changed. At Karlsruhe, however, the clock is provided with an arrangement to automatically set it throughout the year according to the times of lighting and extinguishing.

It is necessary for transmission that the gas should be free from naphthalene. This condition gives a relatively higher value to the gas produced in vertical retorts. The risk is not of any naphthalene stoppages effected by condensation from the gas by the cooling of the compressor (which is never so effective as to prevent a slight rise of temperature of the compressed gas), but of cooling after it has been compressed. The naphthalene stoppages affect greatly the loss by friction, not merely by reducing the internal diameter of the pipe, but also by altering its surface. Numerous observations of this loss of pressure have been made in recent years. The coefficient of friction decreases as the pressure and the diameter of the pipe increase. The range of application of Pole's formula is limited. The fact that as the pressure increases the loss of pressure becomes smaller, is of great importance in regard to the power required for transmitting gas. When the quantity of gas is doubled, the loss of pressure is considerably less than quadrupled, and consequently values are taken for the motors required for compressing which are based on the practical figures obtained. According to Pole's law, doubling the quantity of gas entails eight times the consumption of power. The necessary increase of pressure must be determined as exactly as possible, and then the engines required for compressing may be settled for a particular case.

The transmission of gas by long-distance supply mains applies primarily to the supply of districts which are without a gas supply; but it is applicable also to the reduction of cost of production and distribution which may be effected by the centralization of gas manufacture. There are many cases in which separate communities have combined together to manufacture gas, which is then transmitted under high pressure to the separate districts. The cost of manufacture of gas diminishes considerably with the quantity made, as does also the cost of administration. In many cases, therefore, it is economically proper that communities not separated from one another by too great a distance, should combine to erect a joint gas-works, rather than that each should have a separate works. In the vicinity of large towns also there are numerous villages which are developing into independent communities and towns, which, in the ordinary course, would eventually erect gas-works. Ultimately these outlying towns would be fused in the city; and it is only with difficulty and with the sacrifice of a good deal of money that the separate gas supplies can then be centralized. From the economical standpoint, therefore, it is right that these small communities should in the first instance be connected with the central gas-works of the large towns. It is not necessary, however, that all the outlying districts should be placed on equally favourable terms in respect of gas and water supplies as the town, and thereby—with the advantage also of cheaper land and lower rents and rates—be in a more favourable position than the town to attract residents. The outlying district must be prepared to pay a full return on the undertaking and the cost of laying the mains through the roads. In the alternative case of it having its own installation, it would incur these charges; and it becomes a question of whether it is preferable for it to buy coals from the coal merchant or gas ready made from the central gas-works of the large town, and which method is economically the most advantageous for it. Calculation will generally show that a long-distance gas connection with a town is the most advantageous. But the price of gas must be fixed with regard to the interests of both parties. The price of gas must be low, because the competition of electric light and petroleum has to be met, and gas, in addition to its other inherent advantages, must retain its well-recognized advantage of cheapness. It must be cheap if it is to compete for heating and cooking with coal and coke. It is only out of regard for the better utilization of the heat and the convenience and cleanliness of gas that a higher price is permissible per unit of heat than that which prevails for other fuels. In Germany, generally, the price of gas is still too high. Certain towns and companies however, have now reduced the price of gas—doubtless recognizing that an increase in consumption will equalize any loss through the reduction, owing to the cost of manufacture diminishing with output. Low prices, long-period contracts, and friendly understanding must form the bases of agreements which may be made between communities or gas-works for co-operative gas manufacture. Rivalry

* See "JOURNAL" for Sept. 25, 1900, p. 769.

between small local authorities presents in many cases a serious obstacle. Private companies are generally better adapted for negotiating for the linking-up of different communities. In this case the company may undertake the whole service, or restrict itself to the manufacture of gas, and supply it to the local authority at a price which allows the latter to sell it again at a profit.

Besides gas companies proper, coke-oven works can compete in this supply. It becomes a question of great importance for them how to dispose of the gas produced in coke-ovens. There are large quantities of surplus gas which are not required on the works; and the increase in the German iron industry has caused this production of gas to be extremely large, and its disposal has become a question of the greatest importance for the economy of coke production. Dr. F. Lürmann, of Berlin, recently read a paper in which he gave figures which are extremely valuable for calculations in regard to long-distance gas supplies. He was referring to the utilization of coke-oven gas and blast-furnace gas in this way. He gives a table for the case in which coke-oven gas is used for heating the ovens and the surplus is made applicable for lighting. It is in such a way that coke-oven works would compete with gas-works. He reckons a make of 10,765 cubic feet of gas per ton of dry coal for coking, having a calorific power of 506 B.Th.U. per cubic foot. Then assuming that 1170 B.Th.U. are required for the gasification of 1 lb. of dry coal, he finds that the quantity of gas required to gasify a ton of coal is 5130 cubic feet. There remains, therefore, a surplus of 5635 cubic feet per ton of coal carbonized in the ovens. This would be equivalent to 7615 cubic feet of surplus gas per ton of coke produced. If a price of 8½d. per 1000 cubic feet is obtainable for gas for lighting purposes, and the cost of purification is 3¼d. per 1000 cubic feet, the net return is 5¼d. per 1000 cubic feet, which is equivalent to a profit of 3s. 2d. per ton of coke produced. This return from the surplus gas of coke-ovens would, according to Dr. Lürmann, with a price of coke of 20s. to 22s. per ton, cheapen its production by about 15 per cent. Such figures are of the greatest importance for the whole gas industry, and, as they are based on a selling price of 8½d. per 1000 cubic feet for purified gas, it is clear that the gas industry must take this figure into account for competitive purposes. But this figure needs further investigation for comparative use.

It has been assumed that gas will be delivered from the coke-ovens of uniform good quality, which is a condition that can be fulfilled with proper apparatus, with separation of the gas evolved at different times, and the use of suitable coal. The cost of compression, and interest and depreciation charges on the long-distance main, and the unaccounted-for gas, have to be added to the initial cost of 8½d. per 1000 cubic feet. Interest and depreciation charges may be taken at about 0.05d. per 1000 cubic feet of gas per mile of main. Thus, with a main 50 miles in length, these charges amount to 2½d. per 1000 cubic feet; so that the gas costs 8½ + 2½d. = 11d. per 1000 cubic feet. The unaccounted-for gas, amounting to 5 to 10 per cent., would raise the cost of the gas to 11½d. to 1s. These figures are higher than apply to the making of gas in modern gas-works, and consequently it has still to be established that long-distance supply of coke-oven gas is economical. The author gives a table showing the cost of compression and interest and depreciation charges for an annual consumption of 30 million cubic metres (1060 million cubic feet) of gas, or an output per hour of 222,500 cubic feet, through two equal-sized mains for a distance of 25 miles. The table also includes similar figures for annual consumptions one-and-a-half times and twice the above-named annual consumption. The tables include calculations for mains of the following diameters—viz., 4, 8, 9, 10, 11, and 12 inches. Interest on the expenditure on plant is taken at 4 per cent., depreciation on the motors and blowers at 10 per cent., and on buildings and mains at 3 per cent. The final pressure is taken at 6 inches of water; the gas consumption per horse-power-hour at 18 cubic feet; and the prime cost of coke-oven gas at 3¼d. per 1000 cubic feet. The table shows that the expenses involved are lowest for a main of 8 inches diameter, for which they amount to 1.12d. per 1000 cubic feet for an annual consumption of 1060 million cubic feet. For one-and-a-half times this consumption, a 9-inch main gives the lowest charges—viz., 0.92d. per 1000 cubic feet. For twice this consumption, a 10-inch main gives the lowest charges—viz., 0.82d. per 1000 cubic feet. A second table shows the cost of production of gas in a large modern gas-works. The net cost of manufacture is shown to range from 9.2d. per 1000 cubic feet to 7½d. per 1000 cubic feet, according as the make per annum is increased from about 1630 million cubic feet to 3426 million cubic feet. The interest and depreciation charges range similarly from 6.7d. to 3.9d. per 1000 cubic feet, making a total cost of, and charges on, manufacture ranging from 13.9d. to 11.4d. per 1000 cubic feet for the annual makes stated.

There is, however, a further consideration. A number of small towns have decided against the supply of gas from coke-ovens on the ground that their own gas-works would supply them with cheap coke. If it is reckoned that about 94 lbs. of coke are sold per 1000 cubic feet of gas made, the freight on this quantity of coke has to be added if the coke-oven's supply of gas is utilized, in order to equalize the cost of coke in the district with that produced from a local gas-works. An average charge of 3s. per ton for the carriage of coke is equivalent to 1½d. per 1000 cubic feet on the gas. If this is taken into consideration, the coke-oven supply of gas becomes undoubtedly dearer; and it is a consideration which should not be left out of account when towns are

offered a supply of gas from distant coke-oven works. The gas-works of a large town must make exact calculations as to the effect of the abolition of the supply of coke from the gas-works if coke-oven gas is taken. An article in the "Düsseldorfer Zeitung" in March last pointed out that though oven coke was about 5 per cent. better than gas coke in respect of calorific power, it was commonly 30 per cent. dearer than the latter. This was due to the fact that the production was accommodated to the prevailing prices, and would be restricted if the price obtainable for coke fell below a certain figure. Further, it was pointed out that if towns ceased to manufacture gas the coke-works would have a monopoly of the supply of coke. The increase in the price of coke if the whole supply were obtained from coke-ovens would, according to this newspaper, be equivalent to an increase of 3d. per 1000 cubic feet on the price of gas. Moreover, if the coke-works had to increase their output of coke to make up for the cessation of the coke supply from gas-works, they would be producing correspondingly more gas, and would, in that case, still have to reckon with approximately the same surplus of gas as at present.

These considerations indicate that the question of the supply of gas from coke-ovens is one of economic and industrial importance. Mr. Körting has pointed out how greatly the use of modern settings and conveying plant has cheapened the manufacturing cost of gas; and a recent paper by Herr Debruck, of the Düsseldorf Gas-Works, stated that the cost of gas produced there in vertical retorts was only 8.8d. per 1000 cubic feet. Mr. Körting has made calculations which show that gas can be produced in modern retort-settings more cheaply than it can be supplied from coke-ovens, and he computes the prime cost of crude gas in modern gas-works plant to be 5d. per 1000 cubic feet. To this must be added interest and depreciation charges, and the figure so obtained is comparable with the price which can be paid for coke-oven gas. These considerations lead to the conclusion that, for long-distance gas supplies of any considerable size, large gas-works are at least in as good a position as coke-oven works, and are superior to the latter in that they are independent of the working of a particular coal mine, that they can be placed in the most favourable position relatively to the district to be supplied, and that the cost of transport of coal is equalized by the saving of freight on coke and the better prices obtainable for bye-products. The activity of coke-ovens, however, in the direction of supplying gas to places at a distance, must be met by similar extensions of work by, and co-operation of, gas-works.

The author proceeds to discuss the bases on which several communities may join together for a common supply of gas from a central works. He points out that the necessary way-leaves or powers to lay mains in the roads must be obtained without appreciable expenditure, and that a competitive supply, apart from electrical supplies, must be excluded for the whole of the district. The laying of the long-distance main must be done in a thorough and proper manner, and the manufacture of gas must be properly supervised, and in particular naphthalene must be extracted from it. The separation of naphthalene in a long-distance main would become extremely troublesome. He then proceeds to give particulars of a number of long-distance installations which have been carried out.

The first long-distance supply to which he refers is that of suburbs of Berlin from the Corporation gas-works and from the works of the Imperial Continental Gas Association in the city. Small townships miles distant from Berlin have rapidly developed into colonies of residential villas which require gas for various purposes, but owing to distance they have been cut off from existing gas supplies in the ordinary way. The high-pressure system of supply has been introduced and extended as the places have grown. The diagram given in fig. 1 shows the extent of the districts supplied by high-pressure mains from the Corporation gas-works of Berlin. Twenty-five places in all are already supplied, and eight are about to be connected with the system. The length of high-pressure mains used for this supply in the northern suburbs amounts to about 37½ miles, ranging in size from 6 to 10 inches. The south-eastern suburbs have about 12 miles of high-pressure mains, some of 10 inches, the remainder of 12 inches diameter. The pumping plant for the northern suburbs has a capacity of 42,360 cubic feet per hour, and that for the southern suburbs 35,000 cubic feet per hour. Gasholders are provided at Blankenburg and Wernsdorf [see fig. 1] in order to ensure the maintenance of a sufficient reserve of gas. For the rest, the gas supply is regulated by governors directly supplied from the high-pressure main. These governors are established in nine places, as shown in the plan. It is clear that the supply of gas from high-pressure mains can be carried out without the use of gasholders, thereby cheapening the cost of installation and simplifying the working. The governors may be placed in a pit in the street, or in a special building, or the municipal building, as desired. The Berlin Corporation long-distance supply plant works at the present time at a pressure of 10 inches of water; but the pressure may be increased as required to as much as 160 inches of water. It is this reserve, by which the capacity of the whole installation can be increased so enormously at will, that is so valuable.

Similar conditions prevail to the west of Berlin, where gas is supplied almost exclusively by the Imperial Continental Gas Association. The Association now supply twenty-five suburbs—having a total population of 534,461 in the year 1910—by means of long-distance mains from compressing plant at three of their works. At the Mariendorf works, there are three blowers, each of a capacity of 441,500 cubic feet per hour, and one turbine of

similar support, the long-distance gas supply will develop even more rapidly than hitherto.

The author has drawn up comparative statements of the capital expenditure of central gas-works, and of central electricity works. These tables show that the capital expenditure is very much greater for electricity works than for gas-works. The comparison is based on figures for the year 1906, and it does not pretend to completeness. Though the capital expenditure in each case may not be absolutely right, the ratio is substantially correct for the present time. These tables show that the capital expended, per consumer, amounted for gas-works installations to £13 14s.; while for electricity works installations, it amounted to £78 15s. These figures indicate that the charges for interest and depreciation will amount to about six times as much per consumer for electricity works as for gas-works. Thus, apart from the inherent advantages of gas supply for lighting, heating, and power purposes, the capital expenditure upon gas-works is very much lower than on electricity works, and the actual return from the capital expended on gas-works is also (as has often been demonstrated) considerably greater than that on the capital expended on electricity works. The economical superiority of gas supply compared with electricity supply is thus strikingly demonstrated. Without predicting to whom the future will belong, there is no doubt that the present time is allocated to gas supply. Neither in respect of lighting nor of the supply of heat and power can there be claimed in respect of electricity works any need of superiority which need cause any alarm to the gas industry in regard to its prospects.

LONDON AND SOUTHERN JUNIOR ASSOCIATION.

Visit to the Coronation Exhibition.

GLANCING at the tables, it appeared that nearly a hundred members of the London and Southern District Junior Gas Association availed themselves last Saturday of the invitation of Mr. F. W. Goodenough, Controller of the Gaslight and Coke Company's Gas Sales Department, to inspect the display of the Gas Companies' Joint Exhibit Committee (of which he is Hon. Secretary and Treasurer) at the Coronation Exhibition at Shepherd's Bush, and afterwards to take tea at the Garden Club.

At the conclusion of the tea, Mr. J. G. Clark, of the Gaslight and Coke Company (the new President), took the opportunity of expressing his pleasure at having been elected to preside over the affairs of the Association during the coming year, and assured the members that he would do his best to fill the position worthily. He would, as far as he could, endeavour to follow the excellent examples which had been set him by previous Presidents. In an announcement sent out by the Hon. Secretary (Mr. Ernest Scars), it was stated that the Council would welcome any suggestions or expressions of opinion regarding the programme for their next session. With regard to that day's engagement, he was confident he was voicing the views of the whole of the members when he said they greatly appreciated Mr. Goodenough's kindness in inviting them to tea and taking the chair. He had always been willing to help the Association in every possible way, and had thereby shown his great sympathy with the work. The sympathy which they had received from their patrons (of whom Mr. Goodenough had been one since almost the very commencement of the Association) had played no small part in the growth of the Association from small beginnings to the position it now held. This co-operation of their patrons had encouraged the members, and made them feel that they were on the right road.

A hearty vote of thanks to Mr. Goodenough for his kindness was proposed by Mr. D. J. Winslow, who spoke of the excellence of the gas exhibit, and the good effect it would have from an advertising point of view. Mr. L. F. Tooth, in seconding, said the members were indebted to Mr. Goodenough for what he had done for the Association; and they should endeavour to show their appreciation of it by making themselves better fitted for the various duties they had to perform. The proposition was supported by Mr. E. W. Browning, who remarked that, as an Association, they ought to congratulate Mr. Goodenough on the excellence of the exhibit, for which he was no doubt very largely responsible. It was a pleasure to him to know, as a servant of the Gaslight and Coke Company, that Mr. Clark was the new President of the Association. They could not have a better man for the position.

The vote was carried by acclamation, and was acknowledged by Mr. Goodenough, who said it was a pleasure to him to meet the members. The Association were to be congratulated upon having made Mr. Clark their President; and he had no doubt that he would have a highly successful year of office. As to the preparation of the exhibit, to which reference had been made by the speakers, though it was true that he was the Hon. Secretary and Treasurer to the Committee, the greater part of the hard work had been done by his Assistant, Mr. J. E. Henwood, and by Mr. E. Pilbrow, who was in charge of the display. With reference to the tea, he ought to tell them that, when he mentioned the matter of the visit to Mr. D. Milne Watson, the General Manager of the Gaslight and Coke Company, and Chairman of the Joint Exhibit Committee (who was also a patron of the Association), Mr. Watson at once said that he would like the tea to be provided by the Company. So that, though the members were there on his (Mr. Goodenough's) invitation, they were not there at his expense.

SIMPLE FORMS OF GAS-PRESSURE REGULATORS

By EDGAR STANSFIELD, M.Sc., of Ottawa, Canada.

[A Paper read before the Faraday Society, May 2. From the "Chemical News."]

Some years ago, when working at the Sunderland Technical College, the writer required a gas-pressure regulator which should give a pressure, steady, but easily adjusted, not influenced by the rate of flow of the gas. As he was not able to find any description of a suitable regulator which could be easily made without considerable skill in glass blowing or the purchase of special fittings, he devised two such regulators; and these have since proved so useful that it seems desirable to publish a description of them. In each pattern there is:

1. An outer vessel, such as a battery jar or wide-mouthed bottle.

2. An inner cylinder, open at the bottom and top. This may consist, as in fig. 1, of a cylindrical vessel with one or more holes drilled through the sides near the bottom, or, as in fig. 2, of a wide-mouthed glass bottle with the bottom cut off. A piece of wide glass tubing could be used.

3. A float. A flask, a test-tube, or beaker may be used, weighted at the bottom to cause it to float upright. A beaker, as shown in both figures, gave the best results. The rim of the beaker should be an easy fit inside the cylinder.

4. Gas inlet and outlet tubes.

5. A valve connected to the float.

In fig. 1 this valve consists of a small bulb blown at one end of

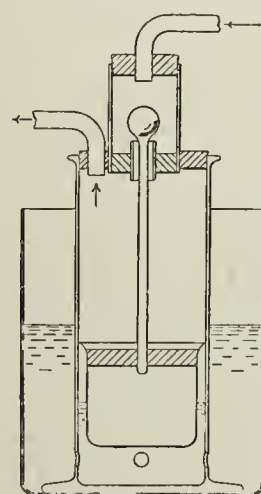


Fig. 1.

the inner vessel—that is, the gas delivery pressure—will be maintained constant at an amount equal to the difference of water level in the two vessels when the valve is just closing. Pouring water into the outer vessel will give a higher pressure; taking it out will reduce it.

In fig. 2, the inlet and outlet tubes have to be blown into a vertical tube. The valve is a glass rod fixed in the cork of the float at one end and having a cylindrical cap at the other which fits in the vertical tube as closely as is consistent with free movement. A piece of glass tube with a cork in it, in which the rod is fixed, will furnish a suitable cap. The working of the regulator is virtually the same as with fig. 1. In practice, the valve would, as a rule, be slightly lower down than is shown in the figure.

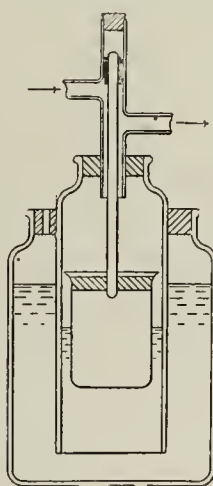


Fig. 2.

In constructing a regulator, unless the inner vessel and accessories are heavy, they should be fixed in the cork of the outer vessel as in fig. 2; otherwise the buoyancy due to the gas displacing water will cause them to upset. The area of cross section of the float should be large compared with that of the valve, in order that the pressure exerted on the top of the valve by the inlet gas should be negligible. Otherwise a large excess of inlet over outlet pressure may cause the valve to close and remain closed.

Of the two types, fig. 1 gives a very constant pressure; and if the valve is well ground, the flow can be reduced almost to nothing. Its disadvantage consists in the fact that a sudden change of flow may set up a vibration which will keep on more or less indefinitely. In ordinary use with a gas-oven, for example, this rarely or never occurs. It could probably be obviated by a slight modification of the shape of the valve.

Fig. 2 has a less positive cut-off of the gas; so that it does not give such a constant pressure as fig. 1, and the flow of the gas cannot be reduced below the point where it becomes comparable with the leak past the valve. But for a large flow of gas where an absolutely constant pressure is not required, as, for example, for a combustion furnace, it gives very satisfactory results, and it never vibrates like fig. 1. For any definite flow, the pressure remains constant; but an increase of flow will slightly decrease the pressure.

USE OF TAR IN DIESEL ENGINES.

By Dr. W. ALLNER,

Chemist to the German Continental Gas Company at Dessau.

[Abstract Translation of a Paper read before the Meeting of the German Gas Association.]

The fuels which come into account at the present day for use in the Diesel engine are derived from three groups of industries—viz.: (1) Petroleum; (2) brown coal (lignite) and shale distilleries; (3) coal gas and oven eoke making. In Germany, the fuels of most importance are the gas-oil fraction of petroleum, and the paraffin oil from brown coal and shale oil-works. But in addition to these oils, the tars produced in oil-gas and water-gas manufacture are suitable for use, though they have only local interest.

More important than the gas oils and paraffin oils, however, are the immense stores of cheap fuel in the form of tar which are furnished by the native gas industry and by eoke-oven works. Development has led step by step to the use of tar oil, and then to that of crude tar, in the engine. In 1909, a process was discovered by which tar oil could be employed without objection as a motor fuel, and a large number of Diesel engines now work satisfactorily with it. A great many firms are either now working on the application of thin crude tar in the Diesel engines, or have already succeeded with it. Coal tar is not a simple material; and its quality varies even with one and the same coal according to the conditions of its production. The temperature of the retort or oven and its shape play a very important part in respect thereto. Thus the tar from vertical retorts is more freely fluid than that from horizontal or inclined retorts, while the tar from ordinary coke-ovens and the chambers recently used for gas manufacture is also much less viscous than the latter.

The products of distillation of coal are not ready formed in it, but result in the course of dry distillation, and the tar finally obtained is the product of a whole series of chemical changes occurring successively or at the same time. The tars produced at low temperatures contain mainly hydrocarbons of the paraffin series and a good deal of paraffin. As the temperature at which the tar was produced increases, the chain compounds of the paraffin series disappear, and the ring compounds of the benzene series take their place. The proportion of oils diminishes, as is shown in fig. 1, while that of pitch and free carbon increases; and the quantity of naphthalene contained in the tar also rises. The free carbon and naphthalene serve as special criteria of whether the tar has been exposed to much superheating in its formation. A tar from horizontal or inclined retorts contains relatively much naphthalene and free carbon, which result from the superheating of the vapours as they pass over the heated walls of the retorts. Tar from vertical retorts, on the other hand, contains very little naphthalene, which is an indication that, notwithstanding the

considerably higher temperature of distillation to which the coal is exposed, there is less superheating of the vapours which pass up through the cold core of the charge of coal. The author gives a table showing the more important properties of liquid fuels, such as petroleum of various descriptions, and tar oils. He also gives comparative figures for the composition of coal tar from different sources [see Table I.]. Other figures relating to the properties of tar of different origin, with comparative figures for paraffin oil and tar oil, are given in Table II.

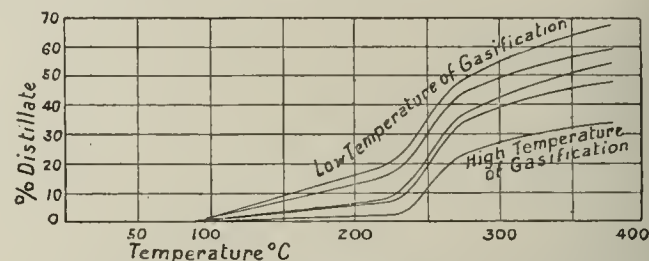


Fig. 1.—Proportions of Distillates yielded by Tars produced at High and Low Temperatures of Gasification.

There is practically no available information as to the tar obtained in large carbonizing chambers as compared with that obtained from the same coal in horizontal or inclined retorts. In comparison with other tars, vertical retort tar contains an extremely low proportion of free carbon—viz., seldom exceeding 4 per cent., and for the most part about 2 per cent. Another characteristic of vertical retort tar is its relatively low viscosity. The diagram given in fig. 2 shows the viscosity curves for different tars as the temperature rises. Figures for the viscosity of certain tars are also shown in Table II. It will be seen that while the viscosity of vertical retort tar may vary considerably at ordinary temperatures according to the description of coal carbonized, yet the viscosity becomes practically the same for all at 50° or 70° C. The viscosity of horizontal retort tar from the same description of coal is considerably higher at all temperatures than that of vertical retort tar; and it does not show the same rapid fall as the temperature rises. The distillation curves given in the diagram in fig. 3 also display a similarly characteristic behaviour of vertical retort tar, which contains a higher proportion of valuable oils than the tar from horizontal and inclined retorts. The same thing appears from the results of the analyses given in Table I.

The difficulties which oppose the use of tar oils and crude tar in engines depend chiefly on the fact that tar and tar oils are relatively difficult to ignite, consequent on their chemical constitution. Until recently, only fuels which ignited comparatively readily could be used in the Diesel engine. Rieppel, in 1908, arrived at the conclusion that in the ordinary construction of Diesel engines, only such oils were applicable as were mainly derived from paraffin hydrocarbons. This restricted the available oils to petroleum,

TABLE I.—Composition of Coal Tar from Different Sources.

Description of Retorts.	Horizontal.		Inclined.		Vertical.			
	English.	Westphalian.	Saar.	—	English.	Westphalian.	Saar.	—
Water. per cent.	6.7	10.0	..	4.9	2.5	1.75	..	2.0
Oily distillate below 170° C.	1.44	4.6	..	3.65	3.52	2.45	..	3.4
" " " 200° C. . . . .	..	..	9.0	..	..	..	10.0	..
" " " between 170°–230° C.	7.33	8.29	..	8.1	14.52	19.4	..	16.5
" " " 200°–270° C. . . . .	..	..	20.0	..	..	..	25.0	..
" " " 230°–270° C.	nil	6.4	..	12.55	8.45	10.29	..	14.5
" " " above 270° C. . . . .	..	..	..	21.45	..	..	..	27.4
Pitch . . . . .	..	..	..	49.35	..	..	..	36.2
Crude naphthalene in oils up to 270° C. per cent. of the tar	3.51 (a)	5.48 (a)	4.5 (b)	.. (c)	0.68 (a)	.. (a)	.. (b)	.. (c)

(a) Tars obtained at works of the German Continental Gas Company.

(b) Tars obtained at Zürich Gas-Works.

(c) Tars obtained at works of Imperial Continental Gas Association; average of a number of analyses (coals used not stated).

TABLE II.—Properties of Tars from Different Sources.

Description of Retorts.		Horizontal.						Vertical.						Paraffin Oil.	Tar Oil.
Description of Coal.		English.		Westphalian.		Saar.	Silesian.	English.		Westphalian.		Silesian.			
Specific gravity . . . . .	..	1'246	..	1'20	..	..	..	..	1'124	..	..	1'12	..	0'893	1'008
Water, per cent.	4'0	8'0	9'6	..	9'3	7'9	11'0	3'0	5'0	2'1	2'0	..	1'0	..	..
Free carbon, per cent.	21'7	28'8	36'9	20-25	35'2	31'7	29'2	1'87	3'65	1'25	1'17	1'5-2'5	0'23	..	..
Pitch, per cent. . . . .	..	..	..	55-60	..	..	..	..	..	..	..	25-30	..	..	..
Flashing point—															
Close test, ° Fahr.	160	194	..	..	..	..	..	160	111	113	108	..	104	178	145
Open „ ° Fahr.	257	266	..	..	..	..	..	..	212	219	210	..	167	235	207
Viscosity :—Engler degrees—															
At 20° C.	114'4	550'0	..	..	..	..	..	75'5	39'3	7'8	10'1	..	6'9	1'36	1'38
„ 50° C.	16'0	51'0	..	..	..	138	..	4'5	3'9	2'5	2'1	..	1'8	1'11	1'15
„ 70° C.	7'2	23'0	..	..	..	..	..	2'2	2'2	1'5	1'4	..	1'3	1'02	1'04
„ 75° C. . . . .	..	..	..	..	43'1	24'6	19'4	..	..	..	..	..	..	..	..
Gross calorific power—															
B.Th.U. per lb.	15,779	..	15,887*	..	15,939*	16,038*	15,903*	16,175	..	16,533	16,002	..	16,438	18,920	17,046
	(a)	(a ¹)	(c)	(b)	(c)	(c)	(c)	(a)	(a ¹)	(a)	(a)	(b)	(a)		

(a) Tars obtained at works of German Continental Gas Company.

(a¹) Tars obtained at works of German Continental Gas Company from same description of coal.

(b) Tars obtained at Cologne Gas-Works.

(c) Tars analyzed by Professor H. Bunte.

* Dehydrated tar,

gas oil, paraffin oil, and crude oils of different kinds containing the relatively high proportion of 11 to 13 per cent. of hydrogen. It excluded tar oils which chiefly consist of hydrocarbons of the benzene series, and contain the comparatively small proportion of 6 to 7 per cent. of hydrogen. The process which is now employed in order to utilize such fuels in the Diesel engine consists in injecting a small quantity of an auxiliary fuel, which ignites readily, before the less readily ignited fuel which is to form the working fuel for the engine. The combustion of the readily ignited material is transmitted to the working fuel. The auxiliary fuel—viz., gas oil—thus takes the place of the ignition-tube in the ordinary explosion engine. This method of working has rendered it possible recently to use freely fluid crude tar in the Diesel engine. The auxiliary fuel, which passes in first, immediately produces, at the temperature prevailing in the explosion chamber, some oil gas.

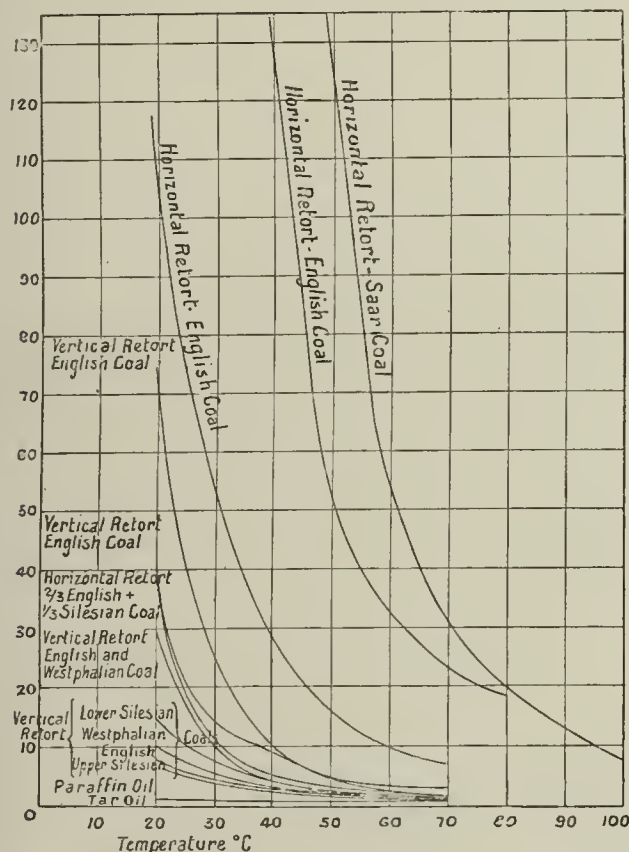


Fig. 2.—Viscosity of Tars produced in Different Retorts from Different Coals.

Investigations by Hempel on the valuation of gas oils for oil-gas manufacture show that gas oil at high temperatures splits up into compounds with chains of two or more members, of which ethylene is the chief. Probably acetylene also occurs. [“JOURNAL,” Vol. CXI., pp. 325, 391, and 457.] Dixon and Coward found the following temperatures of ignition for different gases in air under atmospheric pressure—viz., hydrogen, 580° to 590° C.; carbonic oxide, 644° to 658° C.; ethylene, 542° to 547° C.; acetylene, 406° to 440° C.; and methane, 650° to 750° C. [See “JOURNAL,” Vol. CV., pp. 439, 907.] At the pressure of 30 atmospheres which prevails in the cylinder of the engine, the ignition point of ethylene, which is that with which we are most concerned, will be somewhat lower; and consequently the temperature of 600° C. which the air for combustion possesses, will amply suffice to ignite the gas and bring about further combustion of the gas oil, which combustion will then be transferred to the tar oil or crude tar which subsequently enters the cylinder.

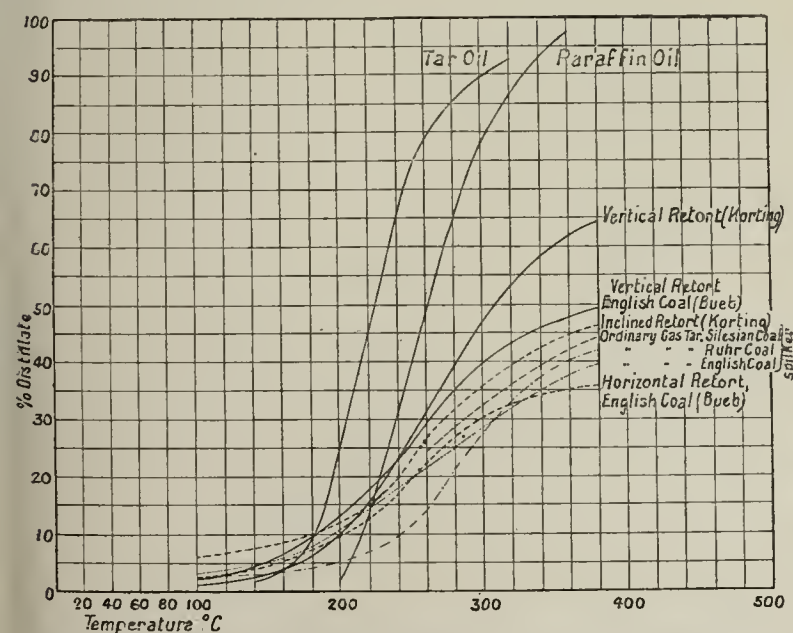


Fig. 3.—Proportions of Distillates obtained at Different Temperatures from Tars of Different Origin (according to the authorities named).

There appear to have been no investigations on the effect which the igniting oil has in lowering the flashing point and altering the distillation curve of the working fuel. Also the effect on the constants or properties of the fuel of the pressure of 30 atmospheres which prevails in the cylinder has not been sufficiently studied. The data for normal pressure, which are given in Table II., admit of certain comparisons; but it must not be forgotten that the conditions are altered somewhat at higher pressures. Moreover, it is not a case of employing a mixture of the auxiliary fuel with the tar oil or tar, which mixtures have proved unsuccessful, but that the paraffin oil should precede the tar. Vertical retort tar appears to contain a somewhat higher proportion of hydrogen than horizontal retort tar from the same coal. The construction of the injecting nozzle is of special importance when fuels which ignite with difficulty are employed. The time of injection is only a fraction of a second, and hence the fuel must reach the engine in an extremely finely-divided condition in order to ensure complete ignition and smokeless working. The Augsburg-Nuremberg Engineering Works use a closed nipple in their Diesel engines, and in it the igniting oil and the tar come in succession. The igniting oil pump has a constant stroke, and is not regulated. The stroke only of the tar-pump is altered by the regulator. Their process uses at all loads approximately the same quantity of igniting oil. The engine of Messrs. Körting Bros. controls the proportion of igniting fuel to tar, and the stroke of the oil-pump is automatically altered along with that of the tar pump, so that a higher percentage of igniting oil is provided as the load is increased.

Before it is used in the engine, the tar must be freed thoroughly from coarse mechanical impurities. It must be passed through a screen of fine mesh, and any water contained in it must be, as far as possible, removed by deposition. This constitutes a special difficulty with the ordinary thick tars from horizontal and inclined retorts, which are rich in carbon, as they retain a comparatively large proportion of water mechanically. It is otherwise with vertical retort tar, the fluidity and small carbon content of which facilitate separation of water, so that the proportion generally does not exceed 4 per cent. The water in the tar appears not merely to act in the engine as an absorber of heat, but also to have a chemical interaction with the hydrocarbons. Before use, the tar must be sufficiently warmed to make it readily fluid, in order that it may immediately be atomized when injected into the cylinder. The preliminary warming is best effected by the waste heat of the engine. It is advantageous to warm the tar-pipe and the tar-pump as well as the storage tank. The degree of warming requisite is such that the tar shall attain a sufficient degree of fluidity, but, on the other hand, that it shall not begin to distil. The same applies to the use of tar as a furnace fuel, for which there is a certain critical viscosity above which the tar cannot be sufficiently finely atomized, and below which, on the other hand, it begins to distil. Tars of which the viscosity curve is relatively flat have the largest permissible range of temperature of preliminary heating. It is thus more easy to use vertical retort tar in Diesel engines than horizontal retort tar. Materials such as gas oil, paraffin oil, and freely-fluid tar oils, have less than the critical viscosity, and therefore need no preliminary heating, unless, in the case of tar oils, separation of naphthalene is feared.

The utilization of the heat of fuels of different calorific power depends in the Diesel engine precisely on the calorific power of the fuel—i.e., of a fuel having a net calorific power of 16,200 B.Th.U. per lb. 0.44 lb. will be burnt per effective horse-power-hour; while if the fuel has a net calorific power of 18,000 B.Th.U. per lb., the consumption of fuel will be only 0.4 lb. The Diesel engine possesses considerable advantages from the thermodynamic stand-point; and as ordinary tar can now be used as fuel for it, its economical advantages become still more pronounced. The cost of fuel is thereby reduced to a minimum. The proportion of the costs per effective horse-power-hour, which relates to fuel, has become extremely small. The other factors—such as the consumption of lubricating oil, attendance, cost of repairs, depreciation, and interest charges—bulk far larger in the balance-sheet.

Whether tar oil or tar should be adopted in a particular case must depend on local conditions. Gas-works which produce a thin tar will probably prefer to work with crude tar, notwithstanding any small inconveniences attaching thereto, rather than use the dearer tar oils. It is obviously not possible to predict with certainty what effect the new use of tar or tar oil in the Diesel engine will have on gas-works; but it appears probable that the Diesel engine will compete keenly with the steam-turbine for all large loads.

The author gives a table showing the annual production in Germany of paraffin oil and gas oil—viz., 49,000 tons; of vertical retort tar, 66,500 tons; of total gas-works' tar, 375,000 tons; of tar from coke-ovens, 900,000 tons; and of tar oils from the foregoing quantities of coal tar, 450,000 tons. He computes the consumption of paraffin oil or gas oil per horse-power per annum at 0.6 ton, and that of vertical retort tar and tar oils at 0.675 ton. The price of paraffin oil or gas oil he takes at about £4 per ton, that of vertical retort tar at 30s. per ton, and that of tar oils at 38s. per ton. On these bases, the cost of fuel per horse-power-hour in the Diesel engine works out for paraffin oil and gas oil at about 1s. 7½d.; for vertical retort tar at 8½d.; and for tar oils at 11½d. Evidently, he says, there is a large and increasing quantity of fuel in the form of tar available for use in Diesel engines.

Of the total production of crude tar, the proportion used in the coal-tar colour industry of Germany he puts at only 5 per cent.

While more and more tar will be used year by year for road tarring, and while the roofing felt industry takes large quantities of tar, there is still a large surplus production, as is indicated by the low prices obtainable for it. The Diesel engine appears to afford scope for a fresh application of tar. There may be some difficulty in employing ordinary gas tar; but the more freely fluid coke-oven tars, and, in particular, vertical retort tar, are suitable. The advantage of crude tar in this respect is that there are available local supplies in most places, and that freight charges and cost of manufacture or preparation are avoided. In this respect, decentralization of gas manufacture and the dissemination of gas-works over the whole country would be an advantage. A single Dessau vertical retort produces per diem as much tar as corresponds to the consumption in a twelve-hour working day of a 20 H.P. Diesel engine. There is no greater danger from fire with vertical retort tar than with tar oil. Gas-works also are now placed in the position of being able to use their own crude tar for the power required on the works, while having considerable surplus quantities for sale for driving Diesel engines in other industries.

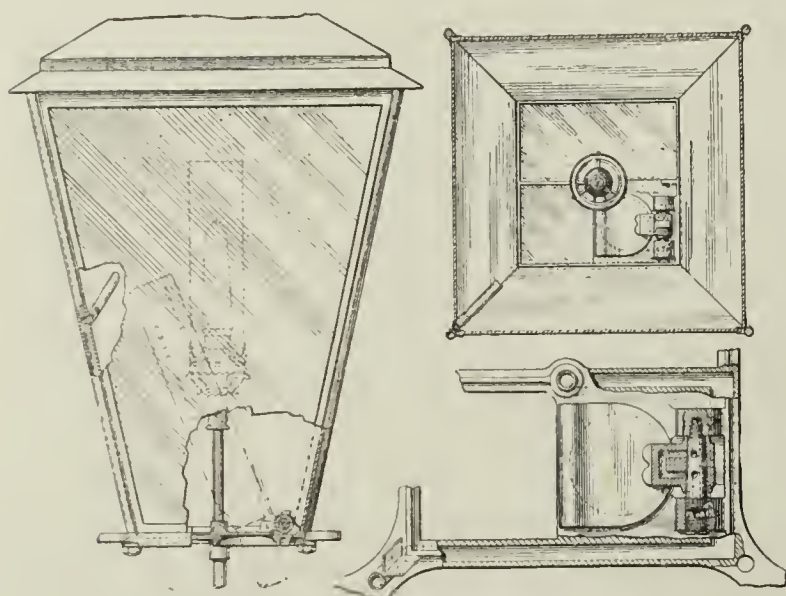
REGISTER OF PATENTS.

Lighting Incandescent Street Lamps.

GILL, A., of Otley, and FOSTER AND PULLEN, LIMITED, of Bradford.

No. 14,072; June 10, 1910.

This invention relates to apparatus for lighting street and other lamps, wherein the main gas supply pipe to the burner (fitted with a cock which is turned on by the lamplighter's torch) is provided with a flash-light pilot jet fitted with an auxiliary cock which is opened by the action of opening the hinged lamp door on the insertion of the torch so as to allow gas to pass to the jet, which is then ignited by the torch.



Gill's Flash-Lighter for Street-Lamps.

As shown, the auxiliary gas supply is led from the main gas supply pipe of the lamp around the base frame of the latter, and thence, by way of the hinge of the lamp door, to a pipe passed up one of the corners of the lamp frame. To this corner pipe is fixed an inwardly projecting pilot jet having its free end toward the burner of the lamp to be lighted, while the lamp door is hinged on a stationary gas-plug, which, together with the hinge of the lamp door, forms the auxiliary gas-cock. The arrangement being such that, on opening the hinged lamp door, the auxiliary gas supply to the pilot jet is automatically turned on; while the closing of the door has the effect of cutting off the auxiliary gas supply to the pilot jet. On opening the lamp door by means of the torch, the auxiliary gas supply to the pilot jet by way of the hinge of the door is automatically turned on, when the pilot jet is lighted by the torch in the usual way so as to effect the lighting of the main upright burner; while on withdrawing the torch to allow of the closing of the lamp door, the latter cuts off the auxiliary gas supply, and so automatically extinguishes the pilot jet.

Automatically Lighting and Extinguishing Gas or Electric Lamps.

EARLE, C., of Smethwick.

No. 13,052; May 30, 1910.

This invention has relation to operations (such as the actuation of a valve, or the opening and closing of an electric circuit) which require to be performed automatically, at given periods, or at intervals by controlling mechanism or clockwork running at standard time. It more particularly relates to appliances of the type comprising, in conjunction with a time-dial, a system of adjustable timing cams or quadrant members, rotated by clockwork mechanism running at standard time, and arranged to control the opening and closing of a valve or switch through the medium of a lever or other device—the cam or quadrant system being adjustable with regard to the effective peripheral length, in order to vary the period during which the valve or switch is to remain closed, and adapted to be adjustably set in different

angular positions to provide for the opening and closing of the valve or switch at various times.

In one known arrangement of this kind for controlling electric circuits, the patentee points out that the rotatable spindle, revolving once every twenty-four hours, has been provided with two time dials—one for indicating the time for switching-on the current, and the other for indicating the time of switching-off; a single cam being adjustably fixed to the one dial for effecting the making of the circuit, and a series of three cam or quadrant plates adjustably attached to the other dial for effecting the breaking of the circuit. These three cam-plates are adapted to be spread out and fixed in position so as to vary the peripheral length, and thus alter the time of switching-off; the arrangement being such that one element of the switch is first raised by the "on" cam, and then the other element lifted by the "off" or multiple cam, when a sudden drop of the "on" cam allows of the first-named switch element being taken into engagement with the other element, so as to complete the circuit, which remains closed until the edge of the rear or following element of the "off" cam allows the respective switch member to be drawn away from the other member.

According to the present invention, however, only a single time-dial is employed, and a single adjustable cam element, which latter controls both the opening of the valve or switch and also its closing. The cam element comprises a series of cam or quadrant plates, loose on the driving shaft, and provided with stud and slot connections between them for allowing of variation of the peripheral length; and mains are also provided for fixing the leading and following elements to the time-dial at various angular positions, so that the beginning of the "lights-on" period is determined by the position of the one-cam element and the end of the period is determined by the position of the other element.

A plain rotating disc is provided in conjunction with the cam members, and upon the periphery of it the device connected with the valve or switch falls after the quadrant members have passed under it—the device remaining upon the disc until again transferred to the quadrants at the end of the predetermined time. To positively effect this transference, a device is employed, consisting of a stepped cam attached to the leading quadrant and engaging with the lower end of a spring-controlled lever, whose upper end is caused, when the stepped part of the cam moves past the lower end, to be moved over by the spring, so as to positively lift the valve or switch operating device.

The specification contains an illustration of an appliance for controlling the lighting and extinguishing of a system of gas-lamps as constructed in accordance with the invention.

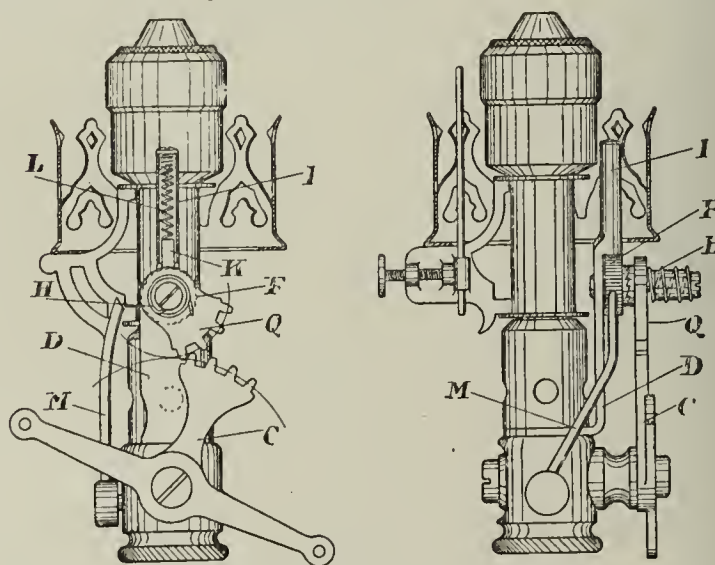
Lighting Device for Gas-Burners.

RUPPERT, H., of Zurich.

No. 16,349; July 8, 1910.

This invention relates to gas-burners the gas in which is ignited by sparks caused by the frictional engagement of two substances brought about by the turning on of the gas-tap.

In contrivances of this kind hitherto known, the friction caused on the pyrophorus substance has usually been of too short a duration, the patentee asserts, to form sufficient sparks, and consequently the gas sometimes has not been ignited. According to his invention, a movable friction disc is turned and a spring put under tension simultaneously—the spring, on being released, causing the disc to rebound and bring about the friction on a pyrophorus body, thereby producing a flash of sparks which ignite the gas. The motion of the spring is transferred through wheel-gear to the friction part in such a manner that the velocity and duration of action of the friction part of the pyrophorus substance ensures a good supply of sparks.



Ruppert's Lighting Device for Gas-Burners.

The support D carries a disc F, which is turned by a sector Q by means of teeth provided on the surfaces of both the disc and sector. The sector is controlled by a spring H, which tends to press the sector towards the disc and hold it in the position first shown. The sector can be brought into contact with a toothed arm C fastened to the burner-tap by pulling one or other arm of the tap. Just before the tap is fully opened, the arm C passes out of engagement with the sector, which, under the action of the spring, recoils into the position first shown, carrying the disc F along. Above the disc, in a guide I, the "ignition" substance K (consisting of a pyrophorus mixture) is being constantly pressed by a spring L against the circumference of the disc.

On the body of the burner, a bye-pass M is arranged with its end on a level with the contact point of the ignition substance K and the disc F. The tap is formed in the usual manner, so that gas enters the bye-pass M before the cock is fully opened. The disc F rubs sparks off the

ignition substance, thrusting them against the outlet of the bye-pass, thus igniting the outflowing gas. When the gas is alight, the tap shuts the gas-way to the bye-pass, whereupon the igniting flame extinguishes.

The creation of sparks can in a large measure be regulated by altering the diameter and pitch of the circle and duration of engagement of the parts Q and F, so that the turn of the disc, and the resultant flash of sparks, will be greater or smaller.

Gas-Meters.

PARKINSON AND W. & B. COWAN, LIMITED, and CHESHIRE, W., of Birmingham.

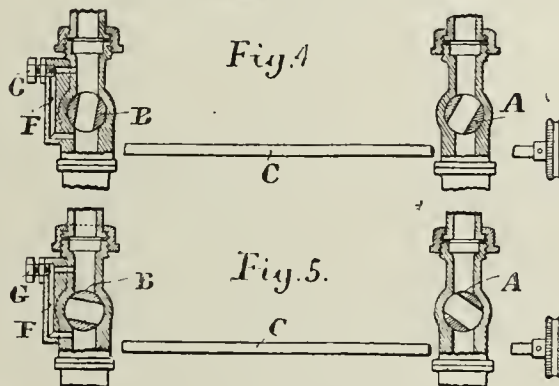
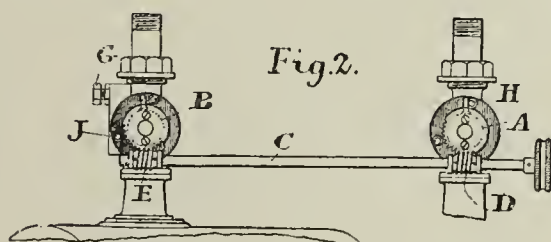
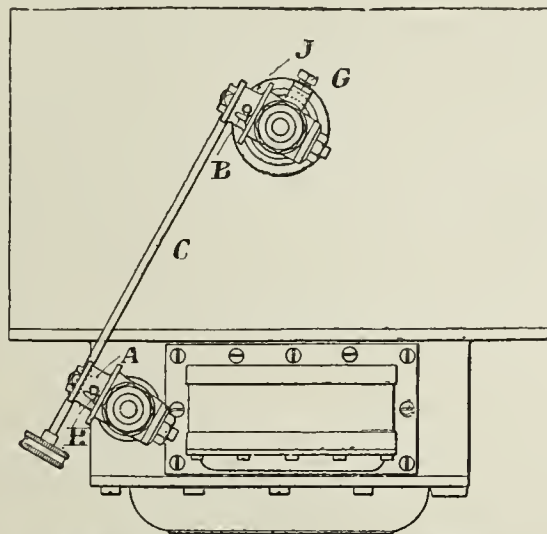
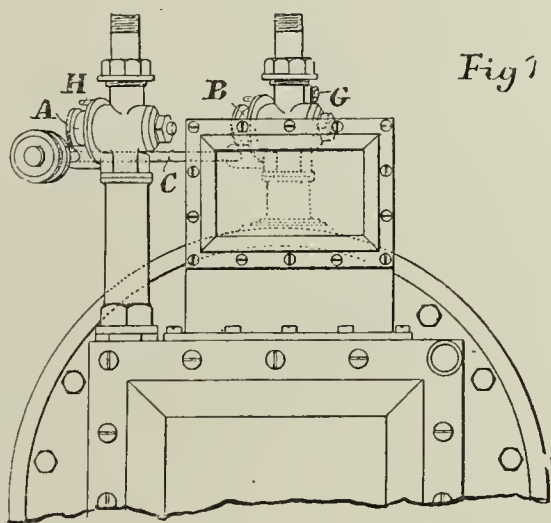
No. 16,579; July 12, 1910.

This invention relates to high-pressure gas-meters wherein the inlet and outlet valves are mechanically coupled together, so as to move in unison or in synchronism in opening and closing—thus “ensuring

equality in pressure at the inlet and outlet of the meter and preventing any disturbance of the water-level or other derangements of the action.”

The object is (1) to provide for simultaneously operating the valves; (2) to arrange for the inlet valve to open slightly in advance of the outlet valve, so as to ensure equilibrium of pressure inside the meter before the outlet is opened; (3) to provide an improved formation of the gas-passages through the valves, so as to prevent the too-sudden rush of gas when the cock is opened; and (4) to provide, in connection with the outlet valve, a bye-pass, controlled by a set-screw or other device, to provide a gas-vent during the adjustment of the water-line of the meter when the two valves are closed.

Fig. 1 is a front view of a high-pressure gas-meter, in which the inlet and outlet valves are coupled together in accordance with this invention; also a plan showing how the worm-spindle couples the two valves together. Fig. 2 shows the valves and the worm-gear mechanism by which they are connected together, in side elevation. This view represents the position of the parts when the valves are both open. Fig. 3 is a similar view, but with the valves closed. Fig. 4 represents a sec-



Parkinson and Cowan's High-Pressure Gas-Meter.

tion through the connected valves when open. This view also shows the bye-pass for giving a gas-vent during the adjustment of the water-line of the meter when the two valves are closed. Fig. 5 is a similar sectional view to fig. 4, but shows the outlet valve closed, and the inlet valve just opening in advance of the outlet valve. In this view, the gas-vent is shown open.

The inlet and outlet valves A B are mechanically coupled together by a spindle C, supported by, and adapted to rotate within, bearing brackets carried by the stationary casing or body part in which the valves rotate. The spindle is furnished with two worms D E, which engage respectively with worm wheels or segments provided upon the outer ends of the valve-plugs. The spindle is also provided, at its outer end, with a knob, by the rotation of which, in one direction or the other, slow rotation is communicated to both valve-plugs simultaneously and in unison for opening and closing them.

The gas-way passages through the two plugs are made taper-sided—being of triangular section at opposite ends, the shapes of which are reversed with respect to one another. It is arranged that, as the valve is opened, the apex or narrow side is first uncovered, so that a minimum quantity of gas shall pass—the small size of this portion of the opening constituting a check or baffle to prevent the too-sudden rush of gas on the cock being opened; and as the cock is progressively opened by the further rotation of the plug, a proportionally larger quantity of gas is admitted.

The two valves are arranged, however (as shown in fig. 5), so that the inlet plug A opens slightly in advance of the outlet plug B, and thereby ensures an equilibrium of pressure inside the meter before the outlet is opened.

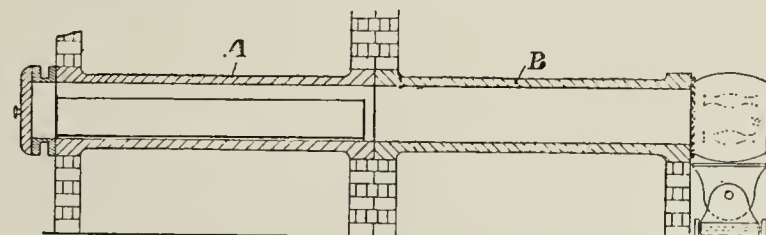
In order to give a gas-vent during the adjustment of the water-line of the meter when the valves are closed, a bye-pass F (figs. 4 and 5) is provided in connection with the outlet valve—passing from one side to the other of the valve and being fitted with a set-screw G for opening and closing the passage and controlling the passage of the gas past the valve when the latter is closed. This obviates the necessity of operating the outlet cock, which, being coupled to the inlet cock, could otherwise not be opened alone. The outer end of each valve-plug is provided with a peg adapted to co-operate with fixed stops, in order to limit the movement in either direction.

Construction of Retorts to Improve the Quality of Coke.

PHILLIPS, S., of Peterborough.

No. 18,406; Aug. 4, 1910.

The object of this invention is to provide a horizontal through retort which is charged in one operation, with an extended portion which is exposed to the atmosphere and in which the coke is cooled. The coke is pushed into the extended portion by the next charge of coal; there being no partition between the two portions.



Phillips's Retort and Coke Cooler.

The illustration shows diagrammatically a retort embodying the invention. The end A containing the coal is heated in the usual way to effect carbonization; while the end B contains the coke and is cooled by the atmosphere. The retort may be in a single length, but longer than those in ordinary use; or “to the present retort may be added an extension of sufficient capacity to receive the charge of hot coke from the carbonizing portion.” The extended portion, supported at its outer end upon a wall or other structure, is so arranged as to be exposed to the atmosphere.

“The coal is fed by machinery into the carbonizing portion of the retort, and when sufficiently carbonized is pushed by the fresh charge into the extension B, where it is partially cooled slowly by radiation of its heat through the sides of the retort during the period when the next

charge of coal is being carbonized. After this partial cooling, the coke is discharged from the retort by being displaced by a fresh charge of hot coke being forced into the extension B from the carbonizing portion A. The retort containing the coal under carbonization and the coke during its partial cooling are under seal, except during the period of discharging of the coke and charging of the coal."

Doors for Gas-Retorts, Coke-Ovens, &c.

OFENBAU GESELLSCHAFT, M.B.H., of Munich, Germany.

No. 844; Jan. 12, 1911. Date claimed under International Convention, March 12, 1910.

This invention relates to doors for gas-retorts and coke-ovens, wherein a shield is pivotally connected to the rear or inner surface of the door so as to protect the latter from the heat of the incandescent material and the pressure exerted by the charge during the gasifying or coking process. The object of the invention is to provide a door of this class in which excessive strains on it from the charge as it expands "are automatically avoided without the operation of any external mechanism, so that the main door is not forced from its seating."

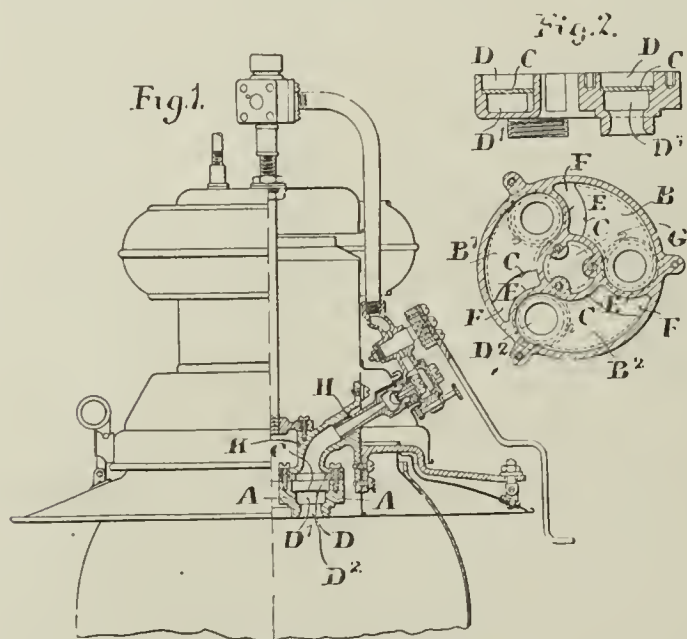
The shield is connected to the door so as to be able to follow the movement of the charge if the latter expands during the coking or gasifying process. To this end, it is connected by pivoted links to the rear surface of the door; the links being preferably so constructed that they can be secured in any desired position from the outside of the retort or oven. Where the door is perpendicularly movable, the links are connected with the lifting mechanism of the door in such a manner that the shield is drawn into a cavity formed in the rear or inner surface of the door, or out of the plane of the seating of the door, so that it does not interfere with the upward opening movement of the door.

Gas-Lamps.

HUBERS, J.; a communication from Julius Pintsch Aktiengesellschaft, of Berlin.

No. 20,569; Sept. 3, 1910.

This invention relates more particularly to lamps for high-pressure gas lighting with inverted burners; and it has for its main object "to provide a lamp having an improved heater in which the mixture of gas and air is highly heated." A further object is to construct the heater in such a manner that it is especially adaptable for lamps with cluster burners.



A Pintsch Regenerating Lamp.

Fig. 1 shows such a lamp, partly in side view and partly in section. Fig. 2 shows the heater in longitudinal and horizontal section.

The heater consists of a circular cast-iron body A, with three circumferential chambers B, B¹, B², arranged around a central opening G. Each chamber is divided by a disc C into two parts D, D¹. The disc does not, however, fully reach to the wall E of the body; so that an opening F is left between the upper and lower parts of the chamber. The gaseous mixture enters one of the chambers from the gas-nipple H at the side opposite the opening F, and passes on a circumferential way through the upper part of the chamber, and thence through the opening F to the lower part, in which it flows in an opposite direction to the outlet passage D² arranged below the inlet. The connecting piece K is made relatively heavy, and of a highly heat-conducting material, such as cast iron. Its outer end is connected to the lamp casing, and the gas-nipple freely projects into the outer end of it, so that easy access can be had to the nipple and to the parts serving for the regulation of the gas and air admission.

Lighting and Extinguishing Gas-Burners.

JULIUS PINTSCH AKTIENGESELLSCHAFT, of Berlin.

No. 29,363; Dec. 17, 1910. Date claimed under International Convention, March 16, 1910.

This invention relates to a device for interrupting and turning on the supply to gas-burners by temporary increases of pressure at the gas-works. It can be used for inverted as well as for upright burners; the construction being such that the gas-valve does not stand in dependent

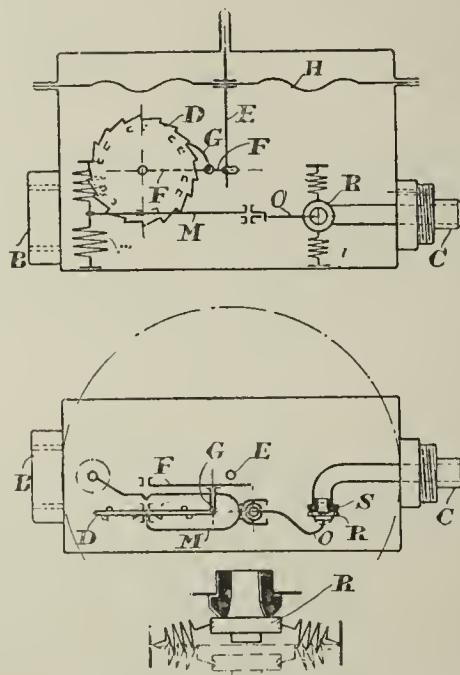
connection with the other mechanism, either in its open or closed position.

In the casing shown (with its inlet B and outlet nozzle C), a ratchet wheel D is arranged, which, when the diaphragm H rises, is moved by the rod E and lever F, provided with a pawl G through a certain angle defined by the length of the stroke. The oblique projections arranged on each side of the ratchet wheel D alternately engage with the stops of the double lever M, and thereby effect the release of the tensions in the two springs (which are in compression in their middle position), which press the lever alternately from left to right against the ratchet wheel. Dependent on the movement of the lever M, the arm O is correspondingly moved through tail pieces, and thereby the valve disc R, connected to the end of the lever and operated by the second pair of springs, is pressed against, or raised from, the valve-seat S.

According to the manner in which the projections are arranged on the ratchet wheel D, certain lamps are extinguished or lighted when increasing the pressure at the gas-works.

The action and arrangement of the side springs governing the valve R is shown in the detail, and the springs connected to the double lever M are also arranged to work in a similar manner.

The employment of a diaphragm with a pawl mechanism operating a ratchet wheel with projections on each side on the one hand, and the employment of a valve governed by oppositely arranged side springs which are in compression in their middle position on the other hand, is known; and so only the combination of these two parts forms the object of the invention. By the combination of these known arrangements, the great advantage is said to be obtained, that the same light-



Pintsch's Lamp-Lighter and Extinguisher.

ing device can be used for inverted as well as for upright burners, as the valve opens and closes independently of the given position of the lighting device. Furthermore, a great advantage consists in the fact that the valve does not stand in a dependent connection with the other mechanism, neither in its open nor its closed position, as the valve disc only comes in contact with the seat, or is raised from it after the full pressure is obtained. "In consequence of this, shocks or other influences effecting a non-intended movement of the mechanism cannot affect the valve in any way, as the ratchet wheel must be moved through a certain angle before the springs can be operated."

Levelling the Charge in Horizontal Retort-Ovens.

BOCHUMER, EISENHÜTTE, HEINTZMANN, and DREYER, of Bochum, Germany.

No. 2633; Feb. 1, 1911. Date claimed under International Convention, Feb. 2, 1910.

In connection with levelling apparatus used with horizontal retort-ovens, it has been found desirable, the patentees point out, to have means for adjusting the height of the levelling bar, in order, for example, to compensate for variations in the height of the rails, caused by expansion, or in order to enable the machine to be used for batteries with ovens of different heights. The adjustability of the levelling rod is here obtained by guiding it on the main frame of the machine in a special auxiliary frame, with which it can be lowered and raised—permanent engagement with the engine being obtained by using a gear described in patent No. 25,268 of 1909, comprising a loose pinion which engages the teeth of the levelling bar and also meshes with a fixed rack, and is reciprocated by a rocking lever or crank connected to its centre.

According to the present invention, the toothed path of the pinion is connected with the adjustable auxiliary frame, so that it is raised and lowered with it, and the required engagement is maintained; the connecting rod driving the pinion requiring only to move through a small, negligible angle from its normal horizontal position. Thus, free adjustment without disturbance of the driving mechanism is obtained.

Mr. W. J. Devers has been appointed to represent Messrs. George Hands and Co. in the South-West of England and Wales.

From a report prepared by Mr. Thomas Hudson, the Town Clerk of Manchester, the annual contribution of the Corporation, under the National Insurance Bill, in respect of employees in the gas and other departments, will amount to £2043.

CORRESPONDENCE.

[We are not responsible for opinions expressed by Correspondents.]

Profit-Sharing and Municipalities.

SIR,—As writer of the article that was published in last Tuesday's "JOURNAL" (p. 18) and on which some comments appeared in the leader columns, I should like to point out that the effect of the suggested rule making the bonus payable not only on the wages earned during the previous year, but also to a certain extent on past savings, is proposed in order to give a somewhat higher rate of bonus to the older workers, who have been employed for a good many years.

The suggestions were put forward by me, not as presenting a complete cut-and-dried scheme, but tentatively to form a basis on which the details of any particular scheme could be founded as should be most suitable to its special conditions.

6, Bloomsbury Square, W.C., July 7, 1911.

E. W. MUNDY.

Proceedings at Gas Institution Meetings.

SIR,—I have been reading with great interest the remarks in your issue of June 20, upon the proceedings at the annual meeting of the Institution of Gas Engineers.

I consider your suggestion to sectionize the various papers dealing with "distribution" and "manufacture," to be an excellent one, and one that should be appreciated by all distribution engineers.

At the present time, the gas industry has numerous competitors for lighting, heating, and power business; and it would be to the benefit of many officials in charge of distribution departments to have an opportunity of reading papers and taking part in the discussion of them.

While it is most important that everything should be done to obtain the highest possible efficiency in the carbonizing department, with a view to producing gas at the lowest price, I feel it is still more important that the best value should be obtained from every cubic foot of gas supplied to our consumers.

It must be evident to most of us that the distribution department is becoming a very important one; and I feel sure that there will be no lack of papers upon important and interesting subjects which should form healthy discussion for those fortunate enough to attend these meetings, and useful reading for other subscribers to the "JOURNAL."

Norwich, July 4, 1911.

W. H. WAYTE.

Vertical Retorts.

SIR,—In the article published in your issue of July 4, dealing with "The Invention, Development, and Present Position of the Dessau Vertical Retorts," the author takes considerable pains in endeavouring to draw a comparison between the Glover-West system of continuous carbonization and the Dessau system of intermittent carbonization. The quality of the coke, the quantity and quality of the gas, together with the capacity of the two systems upon a given area, are all very laboriously compared.

Very little value, however, can be attached to these comparisons, when such manifest unfairness is shown by comparing the figures obtained by means of the very latest development of the Dessau system with the results obtained from the first trial installation of Glover-West vertical retorts erected at St. Helens, and put into operation nearly three years ago.

The absolute futility of such comparisons is further intensified by the attempt made to draw definite conclusions from tests made in the two systems with English coals on the one hand, and German coals on the other.

July 8, 1911.

SAMUEL GLOVER,
JOHN WEST.

Uses of High-Pressure Gas for Industrial Purposes.

SIR,—Mr. E. W. Smith, M.Sc., has raised points which are of very great interest to all who work in the field of the manufacture, distribution, and testing of coal gas. Mr. Alfred Mansfield and other correspondents having started a discussion in the Technical Press, I venture to add my voice to the suggestion that the matter should be thrashed out therein and not by way of a communication to the Institution.

In the hope that this suggestion will be acted upon, I venture to put one or two points which appear to me to require elucidation.

(1) Mr. Smith says that an increase in gas pressure in burners of existing design does not cause a corresponding relative increase in the volume of air injected. He then remarks that this was due to all existing burners being wrongly constructed, and proceeds to say that he designed a correct burner which, *inter alia*, enables more than the theoretical quantity of air to be injected.

My comment on that is: Will Mr. Smith say how he knows what is stated above, or, in other words, how he knows what quantity of air is injected in the bad existing burners and in the good Smith burner.

(2) I suggest to Mr. Smith that the details of the comparative tests of the low-pressure and the high-pressure burners are set out by him in an astonishingly slipshod way, and that it is due to those interested in the matter to give full details as to gas measurement, apparatus used, &c.

Mr. Smith states that for heating water "advantage has to be taken of a type of ring-burner. The usual low-pressure ring-burner is of no use. Not only is the jet too big, but the primary inlet is too large, and the burner tube must be reduced to keep up the velocity of the gas and air in the burner."

My comment on this is that, apart from the thoughts to which this series of terse assertions give rise, it would be interesting to know

what sort of ring-burner was used in the comparative tests. If it was suitable for low-pressure gas, it was unsuitable for high-pressure gas; and yet 92 per cent. efficiency was obtained with a burner which, according to Mr. Smith, "is of no use." If, on the other hand, it was unsuitable for low-pressure gas, then why does he give 47.5 per cent. as a figure for the efficiency of low-pressure gas when it was admittedly obtained in an unsuitable burner.

As science should be impartial, I venture to condemn in the strongest language the use for comparative purposes of figures which are not comparable. In one case, the test took 3 min. 30 sec., in the other 8 min. 30 sec.; and yet no allowance appears to have been made for radiation. Surely time is an essential factor in this case; and its neglect vitiates the figures given, and therefore the conclusions drawn from them. As a matter of fact, the whole conception of this iron-pot business as a comparative test is unsound. If the matter was a question of the absorption of heat units by water, and if the tests had been carried out in an apparatus designed to absorb the heat units—*i.e.*, a calorimeter—does Mr. Smith suggest that gas at 15 inches mercury pressure is of higher calorific value per cubic foot than gas at 20-10ths water pressure.

The point, of course, which does require investigation is whether, by injecting more air through increase of gas pressure, you increase the flame-heat from the combustion of gas; and the way to test flame-heat is not by the use of an iron caldron and a litre of water.

(3) With respect to the measurement of high-pressure gas, if, as Mr. Smith says, this is done so simply and accurately by an ordinary meter before compression, why does he advocate the standardization of jets, and the employment of curves, formulæ, and various assumptions, each of which is a potential source of error? Has Mr. Smith ever seen two jets of absolutely the same diameter, and has he ever met gas of an unvarying gravity?

There is no doubt much that is serviceable in Mr. Smith's communication; but, if I may be permitted to say so, I think it is a matter of regret that the tone adopted seems to suggest an unfortunate consciousness of a superior knowledge which does not appear to be justified by the matter contained in his communication.

Westminster Palace Gardens, S.W., July 6, 1911.

JACQUES ABADY.

SIR,—I have read the letter from Mr. E. W. Smith, in reply to my criticisms on his paper, and note that he corrects his reported reply to Mr. Leather.

Mr. Smith has at his disposal, I understand, a laboratory equipped with everything he can desire. So have I. He has written a paper on a subject which I have been investigating for years. I have collected a mass of data. Unfortunately, the subject is so complex that I have not been able to reduce everything to definite statements of fact. At every point of investigation, I find myself running into a *cul-de-sac*. I then seek the assistance of my friends, who are deeply interested in the subject, and have received much valuable help.

The object of my letter was to endeavour to persuade him to explain his views in the Technical Press. Reading a paper at the annual meeting of the Institution of Gas Engineers may have its advantages. But although many gas managers are interested in the uses of high-pressure gas and the design of atmospheric burners, I think Mr. Smith will agree with me that the major portion of those who investigate these subjects do not belong to the Institution.

In reading over Mr. Smith's paper, I recognized many familiar pitfalls; and I was anxious to know whether he could convince many of us who are working in the same direction, that he had found a way out of them. If Mr. Smith is willing to explain all points, I think he would be doing a great service to the gas industry. Notwithstanding the preliminary remarks in his paper, he must necessarily come to some conclusions; and I gave him instances where he had made definite statements of fact. In his reply, he overlooks all these points, with the exception of the calorific test. I pointed out that he had apparently taken the same calorific power for both high and low pressure gas. He now states that he reduced the volume of the gas from 15 inches of mercury to a pressure of 20-10ths water-gauge. This explanation, however, does not dispose of the question. The reduction of volume, by calculation, from a high to a low pressure may be a simple matter with a perfect gas; but I think some information should be given as to how this calculation has been made with a gas which is very far from perfect.

The position, as I understand it, with regard to this particular test is that he first made a calorific test of the gas at low pressure, and found the net value to be 542 B.Th.U. per cubic foot. With a burner and nipple designed for use of gas at high pressure, he made a test to find the losses due to the escaping heated products of combustion and radiation. He took an iron pot, which would absorb and radiate heat, containing one litre of water, heated this with gas at high pressure, and found the total losses of heat from all causes amounted to only 8 per cent. This experiment lasted for only 3½ minutes. The result obtained leads one to believe that some mistake has occurred somewhere, as it is very high.

He then, presumably, took the same burner and nipple, and used gas at a pressure of 2 inches, although this is not clearly stated in the details of his experiments. The experiment with low-pressure gas took 8½ minutes, or more than twice the time of the high-pressure burner; and he lost 52½ per cent. of his original heat value. A low-pressure burner giving an efficiency of 47½ per cent. is remarkably poor.

My point is that I understand Mr. Smith wishes to convey the impression that gas compressed to 15 inches of mercury will give 92 per cent. efficiency, while at 2 inches pressure it will give only 47½ per cent. My experience does not confirm this. I have never found any particular advantage in using high-pressure gas for heating water.

It would be interesting to know whether Mr. Smith has ever compressed gas to 15 inches of mercury, then discharged it into a test gas-holder at 2 inches of water, and made calorific tests with the released gas, in order to see whether he has gained or lost calorific power, and whether the volume of gas in his test holder equals the reading of his low-pressure meter.

The behaviour of nipples, mixing-tubes, and issuing orifices, and many points which Mr. Smith touched, are subjects which are very

interesting. I have masses of information collected from years of patient work. I will be glad to publish any of these; but they are all inconclusive.

Birkenhead, July 4, 1911.

ALFRED MANSFIELD.

SIR,—Will you allow me to state, through the medium of the "JOURNAL," that I propose to reply to all criticisms of my Institution paper *en bloc*, in time to be included in the "Transactions" of the Institution. I shall at the same time give further details of some of the work that has been done in the high-pressure laboratory.

However, I should like to state here that all gas volumes, at whatever temperature and pressure they were taken, were reduced to one and the same standard—viz., 60° Fahr. and 20-10ths water-gauge.

E. W. SMITH.

High-Pressure Gas Laboratory, Birmingham,
July 5, 1911.

Corrosion of Service Pipes.

SIR,—In his letter published in your last issue, Mr. M'Leod defines "acidiferous" subsoils as those which "contain . . . substances which are acid in character." In his Institution paper, he states, in speaking of ashes, that their "porosity permits access of air and moisture containing carbonic acid." It appears to follow, therefore, that one cannot be altogether incorrect according to Mr. M'Leod's own definition and statement, in speaking of an ash subsoil as "acidiferous" in character. At any rate, so far as I am concerned, I am content to leave the matter there.

Leeds, July 6, 1911.

WALTER HOLE.

Oxide Firing in Purifiers.

SIR,—As there have been several accidents lately through oxide firing when purifiers have been emptied, I am induced to give some recent experiences, in the hope that they may prove useful to my professional brethren.

On Wednesday last, we unloaded a purifier of Green's type, which had been in use since Sept. 24, 1910. During that time, 252,112,000 cubic feet of gas had passed through it. Upon lifting the covers, the material was found to be caked so hard that every bit of it had to be dislodged with a pick and shovel. Upon analysis, it was found to contain 50.44 per cent. of sulphur. At the end of the day, the box was only half empty; and the men were too exhausted to work any longer. After careful examination, it was decided that it would be safe to suspend operations until the morning. The box was accordingly left all night, and completed next day, in perfect comfort and safety. All night, air had ready access to the material left in the box—both at the top and sides and below the bottom tier of grids which supported the hurdles. So all the conditions were favourable for rapid heating, save one.

We have four boxes which we work on the backward and forward rotation principle, and two catch boxes. In all of them we use oxide; and we admit about 2½ per cent. of air for revivification. Having decided to empty the box on Wednesday, we made it the fourth taker or finishing box in the rotation series on Tuesday afternoon—thereby revivifying the oxide *in situ*. Then, when the lids were raised the next morning, the oxide was perfectly safe, no matter how much sulphur it contained. It threw off no offensive odours, and was not at all objectionable, either to the workmen or the neighbourhood.

We have now emptied four boxes in this manner, all of which had been running for months—two being fully saturated with sulphur; and the result has been the same on each occasion. There has been no indication outside the works that a purifier was being taken, and no trouble or danger through the material firing.

We have used two widely different kinds of oxide; and similar material to that taken out last Wednesday has fired at other works. It therefore seems proved that a purifier can be emptied with perfect safety, if it is made the finishing box of the rotation series for eighteen or twenty-four hours before it is discharged. At the same time, this method reduces the nuisance to the neighbourhood and the discomfort to the workmen.

Wakefield, June 30, 1911.

H. TOWNSEND.

A Few Words with the Kendal Health Committee.

Touching the letter on this subject in the "JOURNAL" last week and the editorial the previous week, we have the views of the "Kendal Mercury" on the performance of Dr. Parker and the Health Committee. Our local contemporary says: "The Kendal Health Committee is quite a huge publication department, and will doubtless soon require the services of an editor-in-chief. Already we have pamphlets on flies, how to feed babies, on germs, on gas as a poison and electricity as the *elixir vitae*, and so on. The latest fad is the discovery that people are being slowly poisoned by gas; that it is less conducive to longevity and good health to burn lamp oil, candles, incandescent light, or gas, than electric light. The Chairman of the Health Committee is Dr. Parker, as everyone knows; and the farce he chooses is, to play off two Corporation Committees—the Gas and Water and the Electricity—against each other, by the issue of a fiat from the Health Committee that gas is poisonous and electric light is best. To Kendal folk the whole thing is a screaming farce; and they choose the opportunity to laugh it out of court, though outside Kendal in professional circles the Doctor's statements are regarded as scandalous. Did Kendalians attach much importance to the Doctor's aviation flights of fancy, they might regard them so too; but there is no need for consternation at his temerity. He will alight on *terra firma* all right at the guidance of the Chairman of the Gas and Water Committee." The deficiency on the electricity undertaking last year was £568.

Tenders for gas-stoves have been accepted by the Gas Committee of the Stockport Corporation from Messrs. Arden Hill and Co., the Richmond Gas Stove and Meter Company, Limited, and Messrs. John Wright and Co., Limited.

PARLIAMENTARY INTELLIGENCE.

HOUSE OF LORDS.

The following further progress has been made with Bills:—

Bills brought from the Commons, read the first time, and referred to the Examiners: Margam Urban District Council Bill, Rotherham Corporation Bill.

Bills read a second time and committed: Belfast Corporation Bill, Halifax Corporation Bill, Local Government Provisional Order Gas Bill (No. 2).

Bills reported, with amendments: Chasetown Gas Bill, Gas Orders Confirmation Bills (Nos. 1 and 2).

Bills read the third time and passed: Northampton Corporation Bill, Thames Conservancy Bill.

The Belfast Corporation Bill and the Gas Orders Confirmation Bill (No. 4) have been referred to a Select Committee, consisting of the Marquis of Exeter, Lord Sackville, Lord Basing, Lord Welby, and Lord Rotherham; to meet to-morrow.

On the motion for the third reading of the Metropolitan Water Board (New Works) Bill, on the 17th inst., the Duke of Northumberland will move for the insertion of a new clause providing that if, in connection with the construction of any reservoir, the Water Board cause any diminution of the supply of water from any stream, bore-hole, pond, pool, spring, &c., within the Administrative County of Middlesex, and within a radius of two miles from the site of any such reservoir, the Board shall, upon the written request of the owner of such source of supply, repay to him all costs and expenses reasonably incurred in obtaining an additional supply.

ST. HELENS CORPORATION BILL.

The Position of Ashton.

It will be remembered that in the course of the proceedings on this Bill before the Local Legislation Committee (*ante*, p. 47), the question was raised by the Ashton District Council as to whether two local authorities should have powers for the same district; and they asked the Committee to give Ashton relief by depriving the St. Helens Corporation of such powers as they had in the Ashton area, and which had never been exercised. The decision of the Committee was delayed in order that the Speaker's Counsel might be consulted; the promoters having contended that Ashton could get the relief they asked only by promoting a Bill of their own.

The Committee, at their sitting last Tuesday, decided against the Ashton District Council.

MILFORD HAVEN GAS ORDER.

The Provisional Order promoted by the Milford Haven Urban District Council, by which power is sought to borrow additional money for the Council's gas undertaking, was before the Chairman of Ways and Means Committee of the House of Commons on Unopposed Bills last Thursday. Mr. WHITLEY presided.

Mr. MOONEY (a member of the Committee) directed attention to a clause which, he said, gave a general power for borrowing, and expressed the view that a definite sum ought to be stated.

Mr. WOOD, representing the Local Government Board, pointed out that the clause was in the usual form.

Mr. MOONEY observed that such power as was sought in the clause, and wielded by a Government Department, took the matter from the purview of Parliament, which he held should periodically consider these proposals to raise additional money.

The CHAIRMAN remarked that this was a case in which no estimates had been put before the Committee, and in which no grounds were shown for requiring a particular sum.

Mr. WOOD reminded the Committee that six or seven such measures had already been passed. It had been the common practice for, he thought, four years. He admitted, however, that, under the present conditions, a local authority could go on borrowing for all time without the interference of Parliament.

Mr. MOON (Speaker's Counsel): The question is whether it is desirable that this should go on without being reviewed by Parliament.

The Committee decided to postpone the confirmation of the Order pending evidence which, if possible, would enable the Committee to fix a maximum.

CANNOCK GAS PROVISIONAL ORDER.

A Select Committee of the House of Lords, presided over by Lord BARNARD, had before them last Wednesday the Gas Orders Confirmation Bill (No. 2), containing a Provisional Order applied for by the Cannock Gas Company, against which a petition had been presented by the Cannock Urban District Council.

Mr. TYLDESLEY JONES, who appeared for the Company, explained that the object of the Order was to extend the limits of supply of the Company, to enable them to raise further capital, and to put upon them a sliding-scale instead of a fixed maximum dividend. The only opponents were the Urban District Council, who had the right to purchase the existing undertaking. Before the Board of Trade, a discussion took place, and they thought they had agreed for the Council to purchase the undertaking on their bringing in a Bill next year; but the negotiations seemed to have fallen through. He was glad to be able to say, however, that since they had been in the Committee-room they

had been able to re-open negotiations, with the result that they had come to an agreement. He therefore asked the Committee to insert in the Order a clause which provided for the purchase of the undertaking by the Council if they obtained their Bill next year; and the Company would not oppose them. He did not think it necessary to trouble the Committee with details of the clause, which was a long one.

Mr. JEEVES, on behalf of the District Council, said he was quite in accord with what Mr. Tyldesley Jones had stated. The Council would promote a Bill next session, subject to the consent of the ratepayers, with the object of purchasing the Company's undertaking at an agreed price. Of course, if they did not come or did not get the sanction of Parliament, they would fall back upon the powers they had.

The CHAIRMAN said the Committee were informed that the usual course adopted in the case of Unopposed Bills would have to be followed in this case.

Mr. TYLDESLEY JONES said his friend Mr. Jeeves was opposing. He had made him an offer, and he had accepted it. Therefore, why they should be put to the expense of going to the Unopposed Bills Committee he did not know. He proposed to call a witness, if Mr. Jeeves wished to cross-examine him.

The CHAIRMAN said he was advised that the proper course was for the Bill to go to the Unopposed Bills Committee.

The purchase price mutually agreed upon is said to be £72,000.

LEGAL INTELLIGENCE.

A PIPE CONTRACT DISPUTE AT LINCOLN.

Serious Charge against the Staveley Coal and Iron Company, Limited.

In the Nisi Prius Court at Lincoln Castle last Tuesday, an important action, arising out of the new water-works scheme of the Lincoln Corporation, was commenced before Mr. EDWARD J. POLLOCK, one of the Official Referees of the Supreme Court. Plaintiffs, the Staveley Coal and Iron Company, Limited, claimed from the Corporation a sum of £15,778, under a contract, of which the total was £28,406, to supply cast-iron pipes for the main in connection with the new supply of water. The Corporation on their part said the pipes which were the subject of the claim were some which had been rejected, but had been re-numbered and sent back having been passed; and they made a counterclaim of the same amount as the Company.

Sir EDWARD CARSON, K.C., M.P., Mr. NORMAN CRAIG, K.C., M.P., and Mr. LYNDEN CHACESEY (instructed by Messrs. Davis, Sanders, and Swanwick, of Chesterfield, appeared for the Company; Mr. HUGO YOUNG, K.C., and Mr. J. B. MATTHEWS (instructed by Mr. W. T. Page, Town Clerk of Lincoln) represented the Corporation.

THE CASE FOR THE PLAINTIFFS.

Sir EDWARD CARSON, in opening the case for the Company, said the action was brought to recover damages for breach of contract; in the alternative, for goods sold and delivered; and, also in the alternative, for goods bargained for and sold, of which acceptance was refused. The whole matter arose out of a contract entered into in September, 1909, under which the plaintiff Company agreed with the Corporation for the sale to them of certain pipes for the water-works scheme which they were carrying out. The whole contract amounted to a sum of £28,000. The pipes were supplied to a very large extent, and a good many had been paid for. In the month of April, 1910, the Corporation alleged that the Company were fraudulently sending to them certain pipes which their Inspector had already rejected; and they claimed, by reason of this, to determine the contract. The total number of pipes then delivered was 3191, which equalled 4415 tons 2 cwt. 25 lbs. The contract price—£4 6s. 6d. per ton—would work out to £20,213 13s. 6d.; and there had been paid on account of this £12,628—leaving a balance of £7585 13s. 6d. due for pipes actually delivered. As regarded the balance, he claimed, on behalf of the Company, under two heads. First, the Corporation had no right to put an end to the contract at all, or if they had such right—and this was a question the Referee would have to determine—they had retained the pipes after they were delivered, and he was entitled to recover the amount. As regarded the latter contention, the Corporation pleaded that there was a term in the contract that they must have the Inspector's certificate as a condition precedent to recovery. In addition to these 3191 pipes, there were 671 pipes which were passed by their Inspector, and were ready for delivery, upon the 6th of April when they terminated the contract, and which had been lying at their disposal ever since in the plaintiffs' works. This amounted to 898 tons 4 cwt. 3 qrs. 7 lbs.; and at the contract price it would amount to £3899 9s. 4d. There were 27 pipes in addition which had been made but not inspected, owing to the Corporation's refusal to accept; and they came to £267 15s. 2d. This made altogether £11,752 8s. for pipes manufactured under the contract up to that date. At the date named, there were still to be manufactured under the contract, to bring it up to the full amount, 809 tons 11 cwt. 1 qr. 3 lbs. These pipes had not been made; and if the contract had been wrongfully determined, the Company had a right, as part of the damage, to recover the profit they would have realized upon them. They had estimated the profit on the whole contract at about 4s. 6d. a ton; and this figure would be £182 3s. The question the Referee had to decide was whether the defendants were justified in determining the contract. The charge they made in the letter in which they determined it on the 6th of April was this:

The attention of the Corporation has been drawn to the fact that rejected pipes under your contract have been re-delivered with numbers wrongly put upon them, with a view to deceiving the Engineer and inducing him to accept them as having been duly passed by the Inspector. Under this circumstance, you will not be surprised to be informed that the Corporation cannot continue business transactions with you, and will hold you respon-

sible for such damages as they have sustained up to this date by reason of your improper action.

If this were true, it would be a justification for putting an end to the contract. But, of course, he need hardly say that to make an imputation of the kind against a concern such as the plaintiff Company (for the very small and trivial profit upon such a contract as this), if it was untrue, was outrageous. The charge seriously made was that for a paltry sum of £1390, which was the profit on the whole of the contract, and at a time when this was almost completed, what was complained of was done. What the plaintiffs must have done was this: They must have called together the heads of the three or four different departments; they must have sat down at a table and worked out an elaborate conspiracy of fraud, by which pipes already rejected were to have the numbers fraudulently put back upon them. For the purpose of doing this, they must have removed the pipes, weighing over a ton each, to some place, and they then got their employees to set themselves to put on new marks (which, according to his instructions, was a very difficult thing to accomplish); and they must, for the sake of sending forward a few rejected pipes, have handed themselves over body and soul to their employees, and taken them into their confidence, with a view to carrying out this fraud on the Lincoln Corporation. The plaintiffs said it was a physical impossibility for this to have been done. The improbability was so great that he asked the Referee to most carefully consider for what object a Company of this kind could lend itself to any such scandalous performance. Under the contract, the Corporation could have, and they had, an Inspector on plaintiffs' works who had a right—and he exercised it—of going into every part, from start to finish, where these pipes were manufactured, and staying until they were eventually delivered. To suppose for one moment that any such thing as that complained of could take place, was, he suggested, an absolute impossibility. In addition, there were about thirty or forty inspectors for the other contracts going about the works; and in face of this the Company were, according to the Corporation, carrying out this fraud, which was almost inconceivable. If they did attempt any such thing, they had delivered themselves over to their men, so as to have them on them as blackmailing pensioners for the rest of their lives. They had not got rid of any liability, because under the contract the Engineer had a perfect right at any time, even after the Water Inspector had accepted the same pipes, to reject them. He had a right, and was bound under the contract, when these pipes came to be put into the ground, to apply to them the water test; the pipes which were rejected being, therefore, *prima facie*, improper pipes. The plaintiffs were alleged to have fraudulently altered and re-delivered them with the knowledge that they had to be put into the ground to pass the remaining test, but the severest one of all. Nobody but lunatics would conceive such an idea as this. The first thing they would expect would be that the moment they were put to the water test the pipes would have to be given back under the contract, and the whole expense would have to be incurred again. He submitted that it was inconceivable that the plaintiffs should have concocted this kind of conspiracy. The plaintiffs had put the matter into the hands of the highest experts, who would tell the Referee that the pipes were good and proper ones. So convinced were the plaintiffs that these pipes were good, and that the whole of this trouble had arisen from the suspicion aroused in some way or other by Mr. Angus (the Inspector on the works), that they wrote a letter on the 3rd of May last stating that they were prepared to have the whole of the pipes submitted to three times the working pressure, and also to guarantee their efficiency for a term of five years. The answer was a letter to the effect that the test suggested would seem to have no bearing upon the issues of the action; and that therefore the Corporation could not be advised to comply with the request. He should, he hoped, be able absolutely to disprove that these pipes were ever altered, or could have been altered, in the plaintiffs' works. He should be able to trace the pipes from the time they were manufactured till they were inspected and then handed on and delivered. Having quoted at some length from the contract between the parties, and explained the method of marking, with the object of showing that it was not possible to obliterate a mark and substitute another, Counsel went on to deal with the figures showing the number of pipes delivered to the Corporation and of those rejected.

At this point, a discussion arose between Counsel and the Referee as to the advisability of the latter visiting the pipe depôts and the Company's works, in order to acquaint himself with the pipes and the method of making them. The Referee agreed as to the advisability of doing so at an early stage of the proceedings.

Sir EDWARD CARSON, continuing his address, said he now came to a matter on which he must make some very strong comment. The Corporation had had the pipes in question in their possession for fifteen months. They had made, on the 6th of April, a charge of a most serious character against this great Company. They ought, when they brought the charge, to have got their evidence; otherwise they certainly never should have made the accusation. For the whole of the fifteen months they had retained the pipes. They had no right to touch one of them in view of the seriousness of the charge, unless in the presence of the plaintiffs' witnesses. But they had tampered with the pipes, as would be visible, he was told, to anybody who saw them now. This was a matter of the gravest impropriety where an action was pending. He was told that many of the pipes—in fact, a great number of them—had been chiselled. First, the blacking had been taken off, the pipes filed and marks put upon them of various characters; and in some cases it had been attempted to cover up what they had done by putting on some sort of imitation blacking. He characterized the whole of this operation, from beginning to end, as being a scandalous one in a case of this kind when a charge was pending. It altered the whole appearance and character of the pipes; and he was told there were marks upon them which were never there when they were in the plaintiffs' possession. What explanation would be given of this he did not know. In conclusion, Counsel said the plaintiffs challenged the whole of the case as being got up on grounds of suspicion entertained towards them.

Mr. HUGO YOUNG said the suggestion of his learned friend that there had been some chiselling and filing of the pipes by the Corporation would be absolutely and entirely denied. The pipes certainly did disclose distinct marks of chiselling, which was part of the defendants'

case; but all they had done was to clear off the coating, which they said enabled the Company to hide what they had done.

Evidence was then called in support of the plaintiffs' case.

Mr. *Henry Westlake*, the Managing-Director of the Company, explained the processes employed in the manufacture of the pipes, and the methods used in sending them out. With regard to "wasters," some of them were broken up and others taken into stock, and, if fit for sale, were sold. Though the making actually took place in their works, it was let to sub-contractors. It would not be possible for such a fraud as that imputed to them by the defendants to be perpetrated by his Company.

In cross-examination by Mr. *HUGO YOUNG*, witness admitted that the Company cut down their prices considerably from what they were originally. Their original tender was £66,885 for the whole of the four sections into which the contract was divided. Originally their tender for sections 1 and 2 was £32,683, and they reduced it to £28,406. The Stanton Iron-Works Company obtained the contract for sections 3 and 4 for £29,492; the total contract being £57,898, as against their original tender of £66,885. He had never heard of any arrangement between the Company and the Stanton Company to pool the contracts; and he could not say how it was the latter Company got a portion of the contract. After his Company sent in their first tender, they heard that the Corporation were contemplating getting quotations from abroad. It was in consequence of this that they cut down their prices.

Mr. *HUGO YOUNG* asked witness whether it had been reported to him that in this case the figures now appearing were very often carved out of the pipes and had not been cast.

Witness said he had heard such rumours, and had laughed at them. Though he had seen a number of pipes, he could not say whether he had inspected any that were said to have been so treated.

Sir *EDWARD CARSON* called for the number of pipes which it was alleged had been so treated.

The REFEREE having expressed the opinion that this was quite a reasonable request,

Mr. *HUGO YOUNG* undertook that this should be supplied; observing that he did not think he could resist such an application. He next directed his cross-examination to show that such a fraud as the defendants suggested could have been perpetrated. While witness refused to admit that it could be done, he agreed with the suggestion that if the number of a pipe that had been passed by the Inspector had been altered, and the original number been carved on a rejected pipe, it would also be necessary to place upon the pipe an imitation of the Inspector's stamp. He had heard a suggestion that certain pipes did bear a stamp which was not the Inspector's. Coming to the Company's letter in reply to the Corporation's letter alleging fraud, in which the Company offered to submit the pipes to a test three times as great as the water-test pressure, witness admitted that if the pipes had borne this test it would be no justification for forwarding pipes that had not been passed by the Corporation's Inspector, if this had been done.

The cross-examination of the witness was proceeding when the hearing was adjourned. Next day the Referee, accompanied by Counsel, visited the works of the plaintiff Company, in accordance with the suggestion made.

Second Day.

On the resumption of the hearing on Thursday,

Mr. *HUGO YOUNG* continued his cross-examination of Mr. *Westlake*. Witness was taken in great detail through the methods of dealing with the pipes and the numbers on them. Referring to a visit of Mr. *Barron* (the Water Engineer) and Mr. *J. Richardson* to the works on March 21, 1910, just prior to the termination of the contract, witness admitted generally that he was told that certain pipes were called for; but he persisted that he had no knowledge of three particular pipes, which could not be found. Counsel put it specifically to him that the three pipes numbered 1578, 1616, and 106 were asked for, and could not be found, and that the pipes numbered 1573, 1615, and 105 had been submitted for inspection. The Inspector was suspicious about these, and thought the terminal figures 3, 5, and 5 had been altered from the 8, 6, and 6 on the other three; and he there and then challenged the production of those with the terminal figures 8, 6, and 6. Witness replied that this matter was not reported to him except in general terms. Counsel next dealt at considerable length with a large volume of correspondence in which the Water Engineer of the Corporation complained that the first test of the pipes on behalf of the Corporation disclosed that 26 pipes out of 109 were sweating. Witness admitted that, if this figure was accurate, it was a very bad turnout from the pits. The complaints made in the correspondence also included that many of the pipes were under the minimum specified weight, and that "a certain pipe" had been improperly treated. Dealing generally with the specification, witness declared that it was a very rigid one, and that it was carried out in a very stringent manner. In fact, he declared that the Company were "the rat in the trap;" but they had to stick to the contract.

In answer to Sir *EDWARD CARSON*, witness stated that had the Company read the specification in its true light, and seen the way in which it was going to be carried out on the part of the Corporation, they would not have accepted it.

At a subsequent stage of the proceedings,

Sir *EDWARD CARSON* stated that the pipes which were called for by Mr. *Barron* and Mr. *Richardson* were still at the works, and might be inspected.

Mr. *HUGO YOUNG* said he was not surprised to hear that they were there now.

Sir *EDWARD CARSON*: That means that we have manufactured them for the case.

In re-examination, witness stated that it was not to the advantage of any of their employees to commit the fraud suggested.

Third Day.

On the resumption of the hearing next morning,

Mr. *HUGO YOUNG* said reference had been made the previous day to three pipes, and his learned friend had stated that pipes bearing certain numbers were now in the plaintiffs' possession. He should like to have an opportunity of inspecting them, as he thought this was only

fair, if he gave notice. The numbers of the pipes were 1578 G, 1616 G, and 106 E.

Sir *EDWARD CARSON* said he had no objection, so long as he had a representative present.

Mr. *F. Gandy*, the plaintiffs' Works Manager, said he had filled this position for sixteen years. He explained in detail the methods of dealing with the pipes. The Company paid the Sub-Contractor for 4317 pipes, and 455 of them were rejected. Of these, 70 had been sold; but delivery had been postponed pending the action. He never knew of any alterations of numbers having taken place on the pipes; and he himself certainly took no part in any such fraud. His attention was called to a statement made the previous day that since the termination of the contract the Company had manufactured pipes with a view to supplying deficiencies; and he was asked if there was any truth in it. Witness replied that the statement was absolutely untrue. On the 18th of March last year, he received a letter from Mr. *Barron* to the effect that the writer had visited the works the preceding day, and was shown by the Inspector a number of pipes which had upon them evidence of having been tampered with. He therefore confirmed a verbal order given to stop the casting and delivery of all straight pipes until he had inquired closely into the significance of the treatment that certain pipes had received. With regard to the interview with Mr. *Barron* and Mr. *Richardson* on the 21st of March, witness said that three gentlemen came to his office, and Mr. *Barron* stated that they had come to examine the pipes. Witness went with them to the pipes in question; and Mr. *Barron*, after looking at them through a magnifying glass, said certain of the numbers had been altered. They were 1615G, 1616G, 1578G, and 106E. After the examination with the glass, Mr. *Barron* accused him, or rather the Company, of altering a number—he thought a "6" into a "5"—in No. 1615; but he pointed out that the figure had been merely fettled. Witness then proceeded to give an account of what followed. Mr. *Barron* put down on a piece of paper three numbers, and asked witness to produce the pipes. He replied that he would do so if given sufficient time. He instructed Mr. *Allright* to go and find the pipes; and Mr. *Barron* sent a practical moulder named *Smith* with him. After about twenty minutes they returned without having found the pipes. Witness then had a conversation with *Smith* as to why he had been brought. *Smith* said it was to see if it was possible to burn the numbers on a pipe; and he laughed at the idea. A rather heated argument followed, and witness left and went home to luncheon. While there, a note, signed by Mr. *Barron*, was handed to him, requesting him to have pipe No. 1615G taken to the shop and a portion of it cut away as the writer should direct. Witness wrote instructions for this to be done as Mr. *Barron* requested; and when he returned to the works the visitors had left. He had thoroughly investigated the matter, tracing it through the various departments, commencing with the moulders; and, so far as he had been able to ascertain, there was absolutely no truth in the statement which had been made. Asked if it would be possible to "fake" the numbers in the way suggested, without the matter being discovered, witness replied that he could not think it would, as a great many of the men must have seen it if it had been done. Questioned as to whether he gave any instructions with regard to carrying out the contract, witness stated that he did, to more than one foreman. He told them the Company were in a difficulty with regard to the contract; but rather than have one defective or bad pipe forwarded to Lincoln he would see ten broken up on the works. He had lately seen the pipes at the Corporation depot, and they were not in the condition in which the pipes left the Staveley works. In his opinion, it would be absolutely impossible, from their present state, to ascertain what was their condition when they left the works.

In cross-examination by Mr. *HUGO YOUNG*, witness stated that the only inquiries he made were among the men themselves; and he said Counsel might assume that if anybody wanted to do something that was wrong to the pipes he would have ample opportunity when witness's back was turned. With regard to the piece of pipe with the number upon it, witness was asked if the terminal "5" was in the condition into which it would get by the use of an ordinary fettling-tool; and he said it was, except that it was brighter. In his opinion, beyond the use of some emery paper, the figure was in exactly the same state as when it left the fettler. Witness was then questioned about the fruitless search for the three pipes on the 21st of March; and he said they were found next day. Mr. *Barron* had suggested that the reason they could not be found was because they bore different numbers.

Mr. *HUGO YOUNG*: After that suggestion had been made, and after the next morning, as you say, you found the real pipes, did you ever write to Mr. *Barron* and say: "That charge you made is all nothing. I have found these pipes?"

Witness: I did not; the rupture was too severe for that.

A great deal has been said of what we ought to have done for you. Do you not think it would have been rather the right thing to write to Mr. *Barron* at once, and say: "You demanded to see these pipes. Here they are; come and see them"?—I quite agree that it would have been the correct thing to do.

Why did you not do it?—I remembered the heated parting.

Only yesterday Sir *Edward* stated that these numbers had been found. As far as you know, has any intimation ever been given to us that these three pipes, upon which we base this serious charge, had been discovered?—So far as I know, no information has been offered you.

In reference to the pipes we have, you made a statement that they are not in the condition in which we received them from you. What do you suggest has been done to them, except taking off the coating and putting some vaseline upon them to prevent them rusting again?—I have no suggestion to make.

The REFEREE: Can you tell me of any difference besides the coating taken off and the vaseline put on?

Witness: I should say they have been scraped with a scraper.

Do you think anything else has been done to them, and if so, what?—I am afraid, Sir, if I have to give a direct answer, these numbers have been tampered with.

Mr. *HUGO YOUNG*: In what way do you mean?

Witness: To make them look different from what they were when they left our place.

Do you mean with a file or a chisel?—I should say, from my observation, probably a file; but I do not like to confine myself absolutely. There are chisel marks on them.

I agree with you. Do you suggest anything else has been done besides the file and chisel?—I have seen that there has been white paint applied round some of the figures.

What would be the object of that?—As far as I know, to magnify the case.

Do you agree that the way these figures present themselves to-day is not consistent with the mere fettling that ordinarily takes place in your works?—They are not quite consistent.

Does the condition of these pipes suggest to you that very considerable chiselling and filing has taken place?—It is apparent.

Because I understand your suggestion is that this was done after they left your works?—I positively decline to suggest.

Witness was then questioned at some length in regard to the Company's system of book-keeping.

Just before the rising of the Court,

Mr. HUGO YOUNG remarked that when the Referee had heard the whole of the case, and got certain numbers in his mind, he would find it necessary to go and inspect the pipes, because they could not bring the pipes to the Court.

Sir EDWARD CARSON said he had been to see them; but all the time he was there he was "shadowed" by certain detectives who refused to go away. This was the first time in his professional career that he had been followed about; and it must have been done under instructions, as notes were being taken.

Mr. HUGO YOUNG apologized, and said every facility was to be given for inspection.

Sir EDWARD CARSON said he supposed the detectives thought he was going to take away the pipes and alter them.

After this humorous incident the Court adjourned.

On Saturday, Mr. Gandy was further cross-examined by Mr. Hugo Young with the object of showing what would be the loss to the Company upon a "waster" pipe in comparison with the profit accruing to them if it passed the Inspector and was sent forward to the Corporation. Witness was also questioned with regard to discrepancies in the weights marked on certain pipes and their actual weights. Two specific instances were quoted which he said he could not account for. The further hearing of the case was adjourned till yesterday.

COWDENBEATH GAS COMPANY'S SHARES.

A Question as to Allocation.

In the Court of Session at Edinburgh, on Tuesday last, Lord ORMDALE began the hearing of evidence in the action taken by Alex. Waddell, the Gas Engineer to the Dunfermline Corporation, and Forbes Waddell, formerly Manager of the South Queensferry Gas Company, Limited, against James Hutton, residing at No. 70, Polwarth Terrace, Edinburgh. The action relates to shares in the Cowdenbeath Gas Company, Limited. The pursuers and defender in 1901 acquired a controlling interest in the Company. The shares allotted to the pursuers were held by the defender in trust, in security for advances which were made to the pursuers in connection with the undertaking. When an issue of 300 new shares was made, the pursuers say they were not informed of the issue. They claim that they were entitled to 101 of the new shares; and as at this time the £10 shares were selling at £20 each, their loss, at £10 per share, was £1010. They sue for this amount. The defender says that, under the agreement between the pursuers and him, it was not required that the pursuers should get part of the new shares.

The pursuers were represented by Mr. CONSTABLE, K.C., and Mr. D. ANDERSON (instructed by Messrs. Davidson and Syme, W.S.). The DEAN OF FACULTY (Mr. Scott Dickson, K.C.) and Mr. WILTON (instructed by Mr. G. B. Tweedie) appeared for the defender.

Mr. A. Yuill, the Gas Engineer to the Dundee Corporation, stated that in May, 1909, he purchased from Mr. Forbes Waddell seventy £10 fully-paid shares in the Cowdenbeath Gas Company. He paid £17 10s. per share, which represented a yield of about 18s. 10d. per share, or 9 per cent. The purchase was *ex div.* For some years prior to this, the dividend of the Company had been 10 per cent. He was acquainted with both the Messrs. Waddell; and he also knew the position of the Company. Mr. Waddell showed him a copy of the balance-sheet of the Company for the previous year. The transaction was a purely business one on his part. Mr. Waddell said he would like to sell his shares, if he could, to parties whom he knew. He attended the annual meeting of shareholders last year, and wished for certain information in regard to costs—more particularly with reference to wages paid. The wages paid per 1000 cubic feet were about 10d., which was nearly double the average. This could only be explained by charging sums against revenue which should have been charged to capital. He was aware that there had been a good deal of constructional work the previous year. There was no information at the time of his purchase with regard to an issue of £5000 additional capital; but looking to the balance-sheet, and considering the amount of overdraft at the bank, he should have said that an issue of new capital was advisable. He took up his proportion of the new stock. Cowdenbeath was favourably situated for the development of a gas undertaking, because of the great increase of coal mining in the district. He still held his shares, and intended to do so. They would not get a gas-works anywhere which had made greater progress than Cowdenbeath. There had been annual increases in the output amounting to from 12 to 32 per cent. since 1903. In Dundee, the annual increase was generally about 5 per cent. The price of gas in Cowdenbeath was 4s. 7d. per 1000 cubic feet in 1904, and in 1910 it was 4s. 2d. In Dundee, the price was 2s. 3d. In Motherwell, the present price of the £1 shares was 35s. The dividend in Motherwell last year was 7½ per cent., which was equal to £17 10s. for a £10 share.

Cross-examined: The inference he drew from Mr. Forbes Waddell's letter was that he required to realize at once. He did not know, when

he purchased the shares in 1909, that the Company had been re-constituted in 1900, or that they did not pay dividends in 1901, 1902, or 1903. When he bought the shares, he had no knowledge of what had been done. He was dealing with the then existing position of matters; and the prospects of the Company were rosy. They had had an increased output of 116 per cent. He thought the Company could have paid a higher dividend than 7½ per cent.

Mr. Peter Fisher, the Manager of the Dundee Corporation Tramways, spoke to having purchased ten shares in the Company, at the price of £17 10s. each. He would not sell them now for £20.

Mr. J. W. Napier, the Gas Engineer to the Corporation of Alloa, said that in November, 1909, his father (who was unable to attend the Court) bought ten shares in the Company from Mr. Alex. Waddell, at the price of £17 10s. It was considered that the purchase was a good one, there having been increases in output to the amount of 20 per cent. and over. It was also known that the locality was a growing one. The purchase was a pure matter of business; the return being about 6 per cent., which was higher than his father got in his own Company at Crieff.

In cross-examination, witness said the shares were bought in the expectation of a dividend of 10 per cent.

Re-examined: He had no difficulty in saying, from his knowledge of gas companies, and of the progress of this Company, that a dividend of 10 per cent. or more might have been paid.

Mr. T. Shaw, of Edinburgh, gave evidence to the effect that in March, 1909, he purchased from Mr. Forbes Waddell 15 shares in the Company at £20 per £10 share.

Mr. Alex. Waddell, one of the pursuers, said he was appointed Gas Engineer to the Corporation of Dunfermline in 1900, and shortly afterwards he was consulted as to the gas undertaking at Cowdenbeath. The Company there had been in existence since 1891, but had not made great progress, because to a large extent they had supplied oil and acetylene gas. In 1900, the retort-house and manufacturing parts of the works were burned down. He was consulted as to the best way of starting the works as a coal-gas undertaking. He found that the Directors were unwilling to advance money; and he then offered to become a purchaser, if the Directors were prepared to sell. He consulted his brother, Mr. Forbes Waddell, and they went to Messrs. Alder and Mackay about the raising of capital for the purchase of the concern. Both he and his brother had had business relations with Messrs. Alder and Mackay for years. Messrs. Alder and Mackay advanced £3500, in addition to what would buy up the shares of the existing Company. It was part of the agreement that they should have the exclusive right to supply meters. The arrangement was that Messrs. Alder and Mackay were to have one-fourth of the undertaking, and he and his brother were to have three-fourths. After this, he made an offer of £550 for the old Company; and it was accepted. In September, 1901, an agreement between Messrs. Alder and Mackay and himself was drawn up. It was also agreed that the profits were to accumulate, or be applied towards reducing their indebtedness. He prepared plans for the new works; and these were opened in December, 1901. By September, 1902, the advances amounted to £4432. The number of consumers had increased very rapidly, and outlays also increased very much. In consequence, it was suggested that the amount advanced by Messrs. Alder and Mackay should be converted into shares. The negotiations with regard to this were extremely difficult. The main difficulty was as to who was to predominate. They finally came to an agreement as to the future of the Company. By agreement in November, 1903, it was provided that the holdings of Messrs. Alder and Mackay and themselves were to be equal, subject, however, to fifty shares being held by Mr. Alexander Wilson, of Glasgow. Mr. Wilson was to be Arbitrator between them and Messrs. Alder and Mackay; and he intended that the fifty shares should give him a controlling influence as between them. A question as to the issue of new shares cropped up. Very soon after the opening of the works, Mr. Hutton, who was the Chairman of Directors, evinced a desire to have further interest in the Company. In point of fact, so far as the Directors were concerned, Messrs. Alder and Mackay controlled the Company. Witness spoke to the issuing of new shares in 1906, of which they received no notice, and of which his and his brother's shares would have been 101. He had always regarded the shares as good value at £20. He thought it might safely be said that the advance of the Company had been phenomenal, and that its prospects for the future were also exceedingly good. He sold some of his shares at £17 10s. each. When he did so, he told the purchasers that he did not know any good reason why the Company were not paying 10 per cent. In point of fact, he thought they should have paid 10 per cent. He got his proportion of the 500 new shares issued in 1909, and took them up. They numbered 100, and his brother's share 48. If he had received the 101 shares in 1906, his proportion would have been larger. For the past two years, the accounts of the Company had been stated in such a way as, he thought, somewhat prejudiced revenue as against capital. His complaint was that, in consequence of his having been deprived of the shares in 1906, he had never been able to control the management of the Company. They looked upon, as their greatest loss, their being unable to give effect to what they considered the proper methods of apportionment as between revenue and capital; the loss of the shares was a secondary consideration.

Mr. Alex. Wilson, the Gas Engineer to the Corporation of Glasgow, said he was consulted by the pursuers in the beginning of 1902 with regard to the undertaking. He was so satisfied with the position and prospects of the Company that he expressed his willingness to put £500 into the business. This was not accepted at the time; but he was consulted later by Mr. Waddell with regard to negotiations which were being conducted with Messrs. Alder and Mackay. He knew that he had been constituted Arbitrator between the pursuers and Messrs. Alder and Mackay. He got fifty shares to hold as a neutral influence. He knew both parties very well. He understood that he was then the only one who held shares outside of the parties. He believed that afterwards there was a proposal that the Fife Coal Company should acquire an interest in the Company. He was consulted as to what he would sell his shares for; and he mentioned £25 per share—his being the controlling shares, and therefore the most valuable. No sale took place.

In 1909, he purchased more shares at £20 each. He also got 39 of the 500 new shares issued in 1909, as his share. He thought there would not be the slightest difficulty in the Company, if it were well managed, maintaining an average dividend of 10 per cent.

Cross-examined: His holding amounted to 157 shares. He did not think the Directors had wanted dividends to be high for some little time back. His idea was that dividends were being kept down on account of this action.

Wednesday, July 5.

Mr. W. Carmichael Peebles, the Managing-Director of Messrs. Peebles and Co., Limited, said that in March, 1910, his Directors resolved to find an investment for £350. He advised investment in the Cowdenbeath Gas Company. He made this recommendation upon his views as to the Company's prospects. The Directors authorized the investment; and he purchased twenty shares at £17 10s. each.

Mr. A. Young, of Messrs. Laidlaw and Son (Edinburgh) Limited, said that in March, 1910, he purchased thirty shares in the Cowdenbeath Gas Company from Mr. Alex. Waddell for £17 10s. each. It was a purely business transaction—an investment. He knew that a dividend of 9 per cent. had been paid. He bought in the expectation that the dividend might rise to 10 per cent.

Mr. Joseph Hepworth, Managing-Director of Messrs. Parkinson and W. & B. Cowan, said that in November, 1909, he bought ten shares in the Company from Mr. Alex. Waddell, at the price of £17 10s. each. He considered then the prospects of the Company were exceedingly favourable; and he still thought so. He was not quite satisfied that there should have been a drop of 1 per cent. in the dividend; and he quite anticipated that when present difficulties were over, the dividend would rise to 10 per cent.

In cross-examination, witness said Mr. Waddell offered the shares to him.

Mr. R. Cockburn Millar put in a statement showing that the yield of a number of gas companies in Scotland varied from 4.71 to 5.7 per cent. A yield of 5 per cent. was a fair average for an established gas company. In the case of an undertaking with prospects of large development he would expect that the price of the shares would be at least double the par value.

The evidence of Mr. Forbes Waddell, now in Canada, which had been taken by Commission, was put in; and the pursuers' proof was closed.

The Case for the Defendant.

Mr. J. B. Scott, Manager of the Cowdenbeath Gas Company since 1901, said he was aware of the resolution of the Directors in August, 1906, to raise £3000 additional capital. He was anxious to have an interest in the Company, and he spoke to Mr. Alex. Waddell about getting shares. He thought that Mr. Waddell had an interest in the Company. Mr. Waddell told him so; and he took it that he had the greater part of the shares. Twenty shares were allotted to him, which he still held.

Thursday, July 6.

Mr. Courtenay J. Shiells, a Chartered Accountant, of Edinburgh, said he had made an examination of the books and the balance-sheets of the Cowdenbeath Gas Company since 1901, with a view to ascertaining the value of the shares, and particularly of those allotted in December, 1906. The accounts appeared to have been kept on a thoroughly satisfactory basis from the beginning. The only criticism he had to offer was that the Company did not seem to have allowed sufficient for depreciation. Financially, it appeared to him that it would have been more satisfactory if they had put more to reserve, and paid smaller dividends. Gas plant depreciated very rapidly, and they must provide for renewals; otherwise, when they came to renew plant, they would have to issue new capital, and they would have two capitals against one item of reserve. In comparison with the accounts of other commercial undertakings which he had seen, depreciation seemed to be decidedly on the small side. The annual average balance of profit from 1904 to 1909 was a little over £100. The average rate of dividend from 1902 to 1907 was about 6 per cent.; in 1902 and 1910, it was 7 per cent. There was a reduction of 1 per cent. of dividend in 1909 and of 1½ per cent. in 1910. This was attributable to higher costs in 1909-10. Coal was a large additional expense. The Cowdenbeath Company had not a quotation on the Stock Exchange, and could not have, because of the pre-emption in favour of the Directors with reference to the shares. A pre-emption restricted the value of the shares of a company. On the record of the Company for the four or five years in which they had paid dividends, he did not think that anybody would have been inclined to buy shares at a premium. The Company had no record behind them to allow anyone satisfactorily to gauge the profits or the probable dividends. He certainly would have hesitated to advise anybody to purchase stock in the Company. It would not be an investment for a trust, but simply an investment for speculation.

In cross-examination, witness said his opinion was that in a company of this kind a reserve fund ought to be built up. He would certainly have limited the dividend in the first two years to 5 or 6 per cent., and carried forward the balance. He would not put a commercial value upon a mere prospect, on a three years' experience. The undertaking was such a limited one that he would not have cared to have paid more than par for the shares.

Mr. George B. Turnbull, a stockbroker, of Edinburgh, said that to sell the shares of the Cowdenbeath Gas Company would scarcely be a Stock Exchange transaction. It was a matter of private bargain. He would not have recommended the shares as an investment in 1906.

Mr. J. Hutton, the defender, said the Cowdenbeath Gas Company was registered as an oil-gas company in 1891. The capital was £2000, in 200 shares of £10 each. Only 134 of the shares were issued. The works were burned down in 1900; and in 1901 the attention of Messrs. Alder and Mackay was called to the undertaking by Messrs. Waddell. At the first interview, £1500 was mentioned as the sum which would be required to take over the Company. The firm agreed to assist Messrs. Waddell. He personally succeeded in acquiring all the original shares

of the Company except seven, the holders of which would not part with them; and these shares were still held by the same men. The price paid was £2 10s. per share. In addition, it required £260 to pay the debts of the Company. So the total outlay was about £575. In September, 1901, the first agreement was entered into; and it operated down to November, 1903, when it was superseded. The acquisition and promotion of the undertaking turned out to be much more difficult than was anticipated; and it was agreed that the capital of the Company should be increased, for the purpose of converting the existing loan into shares. In September, 1902, the capital was increased to £20,000, still divided into £10 shares. Mr. Forbes Waddell put £120 into the undertaking at the end of 1902. Mr. Alex. Waddell put £100 in in 1903. This was all the money the pursuers contributed. By this time, Messrs. Alder and Mackay had become involved to the extent of nearly £6000. It was of importance to the lenders that, if they were to put more money into the undertaking, they should have the principal interest in the Company. Messrs. Alder and Mackay took quite a different view of the situation, when the capital had reached £6000, as compared with the original request by the pursuers for only £1500. They desired, when they were advancing money to carry on the concern, that they should have the control of the Company. It would have been highly imprudent of them if they had not. They thought that a very generous arrangement was made with the pursuers in the agreement of 1903. The pursuers had an interest in 494 shares, which represented £4990. He had been Chairman of the Company since the reconstruction. The Directors wanted to turn everything to the best advantage; and therefore they had to consider where the money was to come from. It was proposed to erect sulphate plant, coal and coke handling plant, a coal-store, and a new gasholder. Mr. Alex. Waddell was Consulting Engineer to the Company. They had frequent meetings with him. At a meeting with Mr. Waddell, at Dunfermline, in July, 1906, the new plant was discussed, and the question came from Mr. Waddell as to what was to be done with regard to the capital for the contemplated expenditure; and he told Mr. Waddell that new capital would be required, of which Messrs. Alder and Mackay had no intention to take up more than to an equality with the holding of the pursuers. He did not think there was any doubt that £3000 was always mentioned as what would be required. At the annual meeting of the shareholders in August, 1906, he intimated to the shareholders that the additional works would involve the raising of new capital to the amount of £3000. Mr. Alex. Waddell was very anxious to know what his position would be in regard to any extension of capital. He told Mr. Waddell something like this—that Messrs. Alder and Mackay would not take a penny more than would make equality with their holding. The pursuers sold twelve of their shares; and the sale was agreed to by Messrs. Alder and Mackay, though it was in breach of the agreement. From conversations he had with the pursuers, they seemed always to be in want of money. On one occasion, they wrote asking if they could get the dividend upon their shares, instead of its being added to the accumulated fund; and Messrs. Alder and Mackay conceded this to them. The new shares were issued during December, 1906. Messrs. Alder and Mackay took 79 shares. The loans to the pursuers were called up in March, 1908—six months being allowed for repayment. This period expired before the indebtedness was wholly repaid. A loan of £1000 by Mr. Mackay to Mr. Forbes Waddell, over the South Queensferry Gas Company, was called up at the same time; three months being allowed for repayment. He did not inform the pursuers of the issue of shares; but they undoubtedly knew, from conversations he had with Mr. Alex. Waddell, that new capital was to be issued. The first complaint he received with regard to the pursuers not having received a share of the new stock was on April 19, 1907. He replied on the same day, stating that the shares had been allocated; and recalled that he had told Mr. Alex. Waddell that what Messrs. Alder and Mackay sought was equality in their holdings, and that the agreement did not provide for any extension of capital after complete equality had been reached. No reply to this letter was received. Prior to November, 1906, the dividends upon the holdings of the pursuers, and Mr. Alex. Waddell's consulting fees, had been retained in extinction of the pursuers' indebtedness to Messrs. Alder and Mackay. In a letter in September, 1904, he wrote: "You and your brother are not entitled to be registered until all your loans have been paid up." This was the position he had always taken up. There was no reply to this letter. Since the Company were reconstructed, no capital charge had ever been taken out of revenue. It was not true that dividends had been kept down because of the litigation with the pursuers. The Company had no reserve fund, but only a carried-forward balance to profit and loss account. He thought that in November, 1906, the value of a share in the Company would be £11 or £12. It seemed to him that £20 was an extremely high price to pay for a share. The moment the pursuers paid up their whole indebtedness to Messrs. Alder and Mackay the agreements became inoperative. The firm had no longer the exclusive right to supply meters to Cowdenbeath.

In cross-examination, witness would not say that the exclusive right to supply meters was the sole inducement for Messrs. Alder and Mackay financing the undertaking; it might have assisted them in looking at the matter. Mr. Alex. Waddell strenuously objected to all he proposed to do. He could not recall that he ever told Mr. Waddell when the shares were to be issued, or that he discussed with Mr. Waddell what his position would be after Messrs. Alder and Mackay had taken their 79 shares, and equality was obtained.

This concluded the evidence.

Saturday, July 8.

Counsel were heard upon the evidence to-day.

Mr. CONSTABLE argued that the proof exactly and in terms satisfied the test laid down by his Lordship when allowing the proof, that wilful abstention from acting might bring about loss and damage that could be recovered.

The DEAN OF FACULTY contended that there was no express duty upon the defender, nor any implied duty, to give notice to the pursuers of the proposed issue of shares.

Judgment was reserved.

CHARGE OF MISUSE OF GAS AT FALKIRK.

The High Court of Justiciary sat in Edinburgh last Tuesday (the LORD JUSTICE-CLERK, Sir John H. A. Macdonald, Lord DUNDAS, and Lord SALVESEN, on the Bench) and heard Counsel in a stated case on appeal by the Provost, Magistrates, and Councillors of the Burgh of Falkirk, in the matter of their prosecution of Henry Russell, brass-founder, of Crown Brass Works, Falkirk—one of the town councillors of the burgh. The appellants charged the respondent, in the Sheriff Summary Court at Falkirk, with a contravention of section 18 of the Gas-Works Clauses Act, 1847, in respect that he, having within the Crown Brass Works, belonging to, and occupied by, him, a service of gas manufactured and supplied by the appellants, under the provisions of the Falkirk Corporation Gas Acts, 1894 to 1910, for which he was liable to pay to the appellants at the rate of 2s. 9d. per 1000 cubic feet for the quantity used by him for ordinary lighting purposes as registered by a meter supplied for registering such quantity, and at the rate of 2s. 4d. per 1000 cubic feet for gas used by him for power purposes as registered by the two meters supplied for registering such last-mentioned quantities, did, on Wednesday, Jan. 11, 1911, within the said premises, improperly use and burn gas so supplied to him by the appellants for power purposes, by having at a part of his premises used as an electro-plating shop, in which prior to said date, or at some date or dates unknown to the appellants, he had connected, or caused to be connected, piping for the purpose of supplying gas for ordinary lighting purposes with the main outlet pipe from the meter situated in the electro-plating shop, and in the room adjoining, used as a lacquering room, also part of his premises, used and burned, or caused to be used and burned, in the electro-plating shop, and for the purpose of lighting the electro-plating shop, gas supplied to him by the appellants for power purposes.

Sheriff-Substitute Moffatt dismissed the complaint as irrelevant, and found the appellants liable to the respondent in £1 1s. of modified expenses. In his opinion, section 18 of the Gas-Works Clauses Act of 1847 does not apply to gas supplied by meter. The particular branch of section 18 which the respondent was charged with contravening was the clause "or who shall otherwise improperly use or burn such gas." It appeared to the Sheriff that the word "such," being inserted before "gas," limited gas to the class of gas last mentioned—viz., gas not ascertained by meter. He thought that to hold otherwise would be to hold that the word "such" had no meaning. In the parts of the Act with respect to the supply of gas, being sections 13 to 17, and "with respect to the waste or misuse of the gas," &c., being sections 18 to 20, the word "gas" was used throughout without the qualification of "such," except in the part of the section under consideration. If it had been intended that any improper use or burning whatsoever of gas supplied should be a punishable offence, the section would just have said "gas" without any qualification. He therefore came to the conclusion that the part of the section labelled did not apply to the gas supplied by meter.

The question submitted for the opinion of the Court was: Does the complaint set forth a relevant charge of a contravention of the Gas-Works Clauses Act, 1847, section 18?

The appellants were represented by Mr. MORRISON, K.C., and Mr. D. ANDERSON. For the respondent, the DEAN OF FACULTY (Mr. Scott Dickson, K.C.), and Mr. MACROBERT appeared.

The LORD JUSTICE-CLERK said the case was a most unfortunate one. It could not be doubted that if the authorities had taken a different course a relevant charge could have been made, in the circumstances alleged in the complaint. Unfortunately, they had chosen to proceed under section 18. This section dealt with a variety of matters. The first was that "every person who shall lay, or cause to be laid, any pipe to communicate with any pipe belonging to the undertakers without their consent." This was quite plain and simple. Whether the respondent did it in this way or not he did not know; but if he did, it would be a perfectly good charge as regarded laying a connection with a meter. The section went on to say "or shall fraudulently injure any such meter as aforesaid." This plainly referred back to previous clauses, because there was no word about "meter as aforesaid" in the previous part of section 18. Then it went on, "or who, in case the gas supplied by the undertakers is not ascertained by meter, shall use any burner other than such as has been provided or approved of by the undertakers, or of larger dimensions than he has contracted to pay for, or shall keep lights burning for a longer time than he has contracted to pay for, or who shall otherwise improperly use or burn such gas." When they looked back in section 18, they found that the word "gas" appeared only once; and it occurred in this connection—gas supplied by the undertakers not by meter. It seemed to him that the Sheriff was right in holding that "such gas" did refer to gas not ascertained by meter. He need not go into the rest of the clause; there was no question raised in regard to this. It seemed to him that the words "or otherwise" were just words intended to cover things of a similar kind not otherwise covered, exactly in the same way as "otherwise" was used in an indictment. The words "or otherwise" covered the same things as burners other than those provided or approved of by the undertakers, or burners of larger dimensions than were contracted for. It was using or burning of "such gas" as this which he had to pay for by contract, for a fixed sum, by day or month, according to the time of the year. He could not find any reference to a meter at all in the complaint. If a meter were introduced, the undertaker would have no interest whatever to limit the amount used, because the more this was used, either for power or lighting purposes, the better it was for the undertaking. Therefore it was not unreasonable to hold that "such gas" meant gas as to the use of which the undertakers had no means of measuring from day to day; they must take the obligation of the other party, and if it were not honestly carried out, it would lead to a right of prosecution. Therefore, he had come to the conclusion that the Sheriff's judgment could not be impugned. The Sheriff had rightly decided that the complaint was not a relevant complaint in the circumstances.

Lord DUNDAS and Lord SALVESEN concurred; and the appeal was refused. The respondent was allowed seven guineas expenses.

MISCELLANEOUS NEWS.

SWINTON AND MEXBOROUGH ARBITRATION.

Arguments of Counsel.

At the Surveyors' Institution, Great George Street, Westminster, last Friday week the final stage was reached in the hearing of the arbitration to determine the price to be paid by the Swinton and Mexborough Gas Board for the undertaking of the Swinton and Mexborough Gaslight Company. The proceedings arose out of an Act of 1909, under which a Gas Board for the two urban districts named was established, and obtained power to acquire the undertaking of the Gas Company. A report of the evidence given will be found in the "JOURNAL" for June 27 (p. 1016) and July 4 (p. 50). The concluding sitting was devoted to the addresses of Counsel for the parties.

The Arbitrators were Mr. CORBET WOODALL, for the Company, and Mr. HARRY E. JONES, for the Gas Board. Mr. A. J. RAM, K.C., acted as Umpire.

The Hon. J. D. FITZGERALD, K.C., and Mr. F. N. KEEN (instructed by Messrs. Baker and Co.) appeared for the Company; while Mr. HONORATUS LLOYD, K.C., and Mr. VESEY KNOX, K.C. (instructed by Messrs. Lees and Co.), represented the Board.

Fifth Day's Proceedings.

Mr. HONORATUS LLOYD, on behalf of the Gas Board, submitted that the figures put forward by his witnesses showed a fair valuation of the undertaking, and said his learned friend had put the matter a little high when he spoke of the Company as having shown by its history that it was a prosperous and progressive concern. As a matter of fact, they now knew that down to (say) 1908 the Company were extracting out of the undertaking almost the last possible farthing; and if this alone could be taken as an indication of progress and prosperity, he would agree. But it must be common ground between them that during this period the works were not being properly attended to in the way of maintenance. The Company had been from 1872 until 1908 out of Parliament; and during this period the overdraft at the bank had been steadily creeping up. If, irrespective of statutory obligations and statutory limitation, they could go on borrowing money at 4½ per cent. or less, and then apply all earnings other than those necessary to pay the 4½ per cent. towards paying a higher dividend on the existing capital, he could quite imagine that those who held the capital would not desire to go to Parliament. But this was not a statutory basis. However, in 1908 the time had apparently arrived when they thought they must face Parliament, if they were to increase their business. The result, as they knew, was the introduction of a purchase clause into the Bill. In pursuance of this section, the Local Authorities in the following year secured an Act to enable them to compulsorily acquire the undertaking. This contained the following provision: "Until the date of transfer, the undertaking of the Company shall be maintained and carried on by the Company as heretofore in the ordinary course of business. But the Company shall not without the previous consent of the Board under the hand of their Clerk make, or enter into, any contract, agreement, or obligation except such as shall be in the ordinary course of the maintenance of the works and the proper conduct of the undertaking; and any expenditure incurred by the Company on capital account prior to the transfer with such consent of the Board as aforesaid shall, upon the transfer be repaid to the Company by the Board." There had been considerable expenditure of capital since the Act and prior to the transfer; and the consent of the Board was not asked. He did not want to do that which he believed would be an inequitable thing to the Company. Whatever capital had been spent was there in the form of goods or works: and they were willing to repay it. They were, however, not willing that they should pay a premium on it—or, in other words, that, while repaying the capital so spent, they should also purchase from them the increased profit, if any, which they had been able to earn by reason of it, and which they had allocated to existing capital. An improvement had been brought about in the carbonizing of coal, and new consumers had been found in apparently the only line which was open to the Company (the prepayment consumers). But both of these results had been accomplished to some extent by the capital which his clients had to repay. Allowing for the tar and liquor corrections, the net profit shown by Mr. Hunt for 1909 came to below the £1650 which the Company could divide with gas at the present price. But he agreed that they were entitled to take into consideration 1910; and so far as that year was concerned, he thought (looking at Mr. Hunt's and Mr. Stevenson's valuations) they might take it that £2144 would be a fair figure to take for the net profit. Of course, he was simply comparing valuation with valuation, and had not made any deduction upon the question of coke. But assuming that this was a fair basis, what was the result? With a price of 3s. 6d. per 1000 cubic feet, the sum the Company could divide was £1650. This was the actual price charged; but assuming that they had reduced the price 1d. per 1000 cubic feet, this, on a make of 35 millions, came to £145, and would enable the Company to divide a further £41. This would make the total sum they could divide £1691, and would leave them with a not excessive balance of £308. He agreed that they could, as a matter of arithmetic, reduce the price 2d., when the amount that would go to the consumers would be £290, and to the shareholders £82, making the total division £1772. But the result of this would be that the Company would have a balance of £122, which would be sailing rather near the wind, and was about one-third the amount that Mr. Stevenson, by his suggestion, thought was the right thing. Therefore, he returned to the 1d., and the division of £1691. This, of course, was subject to other matters—the question of how far, if at all, the Board were to pay the Company for any profit that had accrued to the existing shareholders by reason of the capital which the Board were to find. It was subject also to the question

as to the reduction in the yield from residuals by reason of the fluctuation in the price of coke, and all other matters of this kind. Was he right in saying that this income had been, at any rate partially, earned by the Board's capital. Mr. Fitzgerald, quite rightly, pointed out that borrowed capital went to earn just the same revenue as the ordinary share capital. But the position here was that Parliament was prescribing, by two different sections of an Act, in one that the Board were to repay all the capital liabilities, including mortgages and debentures, and so on, subject to the provisions of the other section, and the other section provided that the Company should not, except for certain purposes, spend further capital, and that the Board should repay any capital (that meant to say after the Act), until the transfer, to which they had consented. If he was right up to this point, subject to these questions, and assuming them all against himself, he had arrived at the figure of £1691 as revealed by an amended account for 1910. Next came the question of the multiplier. Mr. Stevenson and other witnesses for the Company suggested 28½ years' purchase; while those called on behalf of the Board proposed 20 years. It was impossible to take the yield obtainable by buying stock piecemeal from existing companies as conclusive proof of what number of years should be given, because it was perfectly plain that anyone who went into the market wanting to buy a whole undertaking as a going concern, without any parliamentary powers or anything else, might be defeated by a single shareholder. There were many reasons why it was quite obvious to his mind, at any rate, that it would not be fair to take as an absolute guide the yield for comparatively small, or indeed large, classes of stocks in existing companies. But he asked the tribunal to look at it as some guide—not as a figure to take as necessarily the one for the purpose of fixing the award, but as a figure showing about what was the yield that people would expect to obtain from gas investments. When this had been done, he could not help thinking, if they made an allowance for the fact that a man wanting to buy by arrangement the whole undertaking would probably have to give something more, they could not possibly arrive at 28½ years. It might be that the fair figure was somewhere between the two; and his experience of these things was that there was what was known as a "fighting figure," and there was really something between the two margins. He was most anxious in this case that substantial injustice should not be done by splitting the difference, because, rightly or wrongly, he ventured to suggest that, having regard to all the circumstances, if anything of this sort was done, the Company would be given too much. Then came a very important part of his case. On the Company's side, there were no deductions made. They seemed to assume that this was a perfect Company, and should be valued as such. The Board, however, held that certain substantial deductions should be made. There were the questions of purifiers and of the subsiding gasholder tank, which were fully dealt with in the evidence; and there was also the important point about the mains. The Board contended that ample purifier accommodation was required, that a new holder should be put up, and that the mains must be put in thoroughly good order. The total of the deductions for these purposes was £8550. Then there was the mortgage of £6000, as to which there was no disagreement, and the overspent capital of £8923 to Dec. 31, 1910, and £329 spent since. Mr. Cash showed that, after payment of the accounts and dividends, the Company would be left with a balance of £2754 which they could not divide; and the Board claimed that they were entitled to this sum, as part of the undertaking. This left a net figure of £6169 as the amount that should be paid for over-spent capital to the end of 1910. Then, of course, there was the £329 spent since that date.

Mr. FITZGERALD, in the course of his reply for the Company, dealt first at length with the question of subsidence. He claimed that the law with regard to subsidence (in circumstances like the present), in case the vendor of land, who had reserved the coal in the conveyance, subsequently worked the coal, had been absolutely settled by the Court of Appeal last April. The land on which the gasholder was built had been purchased by a railway company, but was outside the 40 yards limit; and they sold it to the Gas Company. Until last April, it was doubtful whether the law with regard to the land within the 40 yards was not the same as that relating to the land outside this limit, where a purchase had been made for the purpose of constructing a railway. But the Court of Appeal had now settled that, if the land was within the 40 yards limit from the railway, and the mineral owner proceeded to work, the provisions of the Railway Clauses Act would apply—namely, that the owner of the minerals might give to the railway company notice that he was going to work the minerals, and if they objected to his doing so on the ground that it might endanger the railway, they must pay him compensation; but if they did not serve notice of objection, then so far as the land was within the 40 yards limit the mineral owner might work away, and if the surface came down so much the worse for the surface owner. Where, however, they were dealing with a portion of the land which was outside the 40 yards limit, it had been decided by the case to which he referred—*London and North-Western Railway Company v. Howley Park Coal and Canal Company*—that the provision of the Railways Clauses Act did not apply. Accordingly, the owner of the surface had all his Common Law rights to vertical and lateral support; and if the mineral owner chose to work the minerals and let down the surface, he had to pay for damage, and could be stopped by injunction. The land on which the holder stood was outside the 40 yards limit; and so the case absolutely decided that, if the holder was let down or damaged by anyone working the minerals, the person so doing would have to pay the damage, and, further, could be stopped by injunction if he were so working the minerals as to withdraw either lateral or vertical support.

The UMPIRE: Quite apart from the legal question as to the power of the Gas Company to recover from anybody who may deprive them of the support to which they are entitled, and thereby do them damage, and looking upon them as a Gas Company who have the duty of supplying gas, if there were no question whatever of purchase here, what would you say as to the duty of the Company—having the stability of their gasholder threatened (taking it hypothetically for the moment), and the possibility of an interruption of the supply from the only gasholder out of which they can to-day supply their customers—to provide another gasholder on some piece of land not liable to subsidence?

Mr. FITZGERALD replied that, in view of the evidence given by Mr. Thomson, he would urge that no engineer, as a practical man, would advise the Company, in the present state of things, to go to the large expense of purchasing another site and erecting a new gasholder, until he had further evidence of what was going to happen. It was highly probable that nothing would happen which would prevent the holder being worked. Any subsidence that had taken place within the last year had been only very slight. They might quite properly now, he thought, spend the £300 necessary for putting the small holder in order, and have it in reserve. Then if the large gasholder ever did happen to be getting into a state in which it would be no longer safe to use it, there would be the small one to fall back upon. The Board could then proceed to put up a new holder; and they would be entitled to complete compensation from the Manvers Main Company.

Mr. HARRY JONES: We have been told that it would not be possible to move this gasholder on to another site and carry on the business of the Company in the meanwhile.

Mr. FITZGERALD: I rather understood that, if you had the small gasholder, you could carry on the business, though with some difficulty no doubt. You would not be obliged to stop lighting the place.

The UMPIRE: That was distinctly stated in evidence. They said in summer it would be all right. There would be great difficulties in winter; but they would carry on the business for a time.

Mr. FITZGERALD (continuing) said that, when they recollected how many large districts there were in Yorkshire, Lancashire, South Wales, and Scotland, where the ground was undermined by coal and other workings, and where gas-works were erected, it certainly showed that the possibilities of the collapse of a gasholder in this way were very small. Supposing, however, this did happen here, the natural thing for them to do would be to couple-up their mains with those of the gas companies on either side, and, with the assistance of the small gasholder, they would be able to carry on until they had repaired the collapsed holder or even erected a new one. Turning to the 1909 Act, he remarked that his learned friend had argued that they were to take the cash in hand, money at the bankers, book debts received or due on credit or revenue account, and if they came to more than the divisible amount of dividend, the surplus was not to go to the Company. That this was a wrong interpretation of the Act was made abundantly clear by section 25, which had not been referred to: "The Company shall bear and pay all outgoings and liabilities of every kind properly chargeable to revenue, and shall receive and retain all gas rates or rents, and other payments due to them, and shall be entitled to all receipts from the undertaking up to the transfer." Mr. Honoratus Lloyd and Mr. Cash had entirely overlooked this section. It had been admitted that, in every case where there was borrowed money, this went into the undertaking; and if it was a prosperous undertaking paying a considerable dividend, the borrowed money earned more than the interest, and the shareholders had the advantage of it. This was the reason why they borrowed money instead of issuing further share capital. In the present case the mortgage debt was to be taken over by the purchasers; and there was on the face of things no real distinction between the mortgage debt and the overdraft. Under the 1908 Act, the Company were entitled to issue capital (though they had not done so) necessary for carrying on the undertaking and satisfying all existing obligations. Thus they might have issued capital before the 1909 Act was passed, at any rate with regard to the overdraft and for the purpose of carrying on the undertaking.

Mr. CORBET WOODALL: "To meet existing obligations," would cover the repayments to the bank of the overdraft.

Mr. FITZGERALD said that was so. There was nothing to prevent the Company incurring capital expenditure, provided it was in the carrying on of the concern as heretofore in the ordinary course of business. So far from what had been done being an injury to the Gas Board, it placed them in a most favourable position, because if, instead of borrowing money to carry on the undertaking, they had issued share capital, they would have been entitled to claim in respect of the dividend upon this capital. All they could do now was to ask the tribunal to capitalize the dividend on the existing capital, including any proper increase of this dividend which might be produced partly by this expenditure and partly by other expenditure.

The UMPIRE: Mr. Lloyd's contention is that the tribunal should not cause the Board to pay a premium. That is to say, that we should not give you the capitalized value of the increased income which you are getting by reason of the amount of capital spent in the way he takes objection to. That capital you may raise if it is to enter into a contract, agreement, or obligation in the ordinary course of the maintenance of the works and the proper conduct of the undertaking. The bulk of the improvement in the income was caused (as has been proved before us) by the introduction of slot-meters. The bulk of the expenditure was upon providing these meters. Your contention, as I understand, is that, apart from all other considerations, you were justified in getting an overdraft from the bank, even without consent, to be expended upon the development of slot-meters as being part of the ordinary course of the maintenance of the works and the proper conduct of the undertaking.

Mr. FITZGERALD: Yes.

Mr. CORBET WOODALL: Except for the limitation which you mentioned as to whether or not the Company are under an obligation to supply prepayment meters, it would be an obligation to supply gas?

Mr. FITZGERALD: It is an absolute obligation to supply a consumer if your main is there in the road.

The UMPIRE: Undoubtedly. But this was the introduction of a new practice in the case of this particular Company.

Mr. FITZGERALD: It had been introduced before 1909. In 1908, 2,171,000 cubic feet of gas was sold by prepayment meters; and in 1909, the quantity was 6,000,000 cubic feet. Continuing, he said his learned friend had now admitted that the divisible profit would go up; but he added only £41, making the total £1691. He (Mr. Fitzgerald), however, submitted that £1815, as shown in Mr. Stevenson's valuation, was a reasonable figure, and represented what would be the position of the Company at the date of transfer. In settling the number of years' purchase, the position of the Company had to be considered; and in this connection there were several factors. The reduction of leakage would go on, and would represent substantial saving to the Company

and a consequent increase in the maintainable profits. Then there was the fact that 3000 homes were not yet supplied with gas. It had been pointed out that the Company ought to be in a position to reduce the price of gas by 6d. per 1000 cubic feet, and to lower the leakage to 15 per cent. It was an invariable practice that, in the purchase of a whole undertaking, a larger capital value was given than was represented by the sales of individual shares. As to the deduction of £8550 made by the Board's witnesses from the purchase price in respect of what they called dilapidations and deficiencies, the only thing that could justify such a deduction in a valuation of this sort would be the fact that the deduction represented the capital expenditure necessary to maintain the income that was capitalized. New purifiers were not necessary to maintain the income; and the same might be said of the suggested alterations to the mains. If, however, the £3000 put down by the Board's witnesses was spent under the latter head, and the leakage was reduced to 15 per cent., the outlay would be for the purpose of securing a largely increased income, and therefore would not come in as a deduction at all. Then Mr. Cash suggested that the Company should provide working capital for the Board; but there was nothing in the Act to justify this.

Mr. VESEY KNOX: A claim was made in the Lisburn case.

Mr. FITZGERALD (continuing) remarked that Mr. Cash had deducted from the capital liabilities, which admittedly the Board had to pay, the amount of the reserve fund—£2861. He could not understand this. Where a reserve fund existed as a cash fund, it was often excepted from the purchase; but here it did not exist as a cash fund at all. It was in the undertaking; and, being in the undertaking, the Board would get it, and were entitled to it in this sense. But Mr. Cash treated it as if it were a cash fund in the Company's hands, which the Board were entitled to, and which accordingly ought to be deducted from the liabilities.

Mr. HARRY JONES: You agree that, as a reserve fund, it goes over?

Mr. FITZGERALD: Yes; it is in the business, and it goes over.

Mr. HARRY JONES: They borrow from it to carry on the business, instead of raising fresh capital.

Mr. FITZGERALD, in bringing his remarks to a close, said that, as to the deduction for depreciation of meters and stoves, the Company had kept their accounts in accordance with the Gas-Works Clauses Act. Finally, he hoped the tribunal would see their way to adopt the 10 per cent. allowance for compulsory purchase.

This brought the hearing to a close; and the award will be given in due course.

BRITISH COALITE COMPANY, LIMITED.

Directors Hopeful of Eventual Success.

The Adjourned Ordinary General Meeting of this Company was held last Wednesday, at River Plate House, E.C.—Sir WILLIAM H. PREECE, K.C.B. (the Chairman), presiding.

The CHAIRMAN, in opening the proceedings, reminded the shareholders that the meeting was being held in accordance with the terms of a resolution passed on the 26th of April. [See "JOURNAL" for May 2, p. 317.] Since that meeting the Directors had been giving their undivided attention to the business of the Company, and he was pleased to be able to state that Mr. Herman Clarke (the Managing-Director), in seconding the motion he (the Chairman) was about to put to the meeting, would explain the negotiations he had in hand in regard to the Company's future arrangements. In view of these, the Board had decided that they could not recommend the suggestion made at the last meeting that the Company should be wound up. In his address on that occasion, he explained very fully the details of the accounts as submitted. He did not now propose to supplement his remarks on the subject, but would conclude by moving—"That the report and accounts for the year ended Sept. 30, 1910, as submitted, be received and adopted."

Mr. HERMAN CLARKE said, as the shareholders were aware, the Directors had been taking steps for some time with a view to the rehabilitation of the Company; and he was glad to say that the negotiations had reached a point where they had been practically concluded. Without going into details, he might say generally that they provided for taking care of the present mortgage of £75,000, which had been placed by the Investment Registry, Limited, and the calling-in of which, under the agreement, would be extended for a time long enough to allow the Directors to demonstrate the commercial possibilities of the coalite process. The people with whom they were in negotiation were among the strongest groups in their particular class of trade in England, and were amply able to carry out any contracts they entered into; and the negotiations were along the line of providing sufficient capital to put the Company on a dividend-earning basis commercially. It had been an extremely difficult matter to persuade anybody that this could be done, in view of the past position; but he believed he had succeeded. He had recognized the fact that he could not convince people by telling them this; and he had been obliged to make them believe by showing them that it was so. The Company had actually operated at a profit at Barking, even under the old conditions. He had devoted a good deal of time, and had done a great deal of hard work, in connection with the business, in which he had no interest apart from his official position. But he was vitally interested in it personally, because where other people had made a failure he naturally desired to achieve a success. As soon as the negotiations to which he had referred were carried out, the Directors would call the shareholders together again and ask them to confirm them.

Mr. H. FISHER remarked that since the shareholders met in April they had had time very carefully to consider the situation. The subject divided itself into two branches—first, the financial position of the Company; and, secondly, the manufacturing, or technical, position as elucidated by the Managing-Director. With regard to the financial position, the agreement with Coalite Limited, by which they were released of their indebtedness to the Company, was a most deplorable transaction; and he asked why certain of the former Directors of the Company were not present so as to give an account of their stewardship—leaving Sir William Preece alone, of the old Board, to "face the

music." The speaker went on to refer to the statement of the Chairman at a former meeting, to the effect that the profits as outlined in the prospectus would prove correct, and should be substantially increased as the business was developed and the process was more generally adopted; and he asked whether this forecast had been fulfilled in the slightest degree. It had not. Instead of its fulfilment, they had lost thousands of pounds at Plymouth, Wednesfield, and Hythe; and he believed they would do the same ultimately at Barking. Coming to his second point, Mr. Fisher maintained that on its manufacturing side the Company had been a miserable fiasco. In this connection, he read extracts from the original patent, and criticized in some detail the remarks made by Mr. Clarke at the last meeting—maintaining that it must be clear to anyone who studied the question that Mr. Parker's method as regarded the crucial point of heat was altogether at variance with that now adopted. Mr. Clarke, in his report, said the thing must be handled in an intelligent and businesslike way. What had the Directors been doing for four years? If they had not been handling the business in an intelligent and businesslike way, they were not worthy of further confidence. He suggested that the Company should be liquidated while they were in a position to pay the creditors 20s. in the pound, and perhaps make a small return of (say) 9d. per share to the shareholders. It might even turn out that there would be nothing for the shareholders. In the course of further remarks, Mr. Fisher said the Company had to pay a large sum to get out of a 21 years' contract with the Plymouth Gas Company; and he wished to know whether there was a similar contract with Mr. Clarke.

The CHAIRMAN, in reply to Mr. Fisher, said it would not be in order to put any resolution at the present meeting providing for the liquidation of the Company. He added that it might save time if he stated at once that the Directors were fully armed with voting power to defeat any proposition of this nature, which the Directors were certainly not prepared to accept. It was only right that they should have respect to the wishes of the great majority of shareholders who were unable to be present.

Mr. JAGO said Mr. Clarke, in his circular, used the following words: "We have been operating at Barking for six months under a process which, while it differs in detail from the old coalite process, is within the limits of our master patents, which, we are advised by our Patent Agents, have undoubtedly been strengthened." He believed Mr. Clarke was saying what he honestly thought to be the truth; and, moreover, he considered Mr. Clarke to be a thoroughly capable man. For these reasons, he (the speaker) would vote for continuing the Company, and giving Mr. Clarke a reasonably free hand to do what he could to help make the undertaking a success. Let them help the man who was trying to do something for them. The present Board were proceeding in such a way that the shareholders should show their confidence in them. They now stood to lose practically nothing further; and by backing up Mr. Clarke in restarting work on a humble basis, they would be going the right way towards putting the Company on a sound footing.

Mr. BROMHEAD said he would go farther than the last speaker, for he still believed in the coalite process. He regarded the residuals yielded by the process as being infinitely superior to those produced by any other method of dealing with coal, and, from inquiries he had made, he was convinced that, under Mr. Clarke, the process would even yet be made a great success, notwithstanding all past failures.

Mr. HEWITT appealed to his fellow-shareholders not to exterminate the Company by refusing to pass the balance-sheet. They had a Board of practical men, and had every reason to support them.

Mr. PEARSALL remarked that if the Company were not wound up, it would certainly have to be reorganized, so far as the capital account was concerned.

Mr. CARTER inquired what was being done at Barking.

Mr. CLARKE, in answer to questions, said he was not at liberty to give any details as to the people with whom he was negotiating for an advance of £50,000, or as to the rate of interest proposed to be paid. So far as he was concerned, he had no actual contract with the Company, but was acting under a resolution of the Board which would carry him on to Dec. 31 next. He did not propose to tie up the Company with any contract; he wanted to get rid of those they already had. He thought he had shown his good faith in dealing with the Company. Where others had failed, he had gone to people outside, and, subject to certain details being carried through, had got £50,000. The mortgage with the Investment Registry had been extended voluntarily until the present month; and since then until July next. The interest due next January and the following July would be guaranteed; so that there was no disposition on the part of people who were not shareholders to force the Company into a hole, but rather to give them every chance, though there seemed to be a disposition on the part of certain shareholders to force the Company into liquidation. In answer to Mr. Carter's question, at Barking one battery was being operated until a month ago, when it was necessary to close it down in order to make certain changes in the plant during the summer months, when there was little demand for fuel. They would be restarting on the 1st of August. It was quite correct that they had sold various materials at Barking. But it must be remembered that money was required to carry on operations; and no assessment had been made on the shareholders. No money, in fact, had been provided since last October.

Sir ANNESLEY DE RENZY said he considered it would be an act of insanity on the part of the shareholders to put the Company into liquidation, as, though mistakes had been made, there seemed to be a very good prospect of achieving success even yet.

The motion for the adoption of the report was carried by a large majority.

The retiring Directors and the Auditors were then re-elected; and the proceedings closed with the passing of a vote of thanks to the Chairman.

The Windermere Urban District Council have decided to appoint a Committee to take into consideration the advisability of purchasing the gas and water works; the Committee to consist of all members of the Council not interested in the undertaking.

SOUTH METROPOLITAN CO-PARTNERSHIP SCHEME.

The Year's Bonus—Co-Partnership and Freedom from Accidents.

The current number of the "Co-Partnership Journal" of the South Metropolitan Gas Company opens with an article by the Chairman (Mr. Charles Carpenter) on the subjects indicated in the second of the above headlines. It is as follows:

Something like twenty-one years ago, our old friend Mr. Austin publicly boasted that he possessed £18 sterling of bonus, and was, in consequence, eighteen weeks distant from the workhouse if misfortune should befall him. The present declaration of bonus for the past twelve months amounts to no less a sum than £42,000; and taking the number of employees who participate in it at the round figure of 5950, this means that by one year's work alone each man has, on the average, been able to put aside a sovereign for each of the seven "rainy" weeks in the future without touching a penny of the wages he has earned. Everyone will agree that this is provision on a very liberal scale for being "out of work;" and the co-partner has the further advantage that all these accumulated savings are his absolute property to handle as he chooses, should he at any time decide to give up his regular employment with the Company, and try his fortunes elsewhere. Many have already done so. With a comfortable round sum in their pockets, they have sought in other lands opportunities for advancement that were not possible of attainment in Great Britain; and, however much their leaving the old Company is to be regretted, they cannot be blamed for their choice. Let us hope they will help to lay the foundation of a prospering posterity in our Dominions beyond the seas, and spread far and wide the boon and blessing of co-partnership.

From a return issued the other day by the Chief Inspector of Factories and Workshops, it appears that the number of accidents to workmen is increasing; the figures for 1910 being 4 per cent. in excess of 1907, which was in itself a record year. One of the objections urged against co-partnership in its early days was the assertion that its effect was to increase the number of accidents by "speeding-up" to an unsafe degree the rate at which the employees performed their work. The truth is, however, exactly the reverse of this; and the figures for the last thirteen years, during which we have kept careful records, are so instructive that they are given here:—

Year.	Average Number of Employees.	Number of Accidents During Year.	Percentage of Accidents.
1898	3664	299	8.16
1899	3903	297	7.60
1900	4448	318	7.08
1901	4020	315	6.40
1902	5019	259	5.16
1903	5071	286	5.63
1904	5359	267	4.98
1905	5478	243	4.43
1906	5674	210	3.70
1907	5707	269	4.71
1908	5568	192	3.44
1909	5726	206	3.59
1910	5933	221	3.72

From the above remarkable figures, it will be seen that while the number of workmen employed increased from 3664 in 1898 to 5933 in 1910, the number of accidents fell from 299 during the former year to 221 in the latter one; and that while slightly more than eight men per 100 employed (8.16) in 1898 met with accidents, the average for 1910 was well under four (or exactly 3.72).

I do not for a moment believe that if the Company had insured itself against its legal liabilities by a contribution per head to an Assuring Society, it would have arrived at such a satisfactory state of affairs. But under our co-partnership all work together for the common good, and strive not only to reduce the wear and tear of the apparatus and plant, but of the human machinery also. The State can perform many functions better than the individual; but I am sure an army of inspectors, equipped with unlimited Acts of Parliament, would not have reduced the toll paid by the industrial workers in the form of accident to life and limb with the success they have themselves achieved by their co-partnership of toil and profit.

The example quoted is only one of many instances of what can be accomplished under co-partnership; and what is true of accidents applies equally well to all the branches of our undertaking. Waste can be reduced, materials economized, business increased, and work carried out well and expeditiously.

It has been already stated that the past year's bonus amounts to £42,000. Co-partners do not need to be reminded that this figure is based upon the selling price of gas, and that for each penny it is supplied below the standard of 3s. 1d. per 1000 cubic feet, about £3820 is paid in bonus. It is not too much to hope that the price of gas will not remain at the present figure, and that the day is not far distant when gas will be sold in South London at 2s. per 1000 cubic feet, or lower still.

The present year will be in many ways a red-letter one in the country's history; and I earnestly urge co-partners to make it a record one, too, in the annals of this Company. They have the power to do so, if they will but use it.

PRIVATE v. STATE INSURANCE.

A Letter by Mr. Charles Carpenter.

The following letter on the subject of "Private v. State Insurance" was sent last Friday to the London newspapers by Mr. Charles Carpenter, the Chairman of the South Metropolitan Gas Company.

The attention of the House of Commons was occupied a few days ago by the reported large increase in the number of industrial accidents, and it was suggested that the principal cause of this was the "speeding-up" concomitant with modern ideas of output. A similar suggestion was made some years ago in reference to the effect of co-partnership. But with the great extension of co-partnership principles

the criticism has, I think, been outlived. It is, indeed, not unlikely that accidents more often arise by reason of inattention on the part of the worker than by the excessive speed at which he performs his task; and the less interested he is in his employment, the more listless he is likely to become.

In an old-established Company like this—two or three of our works were started as long ago as 1830-40—it is often difficult to dissociate traditions from methods; and in some cases there is no doubt the latter may not have been the most desirable. Fortunately, the Workmen's Compensation Act of 1897 contained provisions for contracting-out by mutually managed and "approved" societies; and these were taken advantage of by, among other employers, the Chairman of this Company (the late Sir George Livesey), with the result that a fund, managed by the officials and workmen, has met all the provisions in respect of accidents since its establishment thirteen years ago.

The result has been in all respects satisfactory. Every accident is dealt with by the Committees at our different stations, and valuable suggestions are made to obviate their occurrence in future. I have no wish to belittle the excellent work carried out by the inspectors appointed under the Factory and Workshops Act; but I cannot believe that this machinery could be anything like so efficient as that provided by the good will and endeavour of those workmen and officials actually engaged in a particular industry. We keep, of course, careful account of every accident; and the following table proves without doubt that my contention is founded upon fact:—

Year.	Average Number of Employees.	Number of Accidents During Year.	Percentage of Accidents.
1898	3664	299	8.16
1899	3903	297	7.60
1900	4488	318	7.08
1901	4020	315	6.40
1902	5019	259	5.16
1903	5071	286	5.63
1904	5359	267	4.98
1905	5478	243	4.43
1906	5674	210	3.70
1907	5707	269	4.71
1908	5568	192	3.44
1909	5726	206	3.59
1910	5933	221	3.72

Now it would, I think, be very unfortunate if the undoubted advantage of mutual funds formed outside the Act, but giving not less than the benefits it prescribes, were withheld in the case of sickness, when it has been proved to answer so well in the case of accidents. The following figures have been carefully compiled in order to show, in the case of the workmen of this Company, what would be their position under Mr. Lloyd George's Bill compared with what it is under our mutual fund, taking the working of the year 1910 as an example and adding the cost of the extended time of sick benefit which the Bill provides. I think the figures must give occasion for serious reflection to all who have at heart the welfare of the working classes.

Statement showing the Effect of the National Insurance Bill upon the Employees of the South Metropolitan Gas Company.

The figures are based upon the year 1910, and compare the payments and benefits under the rules of the Company's sick fund with those proposed under the Government Bill:—

(A) UNDER THE COMPANY'S FUND.

Workmen's contributions for 1910 at 3d. per week	£3138
Sick allowance at 12s. per week for the first three months, and 6s. per week afterwards	£3419
To above must be added the cost of half-pay for employees who terminated their services owing to ill-health	£203
Medical attendance	£1475

(B) UNDER THE PROVISIONS OF THE BILL.

Workmen's contributions, at 4d. per week	£4183
Sick allowance at 10s. per week for the first three months for men under 50 years of age, 7s. under 60 years, and 5s. over 60 years	£2924
Extension of sick allowance beyond first six months	£138
Maternity grant (*885 births at 30s.)	£1327
Medical attendance at 6s. per head	£1448

SUMMARY OF THE ABOVE.

(A) Under the Company's Fund.

Payments.	Benefits.
By workmen . . . £3138	Sick pay . . . £3622
By Company . . . 1959	Medical attendance 1475
£5097	£5097

(B.) Under the Provisions of the Bill.

Payments.	Benefits.
By workmen . . . £4183	Sick pay . . . £3062
By Company . . . 3138	Maternity grant . 1327
£7321	Medical attendance 1448
	£5837

* Based upon the Registrar-General's Return for 1909.

Note.—The above tables do not include the contributions by the State, which, at 2d. per head per week would increase the cost of (B) by £2091, to be provided by the taxpayer.

I may say at once that this Company do not desire to subscribe any smaller sum per head than it is proposed the State should require, but the money could be used with greater advantage by increasing the present sick allowance of 12s. per week all round to 16s. per week, instead of reducing it to 10s. per week as will be the case under the Bill—a very serious matter for between 4000 and 5000 homes in South London.

I ought to add that at a meeting of the Co-Partnership Committee, held on Wednesday, the wish was expressed unanimously that the Bill should apply similar provisions to approved sick funds as in the case of accident funds by the Act of 1897.

SAN PAULO GAS COMPANY, LIMITED.

Increase of Capital—A Remarkable Record—The Growth of the Cooking Load.

An Extraordinary General Meeting of the shareholders was held last Friday, at Winchester House, Old Broad Street, E.C.—Mr. D. M. Fox, M.Inst.C.E., presiding—for the purpose of considering, and, if thought fit, passing certain resolutions affecting the capital of the Company.

The SECRETARY (Mr. G. H. Rogers) having read the notice convening the meeting,

The CHAIRMAN said the circular addressed to the shareholders, and the notice convening the meeting, would have given them a fair idea of the business to be transacted. What he had to say, he trusted, would be considered ample justification for the action of the Board, and would secure unanimous approval from the shareholders of the policy the Directors proposed to pursue. The Company was formed in 1869. The capital was then £70,000; and the price of gas was 16s. 9d. per 1000 cubic feet. The life of the Company might be roughly divided into two periods of twenty-five years and twelve years respectively. The first period came to an end on the expiry of the old concession, and on the signing of the new contract in 1897. During the first period the Company were in the enjoyment of a monopoly of artificial lighting (kerosene excepted); and there could be no doubt that the then management—without the spur of competition—failed to bring popularity to the enterprise. The works were not kept up to date; and the plant generally was in an unsatisfactory state. He (the Chairman) was then the Engineer of the San Paulo Railway; and after his return to England, he joined the Board of the Company in 1892. In 1893, while in San Paulo on railway business, he paid a visit to the gas-works, and then realized the serious state of things. On his return, he induced the Directors to call in an expert, with the result that one was engaged—Mr. A. F. Phillips, now their Managing Director and Engineer. An inspection of the works was made; and a report was presented to the Board, which was adopted, and acted upon. Ever since then, the Company's position had been improving, both technically and in regard to the popularity with the people and authorities of San Paulo. The second period (still running) commenced in 1897, when a new contract was obtained with the Government, which came into force on Jan. 1, 1898; and in 1899, the Board realized that the Company would have to face the inevitable and keen competition from a powerful and enterprising electrical undertaking. They lost no time in adopting a progressive, liberal, and conciliatory policy, and spared no pains in carrying it out. Confidence was restored, and the service improved throughout. A supplementary contract, made with the Government in 1908, extended the term of the privilege until 1950, when the works would still remain the property of the Company, with the right of the Government to buy them by valuation. Passing on to the practical results of their efforts in the working of the business, he took for comparison the last eleven years—1900 to 1910, because 1900 was the last clear year under the 1897 contract, when the price of their gas was 170 reis per cubic metre. In the first two years of the period, the price, which was on a gold basis, was reduced—that for lighting by 17½ per cent., and for cooking, &c., by 34 per cent.; and these prices had since suffered no alteration. The consumption of gas was, of course, of the most vital importance, as being the basis on which the Company were maintained. The subject was divided into three interesting parts—(a) Public lighting, (b) private lighting, (c) cooking, &c. (a) The consumption of gas for the public lighting had risen in the period taken from 1,320,000 to 2,237,000 cubic metres, or 69 per cent. (b) The consumption of gas for private lighting, which was precisely where they suffered competition, had more than doubled during the eleven years, having increased by 115 per cent. He might here remark that every effort had been, and was being, made to facilitate to the consumers the best and most modern fittings obtainable anywhere. (c) The consumption of gas for cooking, &c., was a special feature. In 1902, the consumption of gas for cooking, heating, &c., was 249,300 cubic metres; and in 1910 it had reached 2,478,000 cubic metres, or an increase of (say) 1000 per cent. in nine years! It was noteworthy that to-day more gas was supplied for cooking, &c., than for the whole of the public lighting or lamps of the city, and that, whereas it was little or nothing in 1900, it amounted in 1910 to a figure equal to 64 per cent. of the total gas sold in 1900. He believed they had here a vast field for operations; and he was not drawing on his imagination, but simply judging by means of known facts, when he predicted for the Company in the future a far greater development of this branch of the business than had been experienced in the past. Taking the sum of the foregoing three items, the total amount of gas sold during the period under consideration rose from 3,840,000 cubic metres in 1900, to 10,140,000 cubic metres in 1910, or an increase of no less than (say) 164 per cent. These momentous figures really spoke for themselves. There was, however, one more interesting point to be noticed in connection with the development of the consumption of gas within this period. The annual increase from 1900 to 1905 rose steadily from about 200,000 cubic metres to about 500,000 cubic metres; from the year 1906 to 1909, the increase became more accentuated, reaching about 800,000 cubic metres annually; and in 1910, the gas sold was no less than 1,200,000 cubic metres in excess of that sold in 1909. He believed that the present price of 1.40 reis per cubic metre (equal to 8s. 10d. per 1000 cubic feet) for public and private lighting was one of the lowest prices, if not the lowest price, for gas in South America, while the price for cooking, &c., was 20 per cent. lower still. On turning to considerations of a financial order, he found that during the past eleven years the receipts rose from £89,800 in 1900, to £203,350 in 1910—showing an increase of about 126 per cent. The capital employed was increased from £268,750 to £456,885—say, 70 per cent. The dividends paid advanced from 8 per cent. to 9 per cent. And, finally, the price of the ordinary shares rose from £11½ to £16. Inasmuch as the capital had increased by only 70 per cent., the shareholders would readily agree that there was ample justification for the proposed taking of powers to substantially increase the capital of the

Company. In the past much expenditure, fairly chargeable to capital account, had been paid out of revenue; and assets had been written-down to figures which were below their real value. It was considered wise to follow this plan until the Company became thoroughly fortified and established in a position of assured and continuous prosperity. However, the time had now arrived for the Directors to reconsider the position, and to recommend a modification of this policy. It was their intention in due course to make the interim dividend, payable on Oct. 1 next, 6 per cent. for the half year; and when the time came round, to recommend that a final dividend of 6 per cent. (making 12 per cent. for the year) be declared. As to the future, it must be remembered that the prosperity of the undertaking was commensurate, and bound up, with the progress and development of the State and City of San Paulo. They all knew more or less, some of them intimately, that it was one of the most favoured regions on the earth, and especially famous as the greatest coffee-producing district in the whole world. Before concluding, he wished to allude to, and explain, a circular which the Directors thought well to issue in May. The Directors having become aware of the efforts of parties to secure control of the Company by the purchase of shares, at what was manifestly a price below their real value, felt impelled to warn the shareholders; and the shareholders, at any rate now, after his statement, could and must act with full knowledge of the value of their shares. No doubt, to many, this attempt to obtain shares of the Company by these shrewd gentlemen must appear as strong evidence of the high opinion formed of the present and future value of the property by those in a position to judge.

The following series of resolutions was then passed separately, on the motion of the CHAIRMAN, seconded by Mr. A. F. PHILLIPS:—

(1) That the capital of the Company be increased to £500,000 by the creation of 20,000 new ordinary shares of £5 each, ranking in all respects *pari passu* with the existing ordinary shares of the Company.

(2) That each of the 25,000 existing ordinary shares of the Company of £10 each be sub-divided into two fully-paid ordinary shares of £5 each, and that the shares resulting from such sub-division be renumbered so that the serial numbers thereof may run from 40,001 to 90,000 inclusive.

(3) That from and after the confirmation of these resolutions, the Articles of Association of the Company and all alterations thereof or additions thereto made by special resolutions be and they are hereby repealed and annulled. Provided always that this repeal shall not affect the validity of the increase of capital or any other act, matter, or thing made or done by, or under the authority of, the said Articles of Association.

(4) That the regulations produced to the meeting and for the purpose of identification signed by the Chairman, shall as and from the same time be and they are hereby made the regulations of the Company in the place, and to the exclusion, of all existing regulations.

A vote of thanks to the Chairman concluded the proceedings.

WANTED, THE WHOLE TRUTH

And Nothing But the Truth.

The "Electrical Times," referring to the meeting of the Institution of Gas Engineers in Glasgow, says:

Electricity was represented [in the meeting room] by electric lamps which benevolently illuminated the proceedings, and did not betray their sense of humour by so much as a wink.

The only occasion on which artificial light was required during the evening was while Dr. Bone's lecture was being delivered; and then the theatre was lit by a "Nonpareil" sun-burner fitted with 28 inverted gas-mantles.

Writing on the subject of the Coronation illuminations, our contemporary remarks:

But what of the dangers of 'fused wires'? Here was a case of temporary wiring *in excelsis*; nobody will ever know what shoddy work was hidden away behind bunting and tissue-paper flowers. Yet we still await news of catastrophe. . . . They piled combustibles round lamps and flexibles, festooned flimsy draperies along cables, put electrical wiring at its shoddiest to an unfair and monstrous test such as it has never been submitted to before—certainly not on such a large scale. Has anybody heard of the resultant holocaust?

Is all this true as to shoddy work, after the warnings of the London County Council and the City Corporation? Let the contractors answer. Then—

Gas suffered from no risks whatever. Forewarned is forearmed, and no fool so foolish as to trust inflammable material within reach of naked fire. But the public was not forewarned of electrical risks, such warnings being limited to the gas journals.

What of the warnings printed in the Daily Press from the County Council and the City Corporation?

We cannot say that we saw a single gas-sign totally extinguished. Out of nearly half-a-dozen of gas designs and monograms that the writer noted in several miles debauch of light, two or three were decipherable, and in one case there was hourly expectation of a return to legibility with a change in the weather.

How was it "Meteor" could only see "nearly half-a-dozen gas designs and monograms in several miles debauch of light"? We acknowledged freely that electric light for this special purpose had advantages, and that it had on the occasion the superior patronage. But we were able to see more than "half-a-dozen gas designs and monograms in the several miles debauch of light."

Water-Main Bursts at Saltaire.—Much damage was done last Thursday evening to the carriage drive at Milner Field, Saltaire, the residence of Sir James Roberts, by the bursting of a 30-inch water-main belonging to the Bradford Corporation. The main, which conveys water from Gilstead to the Heaton service reservoir, runs through the estate, and the fracture occurred a short distance from the lodge gates. It was some time before the supply could be turned off at Gilstead; and the escaping water ran in great volume down the carriage drive, making deep ruts in the road.

SALFORD CORPORATION AND THE PUBLICITY SCHEME.

Subscription on the 2s. 6d. Basis Agreed To.

The minutes of the Gas Committee of the Salford Corporation, as brought forward for confirmation at the meeting of the Council last Wednesday, included the following: "Contribution agreed to be made to the publicity fund of the Institution of Gas Engineers, on a basis not exceeding 2s. 6d. per million cubic feet of gas manufactured per annum in the Salford Gas-Works."

Mr. WHEATCROFT asked if the recommendation had been arrived at in consequence of a proposal made in the first instance by the great gas companies of London and other places; also whether it had been brought forward by people connected with gas undertakings which had private electricity concerns to compete against. He said that as this contribution was likely to mean for Salford a sum of £216 per annum, he failed to see that it was a desirable proposal to adopt until there was fuller information before the Council, especially in view of the fact that both the gas and electricity undertakings in Salford belonged to the Corporation. From what he could make out, it was proposed under the publicity scheme to establish a system under which the Gas Committee would, wrongly and wantonly, compete with the Electricity Committee. It was not as if the undertakings were in private hands, as was the case in many towns.

Mr. W. P. BURLEY, a member of the Gas Committee, said the reason for the establishment of a gas publicity fund was very simple. If the gas undertakings throughout the country were going to hold their own with electricity, they must be kept to the front, and must not be allowed to be thrust on one side. The Gas Committee thought it advisable to join in a general advertising scheme, as put forward by the Publicity and Special Purposes Committee of the Institution of Gas Engineers. It would be useless to enter upon a small scheme for advertising gas, as it would be like a drop in a bucket of water. But if the gas undertakings throughout the country joined together and adopted a big system of advertising the advantages of gas, not only as an illuminant but as a means for heating and providing power, the results would be much more satisfactory and effective. Electricity was coming to the front, and the interests of gas undertakings must be looked after in a businesslike manner. The Gas Committee had very carefully considered the matter, and had come to the conclusion that the money required for the publicity fund would be well spent.

Mr. WHEATCROFT said he could quite understand a publicity scheme being promoted by the gas companies in London, because they had to compete with electricity companies. But, as he had said, the case was different in Salford; and there was no reason why they should subscribe to advertising schemes to create competition between their gas and electricity undertakings. Was it a confession of failure that now, after the gas undertaking had been so long in existence, the Committee should find it necessary for the first time to resort to such schemes? He moved, as an amendment, that the minute be referred back for further consideration.

Mr. W. M. BESCOBY seconded the amendment, holding it to be unwise to have, as he put it, the two departments in competition.

Mr. PURCELL, one of the Labour members, remarked that most people believed competition to be a good thing; and he welcomed the idea that the Gas and Electricity Committees should come into competition, for this was likely to be productive of the best results. The Institution of Gas Engineers and other gas authorities had come to the deliberate conclusion that, in the interests of gas, it was advisable to advertise certain new forms or ideas that had cropped up in recent years in the gas world; and he maintained that they were entitled to try to get all the advantages that could be gained by publicity. He knew for a fact that the Chairman and Deputy-Chairman of the Electricity Committee would be pleased if they had the opportunity of adopting the same course in regard to their undertaking, and would be prepared to subscribe even £500 a year if it would be a good thing for the electricity concern. If the proposed subscription to the gas publicity scheme would be the means of reducing the price of gas to consumers, he would be willing to spend £1000 a year. In his opinion, increased competition would mean that they would get a more efficient service on both sides.

Mr. J. W. WILLOUGHBY, supporting the proposal of the Gas Committee, said that in his opinion it would be a good thing for gas undertakings, and would be of benefit to the Salford Corporation.

On being put to the vote, the amendment was defeated by a large majority, and the minute of the Gas Committee was confirmed.

BELFAST CORPORATION GAS UNDERTAKING.

The Past Year's Working.

As briefly announced in the "JOURNAL" last week, the annual report of the Gas Engineer and Manager of the Belfast Corporation (Mr. J. D. Smith), which was recently submitted to the Gas Committee, showed that the gross profit realized by the manufacture and sale of gas and residual products in the year ended the 31st of March was £64,568; being an increase of £13,490 compared with the preceding twelve months. From the former sum the costs of the working of the stoves department had to be deducted, which left £63,422. Dividends and interest on capital, &c., came to £16,865; leaving a net profit of £46,556, or £13,947 more than in the previous year. Adding the balance brought forward, £8586, made a total of £55,142 to the credit of the profit and loss account. Out of this sum, £6157 was set aside for the sinking fund and £700 for interest on the insurance suspense account; leaving a balance of £48,285. This the Gas Committee disposed of as follows: Handed over to the Finance Committee in aid of the rates, £12,000; dividends and sinking fund on new City Hall stock, £11,397—together, £23,397. This left a balance of £24,888 at the credit of the profit and loss account.

Mr. Smith later on recommended the installation of vertical retorts

capable of producing 2½ million cubic feet of gas per 24 hours, with the necessary coal and coke handling plant, machinery, and housing accommodation; also that the gasholder storage capacity should be increased, No. 5 holder to be demolished, and a new spiral holder of double the capacity erected in its place. He further recommended that a number of members of the Committee should be appointed to visit several gas-works in England and Scotland where vertical retorts are installed, in order that they might compare the relative advantages of the various systems, and at the same time visit some of the gas-works where spiral guided gasholders have been erected. The Committee resolved that the Manager's recommendations in this matter should be adopted.

In moving, at the monthly meeting of the County Borough Council on Monday last week, the adoption of the recommendations, Alderman Craig directed attention to the fact that the gross profits on the gas undertaking showed an increase of £13,490 over those for the year 1909-10. He said he considered this most satisfactory; and it reflected the utmost credit on their new Engineer and Manager. Indeed, this amount had been exceeded on only three occasions since the undertaking was acquired by the Corporation. With regard to the revenue account, in the manufacture of coal gas they last year carbonized 105,142 tons of coal—an increase of 207 tons compared with the preceding year; but as the average price was 2d. per ton cheaper than in the previous contract, there was a saving of about £950. Further, owing to the improved methods of working introduced by the Engineer, there had been an additional saving of more than £4200 in the coal bill and £1052 in the cost of carbonizing. In the year 1909-10, they made 1129 million cubic feet of coal gas at a cost of £96,891, and last year they made 1202 millions at a cost of £96,691 for coal and carbonizing—being an increase in the make of 72 million cubic feet, with a decrease in cost of upwards of £200. They had been equally successful in the purifying department. If they had continued to work on the same lines as before, purification last year would have cost £6764. As a matter of fact, it had cost only £4727—a saving of £2037. As the price of new lime was practically the same as before, this saving was entirely due to the changes made by the Engineer. In the water-gas section there had been a large decrease in the cost of oil. They used during the year 2,360,541 gallons—an increase of 81,977 gallons—at a cost of £6977, and they made 1081 million feet of carburetted water gas, or a decrease of 25 millions. In purification there had been a reduction of £750 in the cost—£127 being due to the reduction in the make of gas, and the rest to the improved method of working previously referred to. There had been an increase of £2818 in the cost of distribution, owing principally to the renewal of some large mains. Turning to the credit side of the account, the sale of gas through ordinary and prepayment meters was 1901 million cubic feet—an increase of more than 70 million cubic feet, and a net increase of £7173 in the revenue. As to residual products, they had sold 67,789 tons of coke and breeze; but, owing to the reduction in the price, their receipts were less by £2464. This was nearly counterbalanced by the increase of £474 in the receipts for tar, and of £1837 in the sale of ammoniacal liquor. As to the profit and loss account, owing to the increase in the borrowed capital, their dividends had been higher by £1865, and their sinking fund by £492. There had been an expenditure of £880 more on the cost of working the stoves department; but this was principally caused by their charging the rent of heating-stoves for only two quarters in the year. They had also contributed £12,000 towards the reduction of the rates, and £11,397 for the dividends and sinking fund of the new City Hall, and they carried forward a balance of £24,888. He considered this a very satisfactory report, and a great deal of credit was due to their Engineer and Manager, Mr. Smith, who had thrown all his energies into the work. They were looking forward to still greater increases in the future. Reference was made in the minutes to certain extensions which the Engineer deemed necessary. The vertical retorts would be a great saving in many ways, and there would be no nuisance from smoke or steam, as this would all be consumed.

The minutes were passed.

WIGAN CORPORATION GAS UNDERTAKING.

Gas Engineer's Annual Report.

The Gas Engineer and Manager to the Wigan Corporation (Mr. Joseph Timmins, M.Inst.C.E.) has recently presented to the Gas Committee his twenty-fourth annual report, showing the results of the working of the gas undertaking in the twelve months ended the 31st of March. It furnishes the following particulars.

As in former years, the works generally were maintained in a high state of efficiency, as testified by the Committee on the occasion of their annual inspection in December. The carburetted water-gas plant has more than borne out the makers' promise, and has exceeded the Engineer's expectations; the make of gas on many occasions being 15 to 20 per cent. more than the quantity guaranteed within a given period by the contractors. The Holmes washer-scrubber, installed during the year, is doing excellent work; every trace of ammonia being absorbed before making its exit. The Livesey washer, put up during the preceding year for the elimination of naphthalene and ammonia, continues to act well. In the process of washing, Mr. Timmins is using the light oils resulting from the condensation of his water-gas manufacture. With regard to the distributing plant, 2291 yards of new mains and 976 new services were laid during the year; the total length at the close being 131 miles 1052 yards.

The quantity of coal carbonized in the year was 36,864 tons 8 cwt.; and 100,920 gallons of gas oil were used. The make of gas was 430,455,000 cubic feet of coal gas and 42,569,000 cubic feet of carburetted water gas—together, 473,024,000 cubic feet, or 292,000 cubic feet less than in the preceding twelve months. The gas sold, supplied for public lighting, and used on the works was 442,512,400 cubic feet, or a decrease of 3,793,000 cubic feet on the year 1909-10. The consumption through prepayment meters (included in the 442,512,400 cubic feet) was 71,597,100 cubic feet—an increase of 1,265,400 cubic feet

on the preceding year. During the year, 2,386,570 pennies were collected from the money-boxes, compared with 2,293,869 pennies in the year 1909-10; representing £9944 0s. 10d. and £9557 15s. 9d. in money value and 47,731 lbs. and 45,877 lbs. respectively in weight. Notwithstanding warnings given to consumers against placing in the money-box of the meter coins which they know will not cause it to work, the practice continues, though Mr. Timmins says it is decreasing. The consumers do not make any secret of the fact that the coins are deposited for security. At the beginning of the year, there were on the register 13,167 consumers by ordinary and 8817 by prepayment meters, and at the end of the year there were 12,997 of the former and 9352 of the latter; giving a decrease of 170 ordinary meters, or 1.29 per cent., and an increase of 535 prepayment meters, or 6.06 per cent. The total increase in the number of consumers for the year was 365, or 1.66 per cent. The number of gas cooking-stoves fixed at the beginning of the year was 1878, and at the end of the year 1802; being a decrease of 76, or 4.04 per cent. Hence the decrease in the consumption of gas under this head during the year of 4,837,800 cubic feet, or 11.57 per cent. Mr. Timmins says this abnormal "slump" in the use of gas for cooking is undoubtedly due to the general condition of trade being so bad, and not to the waning popularity of gas for this purpose.

Coming to the financial part of the report, the gross profit for the past year was £28,543, compared with £27,959 in the preceding twelve months; the net profit being £4565, against £4826 before. The average profit for the past 26 years is £23,865 gross, or 9.84 per cent. on the capital invested, and £9519 net, including the value of the gas supplied free for public lighting within the borough, which for the year just ended represents £5521 net. This, added to the net profit for the year, represents £10,086 as the total net profit. The cost of coal carbonized and its equivalent last year was 11s. 3½d. per ton, compared with 10s. 11½d. before. As the revenue from residuals was 9s. 9½d. and 9s. 9½d. in the two years, the net cost was 1s. 6d. and 1s. 9d. respectively; the average for the past 25 years being 10s. 6½d., 7s. 10½d., and 2s. 8d. per ton.

Mr. Timmins says the working results and costs for the year covered by his report "compare favourably, as in the past, with the best-managed gas-works in the country." It is regrettable that the consumption of gas was below that of the preceding year; but it was so small that Mr. Timmins considers that "rock-bottom" has been reached in the downward grade of the annual aggregate consumption, and that in his next report he will have the pleasure of showing a considerable increase in the output.

In conclusion, he expresses his pleasure in thanking the Chairman, Vice-Chairman, and every member of the Gas Committee for the support and encouragement they gave him during the year in the management of what is one of the most important undertakings of the Corporation. He also testified to the loyal co-operation of those of the staff who are associated with him.

MOSSLEY CORPORATION GAS DEPARTMENT.

Engineer's Annual Report.

In the course of his report on the working of the gas undertaking of the Mossley Corporation in the year ended the 25th of March last, the Engineer and Manager (Mr. James Taylor) states that the gross revenue was £21,627, and the gross expenditure £15,612; leaving a gross profit of £6015. The instalments to the sinking fund amounted to £1403, and the interest on loans to £2939—together, £4342—making the net profit on the year's working £1673. Of this amount, £640 was transferred to the borough fund. The market for residuals improved considerably during the year; and the prices received may be regarded as fairly satisfactory. A contract was made for the sale of tar and ammoniacal liquor for a period of five years; the prices being regulated by a sliding-scale dependent upon the market values of the resultant products. A considerable reduction was made last year in the amount of unaccounted-for gas; the quantity being 12,318,800 cubic feet, against 14,250,400 cubic feet before. Mr. Taylor thinks this difference of 1,931,600 cubic feet, taken in conjunction with the increased sale of 6,725,400 cubic feet during the year, may be regarded as highly satisfactory, especially as the comparisons are now made under precisely similar conditions, and the figures are not affected by variations of temperature. He says the saving is largely due to the renewal of one of the trunk mains, and also to the attention given to the repair or renewal of mains and service pipes where they were suspected of being defective.

Accompanying Mr. Taylor's report is an analysis of the expenditure per 1000 cubic feet of gas sold for each of the last three financial years, prepared by Mr. Thomas Brooke, the Borough Accountant. Taking the figures for the past two years, we find the total cost in 1910-11 was 29.079d., against 31.587d. in 1909-10; the net profit being 3.226d., compared with 1.023d. In a comparison of working results in the three-years period, Mr. Brooke shows that the make of gas per ton of coal carbonized rose from 10,666 cubic feet in 1908-9 to 11,691 cubic feet in 1909-10, and 11,735 cubic feet last year; and the quantity sold per ton from 9684 to 10,413 and 10,714 cubic feet.

Deficits of an Electricity and Tramways Board.—The Stalybridge, Hyde, Mossley, and Dukinfield Electricity and Tramways Board have been a bad creation financially for the districts concerned. It is a clumsy, boastful concern; and the louder it boasts the deeper it gets into the mire of financial deficit. The "North Cheshire Herald" was recently referring to the subject of the Board's finances; and a week later, a worse complexion still was put on to the state of affairs by the following paragraph: "We have had our attention drawn, by a townsman, to our leader of last week, with regard to this Board's undertaking; and he points out that in the Hyde abstract of accounts no mention is made of the loss prior to commencing work—viz., in the year 1903-4, which he states to be, on the authority of the Dukinfield abstract of accounts—Tramways department, £4484 2s. 4d., electricity £3266. These bring the gross total losses, on the two departments, up to £86,760 14s. 11d., which means a sum of £21,690 3s. 9d., that each partner has had to pay."

LINCOLN CORPORATION GAS UNDERTAKING.

An Increased Carry-Over.

At the Meeting of the Lincoln City Council last Tuesday, Alderman Wallis, the Chairman of the Gas Committee, submitted figures relating to the working of the gas undertaking in the past financial year. He said, after allocating £5000 to the relief of the rates and placing £630 to the reserve fund, the Committee increased the carry-over from £1133 to £2368, of which sum £400 would be required to pay for the coke-breaker recently installed at the Bracebridge works. They had every reason to anticipate a very successful current year. They had almost completed the purchase of gas coal; and the prices were somewhat lower than before. On the other hand, the repairs and alterations to the plant would cost more than usual, owing to the contract for improved retort-settings at the Newland works. They were remodelling one-half of the retort-settings this year at a cost of £1100; and repairs to purifiers and other small matters would involve probably a further £250. The maintenance of mains would not require the same outlay as last year; and, so far as they could see at present, the total expenditure for 1911-12 would be rather less than more in comparison with the previous year. The gas revenue for the current year would be about £1000 down, owing to the reduction of 1d. per 1000 cubic feet in the selling price, which took effect after the 1st of October, and the increased discount of 2½ per cent. granted to prepayment consumers. The various residual products promised to yield a revenue in excess of last year. The most important of these products was coke, and it was higher in its market value than twelve months ago. Tar showed very little change; but sulphate of ammonia was making more money than before. They would recover from these sources some of the revenue to be sacrificed by the reduction in the price of gas. Under ordinary circumstances, they expected to be able, in March next, to present a report equal to anything in the past.

KENDAL GAS AND WATER SUPPLY.

The Action of the Chairman of the Health Committee.

The results of the working of the Gas and Water Departments of the Kendal Corporation in the past financial year were submitted to the Town Council at their last meeting.

The gross profit of the gas undertaking was £3667; and after setting aside £2803 for interest and sinking fund charges, there was a surplus of £864, out of which £400 was voted in relief of the rates. The reserve fund remains at £5000; and the sinking fund, including debt repaid, stands at £14,003. During the year the quantity of coal and cannell carbonized amounted to 8332 tons 10 cwt.; the total cost delivered on the works being £6670, or at the rate of 16s. per ton. The gas made was 89,837,300 cubic feet; being an increase of 5,807,600 cubic feet, or 6.91 per cent. The quantity sent out as per consumers' meters, was 82,261,400 cubic feet—an increase of 5,083,600 cubic feet, or 6.59 per cent. The consumption was made up as follows: Slot meters, 17,608,800 cubic feet; private lighting, cooking, &c., 57,319,800 cubic feet; public lighting (estimate) 7,333,600 cubic feet, unaccounted-for gas, 6,847,500 cubic feet, used on the works, 728,400 cubic feet. There are 1856 ordinary and 1876 prepayment consumers on the books. The receipts for residuals show an all-round increase. The gross profit of the water undertaking amounted to £2314.

When moving the adoption of the minutes, Alderman Monkhouse referred to the figures relating to the gas undertaking, and said they had reached the high-water mark with respect to the quantity of gas sold. When he looked at the figures, it brought to his memory how in 1894, when Mr. Arthur Silverthorne was the gas expert for the Corporation, he predicted that in 16 years the output of gas would be doubled. This was received with a great deal of incredulity and suspicion; but nevertheless the prophecy had come true. Of the profit of £864 left at their disposal, £400 had been voted towards the district rate, and part of the balance (£351) had been allocated to extinguishing the cost of the Burnside extension. The reduction in the price of gas last year from 2s. 8d. to 2s. 6d. per 1000 cubic feet had had an effect upon the receipts, making a loss of about £700 on the year. The cookery rentals were also abolished, except for the first year, which meant a loss of revenue of £113. The number of consumers was 3732—1856 ordinary and 1876 prepayment. When they took the works over, he thought there were only 100 slot-meter consumers on the books; and now they had increased so as to be the larger number—the increase for the past year being 48. Gas-cookers had also increased 221 over last year; the present number being 1145. In addition to the various benefits to consumers and contributing to the rates, out of their surplus they paid in rates and taxes on the gas-works just over £700 a year. The results had justified the action of the Council in reducing the price of gas, and proved his contention that the cheaper the gas was the more the people would use it. Passing on to deal with the leaflet of the Chairman of the Health Committee, to which attention has been recently called in the "JOURNAL," Alderman Monkhouse said he thought that it was hardly fair of Dr. Parker to make such severe strictures on another department in the same body, and also praise up another article against which a great deal could be said if one was so desirous. He had taken the trouble, since the leaflet was placed in his hands, to get expert advice upon what Dr. Parker said in it; and at an appropriate time he would be able to put quite a different complexion upon it. The leaflet said the electric light was everything desirable. Had the author gone a step farther, and said the electric light had excellent points, but it was a most detrimental thing for the eyes, he thought Dr. Parker would have said what he was perfectly justified in saying. The Medical Officers in London themselves, in their Association, had taken out the electric light, and replaced it by incandescent gas on this account, because of the large number being blinded through the use of electric light. He did not say this in opposition to the electric light, but he did not want gas to be quite snuffed

out; and, notwithstanding the leaflet, he thought they would be prosperous during the current year. Having himself used gas for fifty years, he wondered whether he really was alive after hearing what Dr. Parker had to say about its injurious effect. Proceeding to deal with the water accounts, Alderman Monkhouse said he was sorry he could not show a surplus; but he pointed out that for seven years they had adopted the policy, with water as well as with gas, of taking nothing from the capital account for new mains, &c., but paying for them out of revenue. He hoped, if there was no extraordinary expenditure, that they would be able to wipe off the adverse balance and show a surplus next year. They did not expect to make money out of the water supply, but expected it to pay its way. If it did this, they were satisfied.

After some remarks on the quality of the water, the minutes were passed.

OLDBURY GAS DEPARTMENT.

Accounts for the Past Year.

The accounts of the Gas Department of the Oldbury Urban District Council for the year ended the 31st of March, as prepared by the General Manager (Mr. A. Cooke), were submitted at the meeting of the Council last Friday and passed.

The total quantity of gas sold by meter was 119,506,600 cubic feet—an increase of 6,306,000 cubic feet on the sale in the preceding year. This brought in a revenue of £14,452; and £2170 was received for public lighting. Adding the adjustments for stock, &c., and deducting discounts and allowances, the net receipts for gas amounted to £15,869. Residuals produced £4599; and the total revenue was £20,899. The expenditure on the manufacture of gas was £12,645 (coal and oil costing £7315, and repairs and maintenance of works and plant £3487); on distribution, £1519; on public lighting, £948; rents, rates, and taxes came to £1362; management expenses were £368; and the total expenditure was £16,843—leaving a balance of £4056 to go to the profit and loss account. After paying the interest on mortgages and the instalment of loans, and transferring £600 to the general district rate account, the net profit was £465. This added to £8572 brought forward made up a total of £9037. The total quantity of coal carbonized was 10,295 tons; and the quantity of oil used 31,789 gallons. The make of gas per ton was 12,439 cubic feet. The quantity of coal gas made was 128,071,000 cubic feet; of carburetted water gas, 12,526,000 cubic feet—total, 140,597,000 cubic feet. In addition to the 119,506,600 cubic feet of gas sold through meters, the public lighting took 14,250,000 cubic feet, and 993,400 cubic feet were used on the works; making a total of 134,750,000 cubic feet—leaving 5,847,000 cubic feet, or 4.15 per cent., unaccounted for. The residuals products made during the year were: Coke, 6434 tons, of which 1798 tons were used in manufacture; breeze, 32 tons; tar, 112,313 gallons; ammoniacal liquor, 243,867 gallons; sulphocyanide, 28,776 gallons.

ROCHDALE GAS UNDERTAKING.

The Policy as to Grants in Aid of the Rates.

An important announcement was made at last Thursday's meeting of the Rochdale Town Council by Mr. Walker, the Chairman of the Gas Committee, in the course of a reply to the following questions put by Mr. Mattley:

"(1) Whether, with a view to increased sales of gas, and at the same time to minimize the emission of smoke from house fires, the Gas Committee will consider the advisability of abolishing, or reducing, at an early date, rents for gas-stoves and for meters used for gas-stoves, as is done in other towns? (2) Whether, in view of the large gas profits, and the admitted unsoundness of the policy of making large gains from trading departments to be devoted to rate aid, which at present obtains in the borough, the Committee will consider the advisability of reducing the price at an early date in order that consumers may directly participate in the profits they produce?"

In his reply, Mr. Walker said he was sure the Committee would not be unwilling to take the two questions into consideration at the earliest convenient date. He indicated that the Gas Committee had an open mind on these matters, adding that the members had not yet had an opportunity of considering either the price of gas or of electricity. Mr. Walker gave the following written replies to other questions, of which notice had been given by Mr. Mattley.

What is the approximate number of gas cooking-stoves in use in the borough per 100 houses?—We have no means of ascertaining the percentage of houses having cooking-stoves in use other than those hired from the Gas Department.

What is the approximate number of gas cooking-stoves on hire to consumers?—At March 31 last, there were 3241 stoves on hire to consumers in the whole area of supply; but separate figures for the borough only are not available.

What is the revenue from gas cooking-stoves on hire to consumers?—The revenue from stove-rents for the last financial year was £922 19s. 4d. The greater part of this was expended on their maintenance and renewal.

What is the approximate number of gas-meters on hire for cooking-stoves? No record is kept of the purpose for which gas-meters are hired. It is not known, therefore, how many are used in connection with gas-stoves alone; but the total number of meters on hire over the whole area of supply was 2772 on March 31 last.

What is the revenue from gas-meters to consumers?—Last year's income from gas-meter rents was £635 16s. 5d., and was applied to their maintenance and depreciation.

What is the number of feet of gas supplied by automatic meters for a penny, and when was the existing price fixed?—Twenty-five cubic feet of gas are supplied through automatic meters for a penny, and the existing price was fixed in 1903 when the existing charges for gas were fixed; 3020 of these meters are now in use.

SALFORD GAS-COAL CONTRACTS.

Council Rescind Resolution as to Publication of Prices.

At the Meeting of the Salford Town Council last Wednesday, considerable discussion took place in regard to a resolution introduced by Mr. J. Willett with the object of preventing the publication on the agenda of the prices paid by the Gas Committee for coal and cannel. It was argued by Mr. Willett that the decision of the Council in July, 1909, by which the prices paid by the Gas Committee for coal and cannel were stated, had adversely affected the department in a pecuniary sense. He denied that his resolution would mean secrecy, because any ratepayer who so desired could, through his representative on the Council, find out the prices in the tenders for the supply of coal and cannel received by the department, and also the names of the firms tendering. What the Gas Committee required was the privilege to buy coal at the lowest possible prices; and under the terms of his resolution, there would be no possibility of corrupt practices. It was the desire of the Gas Committee to reduce the price of gas and to grant concessions to the consumers by prepayment meters; and his resolution would help them to bring this about. He was prepared to concede to the slot-meter users an extra 6 cubic feet per rd.

In support of the resolution, Mr. Windsor said he had come to the conclusion that, under a system of competitive tendering without negotiation, they did not get the lowest price. It was their duty, as members of the Council, to buy coal at the lowest possible figure; and the people who entrusted them with the spending of public money would demand that this should be done. The negotiations for the purchase of coal and cannel required by the Gas Department could be left with a Special Committee; and he was certain the Corporation would benefit considerably by the adoption of the resolution.

An amendment was submitted by Mr. Pickering to the effect that it be an instruction to the Gas Committee that if tenders were invited no bartering or negotiating should take place with those who tendered; but it was not seconded.

In opposing the resolution, Mr. A. Williamson quoted a series of figures with a view to showing that the policy of publicity as to the coal prices had been of advantage to the borough. He maintained that the object of the resolution was to concentrate in the hands of one or two men the whole of the power with regard to the negotiations for the supply of coal and cannel. On one occasion, the Chairman of the Gas Committee himself accepted tenders for large quantities of coal and cannel; and the Council were now, by the resolution before them, asked to perpetuate such a state of things.

In the subsequent discussion, which extended over an hour, and at times became violent, the resolution was carried by 26 votes to 20.

WAKEFIELD CORPORATION WATER SUPPLY.

The Water Engineer of the Wakefield Corporation (Mr. C. Clemesha Smith), in the course of his report for the past year, states that the consumption of water largely increased; the daily average having been 2,766,000 gallons, or 134,200 gallons (5.1 per cent.) more than the consumption in 1909. The increase was general. More water was used in the city for trade and domestic purposes; and every district outside, except one, took a larger quantity. The increase in consumption was equalled by the reduction of waste. The total consumption, city and out-districts, was 462,208,000 gallons; and the net increase was 48,981,300 gallons. In 1898, the average daily consumption of water was 2,539,000 gallons, and the revenue was £28,333, or 7.3d. per 1000 gallons used; in 1910 the average consumption was 2,766,000 gallons and the revenue £36,750, or 8.7d. per 1000 gallons. The treatment of the water for the prevention of plumbo-solvency has been effectual. The cost of labour and materials was 3s. 6½d. per million gallons, against 3s. 10d. in 1909; and the cost of cleaning filter-beds, &c., was 3s. 1½d., against 3s. 2½d. The mains in the city are 61.7 miles long; and there are 31.6 miles outside—making a total of 93.3 miles. The working expenses, which include all outgoings other than rates, taxes, sinking fund, and interest, have been considerably reduced. In 1892, the amount was £4343; last year it was £3828, or 12 per cent. less. The rate-in-aid in 1910 was 6d. in the pound, the amount required being £4455, against 1s. 3d. in the pound in 1903. Exclusive of the rate-in-aid, the revenue has increased from £24,248 in 1892 to £36,580, or 51 per cent., in 1910. The total expenditure last year was £40,405; being an increase of £518.

HALIFAX CORPORATION WATER-WORKS.

Remedying Defects at the Walshaw Dean Reservoirs.

The members of the Halifax Corporation visited the reservoirs at Walshaw Dean last Tuesday, for the purpose of inspecting the progress of the work which is being carried on there to remedy leaks. The reservoirs, three in number, were formally opened five years ago; but soon afterwards the fact was revealed that they were not water-tight. At the bottom embankment, water escaped at the rate of a million gallons a day; and at the middle embankment there was also a leak, but of a much less serious character. Within the past few weeks, however, the Engineers—Messrs. G. H. Hill and Sons—have been able to make the gratifying announcement that the leakage at the bottom embankment had been entirely stopped. The total capital cost of the reservoirs up to the present is £347,264, which includes £12,580 for the remedial works. But before the middle reservoir is water-tight, this item will probably have increased to over £15,000. The method adopted by the Engineers, and now being followed at the middle embankment, was to discover the source of the leakage by sinking shafts. When this object had been achieved, the eroded puddle of the embankment was replaced, and 25 boreholes, each 5 inches diameter, were made. Down these liquid cement was poured and pumped until the

crevices in the strata were so choked that no more water could flow along them. So far 94 tons of cement have been used; and the process will be continued until the boreholes can take no more grout.

At the close of the inspection of the reservoirs, the party assembled for luncheon, after which the Chairman of the Water Committee (Mr. Mark Crossley) offered a few remarks. He said he thought the members of the Corporation would be satisfied with what they had seen. A long time had been spent over the job; but they had been saving money by adopting the method of grouting instead of cutting an arm trench. He was quite hopeful that they would get as good result at the middle reservoir; and when this was done, they would have at Walshaw Dean reservoirs as cheap as any in the country, and a credit to Halifax. Future generations would thank the men who started the construction of these works, despite the assertion that they would never be wanted. The town had been highly favoured in the fact that there had been plenty of rain for years past; but the first dry season that came, the town would have to draw from Walshaw Dean.

Mr. Hill, jun., said that at the beginning they knew the leakage was round the east end of the bottom embankment; and it would have been easy to cut there an arm trench 140 feet deep. But they followed another method; and the patience which the Council had shown had its reward that day. Explaining the method of grouting, Mr. Hill said they grouted down the shaft 50 tons of cement; and the result encouraged them in the opinion that if they could feed into the strata a sufficient quantity, they would choke up the crevices. Working on these lines, they bored 25 holes 4 feet apart, and thoroughly cleared them of all *débris*. In April last they grouted one hole continuously from one Wednesday evening till the following Saturday evening; and the leakage stopped entirely. They were still filling the zone of strata at the east end of the trench, and it would be completed in a few weeks. Cement was a permanent cure, and he saw no reason why the lower reservoir should not remain at top-water level, as it had been seen that day. The cost was only one-third of what would otherwise have been spent on an arm trench. He hoped the work at the middle embankment would be equally successful. Ten out of the 28 boreholes had been sunk; and as soon as these were cleaned out, grouting would be commenced. The prospects were bright. He could assure all present that no time had been lost on the work, and no money had been wasted.

ELECTRICITY SUPPLIED UNDER COST AT SALFORD.

The Agreement with the Manchester Ship Canal Company.

The terms upon which the Salford Corporation supply electricity to the Manchester Ship Canal Company were discussed at a meeting of the Town Council last Wednesday.

Mr. PURCELL, in introducing the subject, said he should like to know from the Chairman of the Electricity Committee whether, in view of the peculiar circumstances the Corporation were placed in with regard to the supply of electricity to the Ship Canal Company, he (the Chairman) was prepared to advise the cutting-off of the supply to the Company; and also whether Mr. Billington was prepared to render to the Council a statement which would show the gross injustice from which Salford was at present suffering in consequence of the failure of the Company to carry out the agreement.

Mr. BILLINGTON, in reply, said an agreement had been entered into with the Ship Canal Company for the supply of electricity for a period of fifteen years, and it could not be broken off at will. The Corporation were compelled to furnish the supply.

Mr. PURCELL: But we are supplying the Canal Company at the present time with electricity at less than cost.

The MAYOR (Alderman Phillips): Would it not be better to allow the matter to remain in the hands of the Committee?

Mr. PURCELL said it had remained in the hands of the Committee for years. The Canal Company were taking from the Corporation 500,000 units of electricity per annum, and were getting it at a price which was based upon an assumed consumption of 2 million units per annum. The Company had never used this quantity of current. If the Gas Committee made such an arrangement, the whole town would be ablaze. It was useless to say they could not interfere with the agreement.

Mr. BILLINGTON said that, from what he could gather, when the agreement was made the Canal Company thought they would require about 2 million units per annum; but there was nothing in the agreement which stipulated that they must take a given quantity. The previous day the Deputy Town Clerk informed him that they could do nothing in the matter. The agreement was not made by the present Electricity Committee; and apparently it was not within their power to terminate it.

No resolution was passed; the opinion being that the Electricity Committee were helpless in the matter.

Theft of Gas at Cardiff.—At the Cardiff Quarter Sessions a few days ago, Henry Williams, a commercial traveller, was charged with stealing gas, the property of the Cardiff Gas Company. Evidence was given that, after the gas had been cut off, the prisoner's house was watched by inspectors of the Company, who stated that from an adjoining garden they saw what they thought was a gas-flame burning in a chandelier in a back room. The suggestion was that the cap of the cut-off pipe had been removed. Mr. Williams, however, swore that the light seen was that of an oil-lamp which had been placed on the chandelier. He denied that he had ever interfered with the gas-fittings. Mrs. Williams and two visitors at the house on the night in question also stated that the light used was an oil-lamp. The Jury, who had had the evidence under consideration for close upon two hours, found Williams guilty. The Recorder (Mr. B. F. Williams, K.C.) sentenced him to three months in the second division; remarking that this was a very small part of the punishment Williams had endured by having been charged with having committed a very mean theft.

NOTES FROM SCOTLAND.

From Our Own Correspondent.

Saturday.

The Corporation of Glasgow have purchased coal for the current year, to the amount of 669,000 tons, at a price which is 7½d. per ton less than was paid a year ago. Bailie Paxton, the Convener of the Gas Committee, has given notice that he will move in the Committee: "That, in order to increase the output of gas, and thereby materially help in the purification of the air, the Committee consider and report on the advisability of the Corporation supplying gas-cookers, range fittings, and grillers, for domestic purposes free of charge within the Corporation area of supply." Application has been made by the proprietor of the estate of Broom, in the parish of Mearns, and from one of the feuars on the estate, for a supply of gas; and the Gas Committee have replied that they cannot deal with the application meantime, but that they are willing to take it into consideration in the event of the estate of Broom and the adjoining area being excluded by Parliament from the area of supply of the Busby Gas Company.

As will be seen from a report in another column, the appeal by the Corporation of Falkirk against the decision of Sheriff-Substitute Moffatt in the charge which the Corporation brought against Bailie H. Russell, with reference to the alleged illegal use of gas, has been refused by the Supreme Court, and the decision of the Sheriff-Substitute affirmed. The decision is upon a question of relevancy; and consequently the merits of the subject of the charge have not yet been reached by any inquiry hitherto made. The decision was given on Tuesday; and on Thursday the Special Committee of the Falkirk Town Council who have been in charge of the matter met to consider the situation. They have resolved not to drop proceedings, but to bring a summary complaint before the Sheriff-Substitute at Falkirk, charging Bailie Russell, under section 38 of the Gas-Works Clauses Act, 1871, with abstraction of gas. The section provides that "every person who wilfully, fraudulently, or by culpable negligence injures or suffers to be injured any pipes, meter, or fittings belonging to the undertakers, or alters the index to any meter, or prevents any meter from duly registering the quantity of gas supplied, or fraudulently abstracts, consumes, or uses gas of the undertakers, shall (without prejudice to any other right or remedy for the protection of the undertakers or the punishment of the offender), for every such offence, forfeit and pay to the undertakers a sum not exceeding five pounds, and the undertakers may, in addition thereto, recover the amount of any damage by them sustained."

In the Helensburgh Town Council last night, it was reported by Bailie Mitchell, the Convener of the Gas Committee, that gas making had been begun in the new vertical retorts, and that the best results had been obtained. The Council entered into contracts for coal for the current year, at the average price of 11s. 11½d. per ton, which is ½d. per ton less than last year. The quantity contracted for (5000 tons) is less than that purchased last year by more than 1000 tons, on account of the results which are expected from the new carbonizing plant.

The Lasswade and Bonnyrigg Gas Company, Limited, have reduced the price of gas from 3s. 11½d. to 3s. 9d. per 1000 cubic feet.

I have before now called attention to the leniency with which persons accused of stealing from prepayment gas-meters are treated by Sheriff-Substitute Campbell Smith, of Dundee. An instance occurred yesterday which I look upon as being of the same kind; but on this occasion the learned gentleman went farther than he has hitherto gone in showing his mind upon the subject. Two boys had admitted before him that they had been guilty of breaking open a prepayment gas-meter in a billiard-room. The Sheriff's remark was that penny-in-the-slot gas-meters were a humbug, but stealing from them was a most contemptible kind of theft. He put the boys under probation. I cannot help thinking that it will be a long time indeed before "contemptible" thefts of this sort are put down unless the thieves are treated with more firmness than a probation order.

The Kelty Gas Company, Limited, earned a profit last year of £1651. A dividend at the rate of 6 per cent. is being paid, and the price of gas is to be continued at 3s. 10d. per 1000 cubic feet.

The contract for the public lighting of the burgh of Inverkeithing has been renewed with the Gas Company, at the prices of 33s. per annum for ordinary lamps, and £3 3s. per lamp for all-night lamps.

The Dunfermline District Committee were applied to on Tuesday, on behalf of the Fife Coal Company, Limited, for permission to lay pipes for the supply of gas to houses which the Company are at present erecting at Newmills. The Roads Committee, it was reported, had considered the matter, and recommended that permission be granted on the usual conditions. Mr. Millar said he understood that the burgh of Dunfermline had obtained sanction from them to lay a gas-pipe from Dunfermline to Culross, and probably this might interfere with that arrangement. It was explained that the Fife Coal Company were to erect gas-works for the supply of their own houses; and they had indicated that they would be prepared to supply others, as well. Mr. Millar said it was exceedingly likely that in the near future application would be made for the formation of a special lighting district in the Lowvalleyfield district, and he questioned whether, in view of this, it was desirable that they should encourage the provision of gas by a separate private concern. They had to look to the rateable value of a defined area for lighting and scavenging; and if they allowed a large slice to be taken out of that area by a private company, they would be diminishing the available assessable value. The recommendation was adopted. This application was somewhat disconcerting to the Town Council of Dunfermline, in view of their expectation that they would be allowed to serve the district from the pipe they are about to lay to Culross. On Wednesday, accordingly, a deputation from the Council repaired to Leven, where they had an interview with Mr. Charles Carlow, the Managing-Director of the Fife Coal Company. They explained the situation to Mr. Carlow, who, at the close, indicated that his Company would be quite prepared to consider any proposals which might be advanced with the object of obviating competing gas undertakings. The Company will not erect gas-works if the Corporation supply them with gas at a rate which they consider cheap enough.

A meeting of the ratepayers of Thornton was held on Friday evening,

to consider the report of the Committee who had been appointed to inquire as to obtaining a supply of gas for the villiage. The terms offered by the Corporation of Kirkcaldy and by the Gas Companies at Windygates and Cardenden were read; and it was at once agreed that the terms that had been offered by the Kirkcaldy Gas Committee were the most favourable.

Then, it is stated, Mr. Magnus Speedie, at great length, gave his views as to the alleged superiority of electricity over gas for lighting, cooking, &c. Mr. Fenwick followed, with comparative statements from several sources as to the cost of electricity as against gas, showing that electricity could not compare with gas—gas being, when tested by candle power, very much cheaper for lighting. The meeting unanimously agreed to request the Corporation of Kirkcaldy to introduce a supply of gas into Thornton. On Thursday, the Gas Committee of the Kirkcaldy Corporation had the finding of the Thornton ratepayers communicated to them; and they agreed to recommend the Town Council to authorize them to proceed with the scheme, in the event of their being satisfied that there was a sufficient demand from Thornton to justify it. The offer of the Kirkcaldy Corporation is to supply gas at Thornton at 4s. 5d. per 1000 cubic feet, which is 1s. 3d. higher than in Kirkcaldy, with the condition that the price will be reduced when there is a reduction in Kirkcaldy, or when the annual consumption of gas in Thornton amounts to over 3 million cubic feet.

A meeting of large gas consumers was held in the Masonic Hall at Stonefield, Blantyre, on Thursday, to hear the report of a deputation who had been appointed to wait upon the Directors of the Blantyre Gas Company with reference to the price of gas. The deputation reported that the Directors had refused to grant them an interview, or to make any reduction in the price. The deputation were of opinion, from the information at their disposal, that a strong case existed for a substantial reduction. It was arranged that a public meeting should be held immediately after the holidays, "to protest against the exorbitant price presently being charged to consumers." The Directors of the Gas Company are a generation behind the present day. Their attitude might have been quite appropriate at one time; but it will not do now to refuse to give a hearing to people who consider that they have a complaint. The public meeting to be held will very probably result in a movement for the introduction of electric lighting; possibly, though not so likely, of high-pressure gas lighting from some of the gas undertakings in the neighbourhood.

The Motherwell Gas Company, Limited, had a make of gas last year of 109,681,900 cubic feet—an increase of 3,229,600 cubic feet over the previous year. A dividend at the rate of 8 per cent. has been declared.

At a meeting of the St. Andrews Town Council on Monday, the Lighting Committee recommended acceptance of an offer by the St. Andrews Gas Company to regulate the supply of gas for public lighting by placing a governor on each lamp. Increased pressure had resulted from the laying of a new trunk main, and the Company offered to reduce the consumption by 14½ per cent. The governors would allow

3½ cubic feet of gas per hour to pass; but the Company would charge for only 3 cubic feet. The recommendation was approved of.

It is intimated that in Johnstone the Corporation have ascertained that the net profit for the past year has been more than £600. The Corporation have been successful in purchasing coal for the current year on better terms than last year; and they anticipate that they will be able to reduce the price of gas from 2s. 2d. to 1s. 11½d. per 1000 cubic feet for lighting, and to 1s. 9½d. for power purposes.

The Alyth Gas Company have closed a satisfactory year, and have paid a dividend of 5 per cent. The usual honorarium has been granted to the Manager and the foreman.

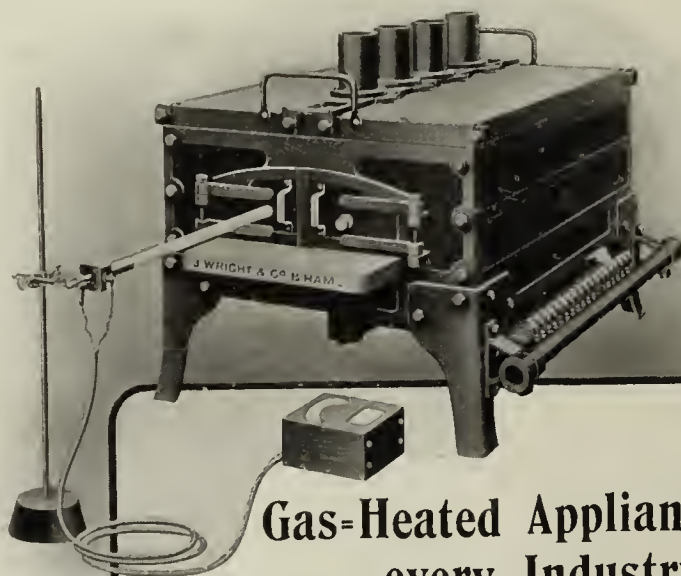
The Anstruther Gas Company, Limited, have paid a dividend of 6 per cent., and placed £200 to the reserve fund. The price of gas has been continued at 3s. 9d. per 1000 cubic feet; but meter-rents have been reduced by one half.

The announcement is made that it is proposed to hold an exhibition of gas appliances in Aberdeen at the end of this year; and also that it is under the consideration of the Gas Committee of the Town Council to supply gas cooking-stoves on more liberal terms than at present.

In the Peterhead Town Council on Monday, it was reported that the Gas Committee had had before them a report by Messrs. James Meston and Co., of Aberdeen, upon the financial position of the gas undertaking, which had been obtained because of a letter in February last from the Office of the Secretary for Scotland. The Town Clerk was instructed to transmit a copy of the report to the Secretary for Scotland, along with the answers suggested by Messrs. Meston and Co. to the questions from the Office. The Gas Committee, it was explained, intended to further consider the report, with a view to recommending to the Town Council whatever action might be thought fit.

The Oldham Gas Committee decided that in cases where gas is not used for lighting purposes the cost of fixing gas-cookers should be charged, and also a rental to cover depreciation. When, however, the minutes came before the Town Council, Alderman Wilde said he would take this matter back for reconsideration, as he had had a conversation with the Chairman of the Electricity Committee on the subject, and he thought the two Committees would desire to have a conference upon it.

We have received from Messrs. Fletcher, Russell, and Co., Limited, an artistic *brochure* on the management of gas cooking-ranges, with recipes for every-day use, by Mrs. H. M. Young. The recipes are arranged in the order of courses on a menu, and each item is appropriately and effectively illustrated. The title is given in French as well as English. The recipes are preceded and followed by some useful hints on cooking. Mrs. Young's larger work has been found very helpful to users of gas-stoves; and the little book under notice will doubtless be welcomed by many for the amount of information it furnishes in a handy form.



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CURRENT SALES OF GAS PRODUCTS.

[For Table of "Tar Products Prices," see p. 130.]

Sulphate of Ammonia.

LIVERPOOL, July 8.

The strength of the market continues unabated, and all available supplies have been readily taken up at further hardening values. There has again been a good inquiry from direct consumers, of which a fair portion has resulted in actual business; buyers having evidently become more reconciled to the high level now attained. The closing quotations are £13 10s. per ton f.o.b. Hull, £13 11s. 3d. per ton f.o.b. Liverpool, and £13 12s. 6d. per ton f.o.b. Leith. In the forward position, it is recorded that £13 12s. 6d. f.o.b. at the principal ports has been obtained for delivery up to the end of this year, as well as for the first half of 1912, and manufacturers are now holding for £13 15s. per ton.

Nitrate of Soda.

The situation remains without change, and the prices required on spot are still 9s. 10½d. per cwt. for ordinary and 10s. 1½d. for refined quality.

LONDON, July 10.

Tar Products.

The markets for tar products remain very steady. In pitch, a fair amount of business has been done during the past week at improved prices. Creosote remains steady. Benzols are quiet, though prices keep fairly firm. Solvent naphtha is quiet; but there is a fair demand for heavy naphtha. Crude carbolic continues firm.

The average values during the week were: Tar, 19s. to 23s., *ex works*. Pitch, London, 38s. to 38s. 6d.; east coast, 37s. 6d. to 38s.; west coast, Manchester, 37s. to 37s. 6d., Liverpool, 37s. 6d. to 38s., Clyde, 37s. 6d. to 37s. 9d. Benzol, 90 per cent., casks included, London, 9d. to 9½d.; North, 9d.; 50-90 per cent., casks included, London, 8½d. to 9½d.; North, 8½d. to 9d. Toluol, casks included, London, 9½d. to 10d.; North, 9½d. to 9½d. Crude naphtha, in bulk, London, 4d. to 4½d.; North, 3½d. to 3½d.; solvent naphtha, casks included, London, 11d. to 11½d.; North, 10d. to 10½d.; heavy naphtha, casks included, London, 11½d. to 1s. 0½d.; North, 10d. to 10½d. Creosote, in bulk, London, 2½d. to 2½d.; North, 1½d. to 2d. Heavy oils, in bulk, 2½d. Carbolic acid, 60 per cent., casks included, east coast, 1s. 10d. to 1s. 10½d.; west coast, 1s. 9d. to 1s. 9½d. Naphthalene, £4 10s. to £8 10s.; salts, 40s. to 42s. 6d., bags included. Anthracene, "A" quality, 1½d. per unit, packages included and delivered.

Sulphate of Ammonia.

There has been a further improvement in the value of this article during the past week, and a fair amount of business has been done for both prompt and forward delivery. Actual Beckton to-day is quoted £13 2s. 6d.; outside London makes, £12 17s. 6d.; Hull, £13 8s. 9d.

to £13 10s.; Liverpool, £13 11s. 3d. to £13 12s. 6d.; Leith, £13 11s. 3d. to £13 12s. 6d., and for forward £13 15s., is quoted. Middlesbrough quote £13 8s. 9d.

COAL TRADE REPORTS.

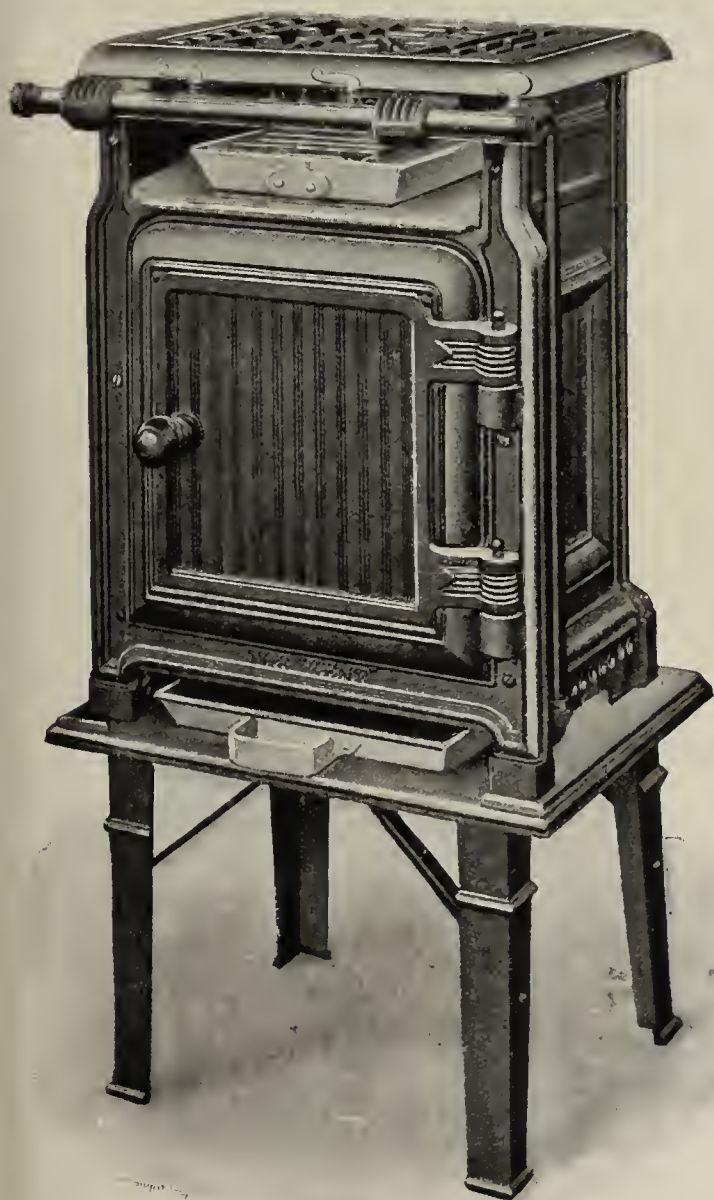
Northern Coal Trade.

The coal trade in the North of England has been interfered with by the labour unrest; and it may be more shown in the early future, as the Northumbrian miners are voting strongly against the present system of working. Best Northumbrian steam coals have, consequently, risen to 11s. 3d. and 11s. 6d. per ton f.o.b.; second-class steams are 9s. 6d.; and steam smalls are from 5s. 3d. to 6s. 3d. The production is now full, and the shipment is being more peaceably conducted. In the gas coal trade, there is not so much dread of the future, but there is more desire to accumulate stock. Durham gas coals are about 9s. 6d. per ton f.o.b. for second-class kinds; and best Durhams are steady at about 10s. 3d. For "Wear" specials, about 10s. 9d. per ton is the f.o.b. quotation at present. Tenders for about 65,000 tons of gas coal for Trieste have just been sent in. There are also orders in the market for gas coal for Genoa; but the views of buyers and sellers are a little apart. Coke is in better demand. Good gas coke is quoted from 13s. 9d. to 14s. 6d. per ton f.o.b. in the Tyne or Wear.

Scotch Coal Trade.

Trade continues quiet. Shipment demands are very unsatisfactory; and the home request is not very much better. The outlook is poor. Prices are now quoted at: Ell, 8s. 3d. to 9s. 3d. per ton f.o.b. Glasgow; splint, 9s. 3d. to 9s. 6d.; and steam, 8s. 9d. to 9s. The shipments for the week amounted to 326,221 tons—a decrease of 6430 tons upon the previous week, and of 33,549 tons upon the corresponding week last year. For the year to date, the total shipments have been 7,928,386 tons—a decrease upon the corresponding period of 24,998 tons.

Gas Workers' Wages at Sunderland.—A deputation of the Gas Workers and General Labourers' Union, consisting of Mr. H. Lynas and representatives of the men in each department of the Sunderland Gas-Works, waited upon the Directors of the Company last Wednesday, in furtherance of their application for an increase of wages for all the men employed at the works. Some time ago, the Directors offered an increase of 1s. per week to all except the retort-house men, who work eight hours a day. The men declined this until the offer was extended to all the men. The Directors agreed to give 1s. a week increase to all their workers; and on the question of holidays they also agreed to grant the men a day's holiday on Christmas Day and Good Friday, with a full day's pay. This gives the men four days' holiday in the year, against three as at present. It is understood that the Union will recommend the acceptance of these terms as a full settlement of the question.



PAPER BAG COOKERY DIFFICULTIES.

In an interesting paragraph in the "JOURNAL," dated June 27, it was stated that as much gas was consumed with Paper Bag Cookery as with the ordinary method, and that a Cooker with an oven smaller than that usually supplied would better meet the requirements of the ordinary household and prevent waste of heat. MAIN'S

KENT COOKER

meets the case. It is an efficient and handy little Cooker designed to take up the smallest amount of room consistent with practical purposes. With or without adjustable stand. The "SUSSEX" is a slightly larger Cooker on the same lines.

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25, Princes St., Oxford Circus, W.; 136, Renfield St., GLASGOW;
56, Broad St., BIRMINGHAM; 83, Old Market St., BRISTOL;
13, Whitworth St. West, MANCHESTER; 333, Queen St., MELBOURNE;
and 12, Cunningham Lane, Pitt Street, SYDNEY.

Sales of Stocks and Shares.

At the Mart, Tokenhouse Yard, last Tuesday, Messrs. A. & W. Richards sold, by order of trustees, stocks and shares in the Brighton and Hove, North Middlesex, and Southgate Gas Companies. The first lots offered were some fully-paid original £10 shares (10 per cent.) in the Southgate Company; and they fetched £21 5s. to £21 10s. each. Some additional £10 shares (7 per cent.) were next offered; and they were sold at £14 10s. to £14 12s. 6d. each. A parcel of additional ordinary 7 per cent. stock realized £145 per £100; a few £10 preference shares (5 per cent.) were sold at £11 5s. per share; and some 4 per cent. perpetual debenture stock at par. Next came some additional ordinary £10 shares in the North Middlesex Gas Company, ranking for a standard dividend of 7 per cent., but carrying £7 7s. per cent.; and they fetched £15 10s. to £15 15s. each. Some 5 per cent. preference stock of the Company sold at £114 per £100; and some 5 per cent. debenture stock at £106. The final lots offered consisted of some original ordinary consolidated stock of the Brighton and Hove Gas Company, ranking for a standard dividend of 10 per cent., but the last dividend having been at the rate of 11 per cent. It fetched from £220 to £222 per £100. The 6 per cent. "B" preference stock of the Company sold at from £136 to £137 per £100; some 4 per cent. perpetual debenture stock at from par to £100 5s.; and some 5 per cent. similar stock at £120 to £120 10s. At the Crown Hotel, Marlow, Messrs. Lawrence and Son offered for sale, on Monday last week, 100 additional £10 shares in the Great Marlow Water Company, Limited; and the average price obtained was £16 2s. 6d. per share. Messrs. Hewett and Lee offered for sale at the Albion Hotel, Woking, on Tuesday, twenty fully-paid £5 shares and one £50 4 per cent. debenture of the Woking Gas Company. The former fetched £107 10s. and the latter £50.

Electric Lighting in Dublin.—Some time ago, the Dublin Corporation applied to the Local Government Board for Ireland for sanction to a loan of £128,129 for carrying out extensions of the electric lighting of the city. The application, which met with considerable opposition, was inquired into by the Board's Chief Engineering Inspector (Dr. P. C. Cowan), whose report has been submitted. The Board have informed the Corporation that they will communicate their decision on all the points involved when they have given the matter the fullest consideration; but they further state that, as they learn from the City Treasurer and the Law Agent, an offer of a loan at a moderate rate of interest has been received, the period during which it is to remain open being limited, and as some time must necessarily elapse before the Corporation can be addressed at length on the inquiry, they think it desirable that the Corporation should be enabled to raise a portion of the amount of the loan in question. They accordingly sanction the borrowing of a sum of £50,000 under section 237 of the Public Health (Ireland) Act, 1878; repayment to be made in a period not exceeding twenty years.

Reductions in Price.

At the last monthly meeting of the Glastonbury Town Council, a report was presented from the Gas Committee, announcing a reduction in the price of gas of 4d. per 1000 cubic feet to consumers by ordinary meter. Prepayment meter consumers receiving 16 cubic feet for 1d., with free cooker rental, would be given 18 cubic feet for 1d.; and those receiving this quantity, but who pay cooker rental, would be allowed the cooker free. The reductions came into force on the 1st inst. At their meeting last Wednesday, the New Mills Urban District Council decided to reduce the price of gas by 1½d. per 1000 cubic feet, bringing it down to 2s. 6d. There has been a reduction every year since the undertaking was acquired by the Council; and meter and stove rents have been abolished. Notice has been given of a proposal to be made at the next meeting of the Carlisle Town Council "that the price charged to consumers within the city be reduced 3d. per 1000 cubic feet." On the recommendation of the Gas Committee, the Oldbury Urban District Council decided last Friday to make the following reductions in the price of gas from the September quarter: In one building, per quarter, per 1000 cubic feet: Under 25,000 cubic feet, 2s. 6d.; 25,000 and under 100,000 cubic feet, 2s. 4d.; 100,000 cubic feet and upwards, 2s. 2d.; gas for cooking, 2s. 2d.; gas for power purposes, 1s. 4d.—all subject to 5 per cent. discount as before.

Shoeburyness Water Supply.—The Shoeburyness Urban District Council discussed in committee a report on the subject of raising more water at the water-works. It was stated that Mr. Arnold Goodwin, of London, had been consulted, and it was considered advisable to carry out his suggestions. It was proposed that the Clerk be instructed to apply to the Local Government Board for sanction to a loan of £2000, and that the necessary works should be proceeded with. It transpired that the shortage of water had caused the Engineer (Mr. Goodchild) much anxiety, as he had been pumping for 20 hours a day. The proposal was agreed to.

Cockermouth Gas Manager's Bonus.—The minutes of the Gas Committee submitted at the monthly meeting of the Cockermouth Urban District Council contained a recommendation that, in view of the satisfactory results achieved at the gas-works, the Manager (Mr. E. D. Wootten) be granted a bonus of £5. Mr. Cook said that, while nobody appreciated the services of the Manager more than he did, he thought it would be better if, instead of granting him a bonus, they should give him an increase of salary, if they thought him worthy of it. Mr. Walker remarked that he had decided to set his face against any further increase of officials' salaries, unless there was a change for the better in the times. Mr. Fleming pointed out that the Manager attended the recent meeting of the Institution of Gas Engineers in Glasgow, from which he had obtained perhaps £30 worth of experience; and it was thought that the amount they proposed to give him would cover his expenses, which might not have been allowed by the Auditor if paid by the Council. The minutes were confirmed.

HOT WATER SUPPLY

IS THE QUESTION OF THE SEASON.

MAUGHAN GEYSERS

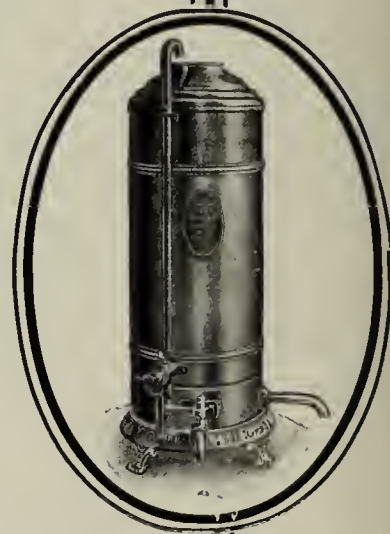
are always increasing in popularity.

They **APPEAL TO CONSUMERS** on grounds of
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Plymouth Water Supply.—Members of the Plymouth Corporation paid on Wednesday last their annual visit to the water-works for the historic fishing feast. Alderman R. W. Winnicot, the Chairman of the Water Committee, in a speech on the position of the water undertaking, remarked that during the recent drought there had been no anxiety as to the maintenance of the full supply of water. They had had enough and to spare. The contents of the storage reservoir was 657 million gallons; and the average daily consumption was $6\frac{1}{2}$ millions. Last year they were able to hand over £6900 to the relief of the rates, which was considerably more than in any previous year. At the same time the charge to consumers was almost the lowest in England.

Richmond (Surrey) Water Supply.—In the course of the budget statement made by the Mayor of Richmond (Alderman Edgar), as Chairman of the Finance Committee, at the meeting of the Town Council last week, he announced a reduction of 2d. in the water-rate. He explained that it had been hoped for some time to reduce the rate by the amount named; and this was the only consolation they could look to in the present financial position of the borough—there being a net increase of 4d. in the general rate. At the same meeting, an estimate received from Messrs. James Simpson and Co., Limited, for the supply and erection of duplicate electrical pumping plant at the Peter-sham well, for the sum of £124, was accepted, on the recommendation of the Water Committee.

Stockton Gas-Works Extensions.—After a good deal of opposition, the Stockton Town Council recently gave permission to the Gas Committee to obtain certain new plant urgently required. The opposition called forth the following remarks in a local paper: "The opposition on the part of certain members towards the Corporation milch cow that produces the golden cream seems difficult to understand. Without a murmur, they accept the not inconsiderable profits made by the gas-works for the relief of the rates, yet, when proposals are made to make the necessary expenditure of money to keep the works in good condition, they object on the ground of extravagance, and that there is no urgent need. As a matter of fact, the finances of the gas-works are managed on the wrong principle. If, instead of handing over all the profits made at the works every year, a certain proportion was set aside to provide working capital and to pay for renewals, a nice little nest-egg would soon be accumulated, and the Gas Committee, after contributing handsomely to the reduction of the rates annually, would not, as now, have to beg for every penny that is required for improvements."

Winchester Public Lighting.—At the meeting of the Winchester Town Council last Thursday, a new contract with the Gas Company for three years for the public lighting of the city was submitted. Alderman Dyer said the Council had had under consideration the adoption of electricity; and they felt they were entitled to a reduction in the price of gas. Negotiations had taken place with this end in view; and he thought the result was fair and equitable to both sides. The present cost of lighting was £2 19s. 10d. per lamp; and the Committee had hoped to get the figure back to that of 1904—viz., £2 12s. The Gas Company, however, were unable to make this reduction, owing to the increase in the cost of coal; and the Committee considered the argument a reasonable one. The price agreed upon was £2 13s. 3d. per lamp. The Company had undertaken to insert in the contract a clause that pressure should be kept up till eleven o'clock at night, and that the Council should have the right to see the pressure charts. On the question of area, they thought an experiment should be made with electric lighting in various parts; and it had been agreed that the Council should have 70 lamps to begin with, so that in three years' time, if they wanted a change, they could make it. The report containing the foregoing matters was passed.

At the meeting of the Teignmouth Urban District Council last Tuesday, tenders were received for the erection of a new retort-bench and washer at the gas-works; and that of Messrs. R. Dempster and Sons, of Elland, was accepted. The Town Clerk (Mr. A. P. Dell) was instructed to apply to the Local Government Board for sanction to a loan of £1700 instead of £1500.

APPLICATIONS FOR LETTERS PATENT.

- 14,825.—HORSTMANN, G. O. H. & E. H., and EDGAR, W. T., "Gas-controllers." June 26.
 14,843.—BROWN, A., "Gas-retort ovens." June 26.
 14,879.—BARKER, W. H., JUN., "Conveyors or screens for coal." June 26.
 14,955.—SMITH, W., "Gas-heated wash boilers." June 27.
 14,956.—SMITH, W., "Gas-taps." June 27.
 14,976.—LIVENS, F. H., and SENIOR, H. V., "Suction-gas producers." June 27.
 14,991.—CARRUTHERS, F. J. C., "Carburetting air." June 27.
 15,008.—WATKINSON, J., and PAYNE, A. E., "Shade-holders." June 27.
 15,030.—KUNZE, E. A., "Producing gas from coal." June 27.
 15,034.—MUELLER, W., "Recovery of ammonium sulphate from distillation gases." June 27.
 15,040.—LARSON, E. E., "Rotary gas-engines." June 27.
 15,049.—COLBRAN, J. B., "Inverted burners." June 27.
 15,057.—BEEDLE, W., and CHOPPING, F., "Taps and cocks." June 27.
 15,117.—WHITE, M. & J. H., and ARNOLD, H., "Gas-generating apparatus." June 28.
 15,140.—GLOVER, S., and WEST, J., "Vertical retorts." June 28.
 15,187.—GAMMENTHALER, J., and BRITISH MANNESMANN TUBE COMPANY, LTD., "Pipe-couplings." June 29.
 15,193.—MOLINS, W. E., "Supporting inverted mantles." June 29.
 15,228.—ROSSITER, E. C., SALAMON, A. G., CHANCE, K. M., and BRITISH CYANIDES COMPANY, LTD., "Manufacture of cyanide." June 29.
 15,287.—OFENBAU-GES. M. B. H., "Gas-generating furnaces." June 30.
 15,381.—DAVIS, H. N., and TWIGG, W. R., "Gas-heating stoves." July 1.

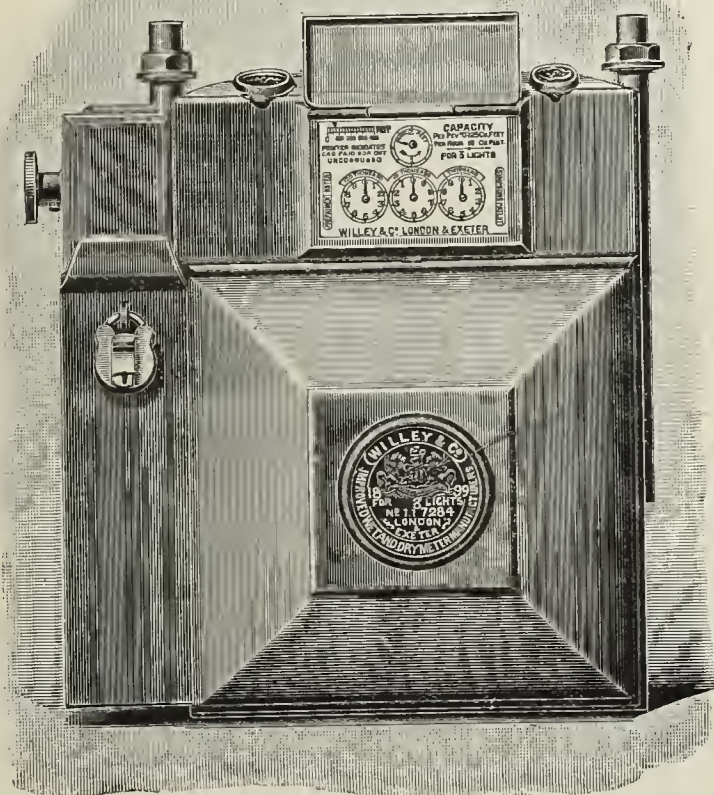
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DEVONPORT: 93, Fore Street.

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D. M. NELSON & CO., 53, WATERLOO STREET, GLASGOW.

Messrs. Ashmore, Benson, Pease, and Co., Limited, of Stockton-on-Tees, have received an order by cable for a four-lift gasholder with steel tank 18½ feet diameter by 31 feet deep, with guide-framing and four galleries, for the Chiyoda Gas Company, Japan, to the same design as that just executed for the Tokio Gas Company. Both the

holders are of a capacity of 3 million cubic feet. The firm are also building a 3 million cubic feet tank and holder for the Vancouver Gas Company. The order was placed early in January; and the tank was completed on the site by Messrs. Ashmore, Benson, Pease, and Co.'s men on June 23 last.

WANTED, FOR SALE, CONTRACTS, &c., ADVERTISEMENTS IN THIS WEEK'S "JOURNAL."

Appointments Vacant.

WASTE INSPECTOR. Colne Valley Water Company.
WASTE WATER INSPECTOR. No. 5422.
CHEMIST. No. 5423.
WORKING FOREMAN. Chertsey Gas-Works.

Appointments Wanted.

CLERK. No. 5420.

Plant, &c. (Second-Hand), For Sale.

RETORT MOUTHPIECES, PIPES, VALVES, &c., AND
STEAM ENGINE. Smethwick Gas-Works.

Meeting.

COMMERCIAL GAS COMPANY. Cannon Street Hotel,
Aug. 10. Twelve o'clock.

TENDERS FOR

Coal and Cannel.

CLACTON URBAN DISTRICT COUNCIL. Tenders by
July 20.
DEVON GAS ASSOCIATION. Tenders by July 22.
HAWORTH URBAN DISTRICT COUNCIL. Tenders by
July 24.
LYMM URBAN DISTRICT COUNCIL. Tenders by July 20.
MOSSLEY GAS DEPARTMENT. Tenders by July 21.

Pipes, &c., and Pipe-Laying.

CLACTON URBAN DISTRICT COUNCIL. Tenders by
July 20.
DOCKING RURAL DISTRICT COUNCIL. Tenders by
July 25.
NEW HUNSTANTON URBAN DISTRICT COUNCIL. Ten-
ders by July 25.

Tar and Liquor.

HEYWOOD GAS DEPARTMENT. Tenders by July 18.
LYMM URBAN DISTRICT COUNCIL. Tenders by July 20.
ROTHERHAM GAS DEPARTMENT. Tenders by July 18.

Water Tower and Tank, &c.

DOCKING RURAL DISTRICT COUNCIL. Tenders by
July 25.

TAR PRODUCTS PRICES.

Representative manufacturers give the following as fair current values for the week ending July 8. Prices are net, and they include the usual packages and delivery f.o.b., f.a.s., or f.o.r., as customary.

Article.	Basis.	London.	North-East Coast.	East Coast, Yorks.	West Coast.		Glasgow.
					Liverpool.	Manchester.	
Tar, crude	per ton	—	18/6 21/3	23/6	19/9 22/-	19/9 22/3	—
Pitch	"	39/-	36/6	37/6	37/3	36/6	37/6
Benzol, 90%	per gallon	—	-/9½	-/9	-/9½	-/9½	-/10
Benzol, 50-90%	"	—	-/9½	-/9½	-/8½	-/8½	—
Toluol, 90%	"	-/10½	-/9½	-/10	-/10	-/10	-/10
Crude naphtha, 30%	"	—	-/3½	-/4	-/3½	-/3½	—
Light oil, 50%	"	—	-/3½	-/3½ -/4	-/3½	-/3½	—
Solvent naphtha, 90-160	"	—	-/10	-/10	-/10	-/10	-/11
Heavy naphtha, 90-190	"	—	-/11	-/11½	-/11½	-/11½	-/11
Creosote in bulk	"	-/2½	-/2½	-/2	-/2½	-/2½	-/1½
Heavy oils.	"	—	-/2½ -/2½	-/2½	-/2½	-/2½	-/2½
Carbolic Acid, 60's.	"	—	1/10	1/11	1/9	1/8½	1/10
Naphthalene, crude drained salts	per ton	—	43/9	41/3	47/6	48/9	—
" pressed	"	—	60/-	63/-	60/-	60/- 72/6	—
" whizzed.	"	—	—	—	65/- 72/6	60/- 75/-	60/-
Anthracene	per unit	-/2	-/1½	-/1½	-/1½	-/1½	—

GAS COMPANIES' STOCK AND SHARE LIST.

Referred to on p. 95.

Issue.	Share.	When ex- Dividend.	Dividend or Dividend & Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Invest- ment.	Issue.	Share.	When ex- Dividend.	Dividend or Dividend & Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Invest- ment.
£	Stk.		p.c.				£ s. d.	£	Stk.		p.c.				£ s. d.
1,551,868	Stk.	Apl. 12	5	Alliance & Dublin Ord.	82-85	..	5 17 8	4,940,000	Stk.	May 12	9	Imperial Continental .	183½-185½	-½	4 17 0
374,000	Stk.	Jan. 13	4	Do. 4 p.c. Deb.	95-97	..	4 2 6	1,235,000	Stk.	Feb. 10	3½	Do. 3½ p.c. Deb. Red.	92-94	..	3 14 6
200,000	5	May 12	7	Bombay, Ltd.	64-6½	..	5 3 8	200,242	Stk.	Mar. 10	6	Lea Bridge Ord. 5 p.c.	120-122	+1	4 18 4
40,000	5	"	7	Do. New, £1 paid.	54-5½	..	4 17 5	561,000	Stk.	Feb. 24	10	Liverpool United A . .	215-217	+1	4 12 2
50,000	10	Feb. 24	15	Bourn-) 10 p.c. . .	28½-29½	..	5 1 8	718,100	"	"	7	Do. B . .	163-165	..	4 4 10
311,810	10	"	7	mouth Gas } B 7 p.c. .	16½-16¾	..	4 3 0	306,083	"	June 30	4	Do. Deb. Stk.	102-104½	..	3 16 11
75,000	10	"	6	and Water } Pref. 6 p.c.	11½-15	..	4 0 0	75,000	"	June 15	6	Malta & Mediterranean	4½-4½	..	6 3 1
380,000	Stk.	"	12½	Brentford Consolidated	257-262	..	4 15 5	560,000	100	Apl. 1	5	Met. of } 5 p.c. Deb.	100-102	..	4 18 0
330,000	"	"	9½	Do. New	203-208	..	4 11 4	250,000	100	"	4½	Melbourne } 4½ p.c. Deb.	100-102	..	4 8 3
50,000	"	"	5	Do. 5 p.c. Pref. . .	122-124	..	4 0 8	541,920	20	May 31	3½	Monte Video, Ltd. . .	12½-13½	..	5 5 8
206,250	"	June 15	4	Do. 4 p.c. Deb. . .	97-99	..	4 0 10	1,775,892	Stk.	Feb. 24	4½	Newcastle & G'tesh'd Con.	103½-104½	+1	4 3 9
220,000	Stk.	Mar. 10	11	Brighton & Hove Orig.	217-220	..	5 0 0	529,705	Stk.	June 30	3½	Do. 3½ p.c. Deb.	87-89½	..	3 18 8
246,320	"	"	8	Do. A Ord. Stk. . .	157-160	..	5 0 0	55,940	10	Mar. 10	7	North Middlesex 7 p.c.	15-16	..	4 7 6
490,000	20	Apl. 12	11½	British	44-45	..	5 4 6	300,000	Stk.	Apl. 27	8	Oriental, Ltd.	137-139	..	5 15 1
120,000	Stk.	June 30	4	Do. 4 p.c. Deb. Stk.	94-96½	..	4 3 4	60,000	5	Apl. 12	8	Ottoman, Ltd.	6½-7½	..	5 10 4
109,000	"	Feb. 10	6	Bromley, A 5 p.c. . .	116-118	..	5 1 8	31,800	53	Feb. 24	13	Portsea Island A . . .	135-140	..	4 18 4
165,700	"	"	4½	Do. B 3½ p.c. . . .	87-89	..	5 1 2	60,000	50	"	13	Do. B	—	..	—
82,278	"	"	5½	Do. C 5 p.c.	106-108	..	5 1 10	100,000	50	"	12	Do. C	120-125	..	4 16 0
55,000	"	June 30	3½	Do. 3½ p.c. Deb. . .	82-84½	..	4 3 4	114,800	50	"	10	Do. D and E	—	..	—
250,000	Stk.	"	4	Buenos Ayrcs 4 p.c. Deb.	95-97½	..	4 2 6	398,490	5	May 31	8	Primitiva Ord.	7½-7½	..	5 3 3
100,000	10	"	—	Cape Town & Dis., Ltd.	2-3	..	—	796,980	5	June 30	5	Do. 5 p.c. Pref. . . .	5½-5½*	..	4 10 11
100,000	10	"	—	Do. 4½ p.c. Pref. . .	4-5	..	—	488,900	100	June 1	4	Do. 4 p.c. Deb. . . .	97-99	..	4 0 10
50,000	50	Nov. 2	6	Do. 6 p.c. 1st Mort.	—	..	—	312,650	Stk.	June 30	4	River Plate 4 p.c. Deb.	95-97½	..	4 2 6
100,000	Stk.	June 30	4½	Do. 4½ p.c. Deb. Stk.	86-88½	..	5 2 3	250,000	10	Mar. 24	9	San Paulo, Ltd.	21½-22½	+1½	4 0 0
157,150	Stk.	Feb. 24	5	Chester 5 p.c. Ord. . .	109-111	..	4 10 1	115,000	10	"	6	Do. 6 p.c. Pref. . . .	12-12½	..	4 16 0
1,513,280	Stk.	"	5/9/4	Commercial 4 p.c. Stk.	114-116	..	4 14 3	125,000	50	July 1	5	Do. 5 p.c. Deb. . . .	49-50½	..	5 0 0
560,000	"	"	5½	Do. 3½ p.c. do. . . .	108-110	..	4 16 11	135,000	Stk.	Mar. 24	10	Sbeffield A	235-237	..	4 4 5
475,000	"	June 15	3	Do. 3 p.c. Deb. Stk.	75½-77½	..	3 17 5	209,984	"	"	10	Do. B	235-237	..	4 4 5
800,000	Stk.	May 31	4	Continental Union, Ltd.	92-95	..	4 4 3	523,500	"	"	10	Do. C	234-236	..	4 4 9
200,000	"	"	7	Do. 7 p.c. Pref. . . .	135-137	+1	5 2 2	70,000	10	June 15	7	South African	8½-9½	..	7 7 4
492,270	Stk.	"	5½	Derby Con. Stk. . . .	122-124	..	4 8 9	6,429,895	Stk.	Feb. 10	5/9/4	South Met., 4 p.c. Ord.	119-121	..	4 10 3
55,000	"	"	4	Do. Deb. Stk.	104-105	..	3 16 2	1,895,445	"	Jan. 13	3	Do. 3 p.c. Deb. . . .	80-82	..	3 13 2
148,995	"	Apl. 12	5	East Hull 5 p.c. Ord.	—	..	—	209,820	Stk.	Mar. 10	8	South Shields Con. Stk.	154-156	..	5 2 7
840,150	10	Jan. 27	10	European, Ltd.	19-20	..	5 0 0	605,000	Stk.	Feb. 24	5½	S'th Suburb'n Ord. 5 p.c.	119-121	..	4 13 6
16,179,415	Stk.	Feb. 24	4½	Gas-) 4 p.c. Ord. . .	106½-107½	+½	4 6 9	60,000	"	"	5	Do. 5 p.c. Pref. . . .	118-120	..	4 3 4
2,600,000	"	"	3½	light) 3½ p.c. max. . .	85-87	..	4 0 6	117,058	"	Jan. 13	5	Do. 5 p.c. Deb. Stk.	123-125	..	4 0 0
4,062,235	"	"	4	and) 4 p.c. Con. Pref.	103-105	..	3 16 2	502,310	Stk.	May 12	5	Southampton Ord. . .	109-111	..	4 6 11
4,531,705	"	June 15	3	Coke) 3 p.c. Con. Deb.	78½-80½	..	3 14 6	120,000	Stk.	Feb. 10	7	Tottenham } A 5 p.c.	147-150	..	4 13 4
258,740	Stk.	Mar. 10	5	Hastings & St. L. 3½ p.c.	95-97	..	5 3 1	488,940	"	"	5½	and } B 3½ p.c. . . .	116½-118½	..	4 12 10
82,500	"	"	6½	Do. do. 5 p.c. . . .	—	..	—	149,470	"	June 15	4	Edmonton } 4 p.c. Deb.	96-98	..	4 1 8
70,000	10	Apl. 27	11	Hongkong & China, Ltd.	17½-17½	..	6 3 11	182,380	10	June 15	8	Tuscan, Ltd.	8½-9½	..	8 13 0
131,000	Stk.	Mar. 10	7½	Ilford A and C	147-150	..	4 18 4	149,900	10	July 1	5	Do. 5 p.c. Deb. Red.	96-98½	..	5 2 0
65,780	"	"	5½	Do. B	118-121	..	4 17 1	236,476	Stk.	Feb. 24	5	Tynemouth, 5 p.c. max.	115-117	..	4 5 6
65,500	"	June 30	4	Do. 4 p.c. Deb. . . .	94-96½	..	4 3 4	255,636	Stk.	Feb. 24	6½	Wands- } B 3½ p.c. . .	141-143	..	4 14 5
								85,766	"	June 30	3	worth } 3 p.c. Deb. Stk.	71-73½	..	4 2 2

Prices marked * are "Ex. div."

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No notice can be taken of anonymous communications. Whatever is intended for insertion in the "JOURNAL" must be authenticated by the name and address of the writer; not necessarily for publication, but as a proof of good faith.

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A HISTORY OF THE INTRODUCTION OF GAS LIGHTING.

BY CHARLES HUNT, M.Inst.C.E.,

Past-President of the Institution of Gas Engineers.

Author of "Gas Lighting," which forms the Third Volume of Groves
and Thorpe's "Chemical Technology."

As a frontispiece the book has a photographic reproduction
of the portrait of William Murdoch in the Edinburgh Art
Gallery. There are also portraits of the Hon. Robert Boyle,
F.R.S., James Watt, Philippe Lebon, Frederick Albert
Winsor, &c.; a reproduction of the picture of "Scientific
Celebrities in 1800" in the National Portrait Gallery, in
which James Watt, Boulton, and Wm. Murdoch are included;
and numerous illustrations of various apparatus used in the
early Manufacture of Gas, with three folding plates repro-
duced from the original drawings of Messrs. Phillips and
Lee's Mill and the Gas-Works erected there in 1806. In
addition to these, there are also views of Bello Mill Cottage,
the birthplace of Murdoch, and of the neighbourhood in and
around Lugar.

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Indicating Electric Pyrometers.
Recording Electric Pyrometers.
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SPECIALLY prepared for Sulphate of
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PREPARED from Pure Iron.

Twice as rich as Bog Ore.
Gives no back Pressure.

The Cheapest in the Market.

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GAS-WORKS requiring Extensions
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Speciality of Catering for the Smaller Gas Concerns.
Prices Reasonable; quality and results, the best. Satisfaction Guaranteed.

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FIRTH BLAKELEY, SONS, AND COMPANY, LIMITED,
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MEADE-KING, ROBINSON, & CO.,
Represent the Strongest Independent Refineries in America; also Petroleum Spirit for Gas Enrichment. 18, EXCHANGE STREET, MANCHESTER, and TOWER BUILDING, 22, WATER STREET, LIVERPOOL.

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BROTHERTON AND CO., LTD., Ammonia Distillers.
Works: BIRMINGHAM, GLASGOW, LEEDS, LIVERPOOL, SUNDERLAND, AND WAKEFIELD.

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Purification Plant.

Results Guaranteed. No Working Costs.

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It is also used for the enrichment of Gas.
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Cleaning Gas-Cookers and Gas-Fittings, read Canning Handbook on Polishing, Electro-Plating, and Lacquering. Fully illustrated. Price 2s. 3d., post free; abroad, 2s. 6d.

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ING FOREMAN for a Gas-Works making 70 Millions. One well used to Regenerative Furnaces. Apply to the MANAGER, Gas-Works, CHERTSEY.

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ence in large Gas Company, desires CHANGE. Expert Shorthand-Typist. Sound knowledge of Accountancy and Book-keeping. Experience in Drafting Reports, &c. Capable correspondent. Age 26. Highest Credentials.

Address, No. 5420, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

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A THOROUGHLY competent Waste
WATER INSPECTOR is required by a Water Company. Must understand his work, Wages to commence, 30s. per Week.

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WANTED, a Chemist Experienced in
the Analysis of Coal, Gases, Sulphate of Ammonia, Crude and Refined Benzols, and Tar Products.

Apply, by letter, stating Age, whether Married or Single, Salary required, Experience, and Qualifications (if any), and enclosing Three copies of recent Testimonials, to No. 5423, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

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Experience in reading Water-Meters and working Deacon's Waste Meters. Wages 30s. per Week.

Apply, stating Experience, with Testimonials, to the SECRETARY, Colne Valley Water Company, New Bushey, WATFORD.

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RETORT Mouth-pieces and Fittings of

Four through Beds in Settings of Eights, consisting of 64 Mouthpieces 22 in. by 15 in. with Tangye Self-sealing Lids, and 64 Ascension Pipes Taper 6-inch to 5-inch. Dry Mains, Valves, Bridge Pipes, and other Connections. All in good working condition. Also one STEAM ENGINE, Horizontal, High-Pressure, 14-inch bore by 20-inch stroke, to work with 80 lbs. Steam pressure. Splendid Condition.

A low price to clear will be taken for the whole or part of the above.

Apply to VINCENT HUGHES, Engineer, Gas-Works, SMETHWICK.

BOROUGH OF HEYWOOD.

THE Gas Committee invite Tenders
for the Purchase of Surplus TAR.

Specification and Form of Tender may be obtained from the Gas Manager.

Sealed Tenders, endorsed "Tar," to be sent to me not later than Tuesday, July 18, 1911.

By order,

GEO. G. BOUCHIER,
Town Clerk.

Municipal Buildings, Heywood,
June 27, 1911.

COUNTY BOROUGH OF ROTHERHAM.

(GAS DEPARTMENT.)

THE Corporation of Rotherham are
prepared to receive OFFERS for the Purchase of the Surplus GAS TAR and AMMONIACAL LIQUOR produced at their Gas-Works during the ensuing Year.

Forms of Tender and Specification may be obtained on Application to Mr. J. S. Naylor, Gas Engineer.

Offers, endorsed "Gas Tar and Ammoniacal Liquor," to be sent to me not later than July 18 next.

W. J. BOARD,
Town Clerk.

Town Hall, Rotherham,
July 5, 1911.

THE Devon Gas Association, Limited,

are prepared to receive TENDERS for about 1100 Tons of Best Screened or Unscreened GAS COAL, delivered f.o.r. truck loads at either Chudleigh, Moreton-hampstead, North Tawton, or South Brent Stations, as required during the Year ending the 31st of July, 1912.

Sealed Tenders, endorsed "Tender for Coal," to be addressed to the Chairman, and received not later than Saturday, July 22, 1911.

GEO. LANE,
Secretary.

Haven Road, Exeter,
July 3, 1911.

BOROUGH OF MOSSLEY.

THE Gas Committee invite Tenders
for the Supply of 12,000 Tons of Screened GAS COAL.

Specification and Form of Tender may be had upon Application to the undersigned.

Tenders, endorsed "Gas Coal," to be addressed to the Chairman of the Gas Committee, Gas-Works, Mossley, and Delivered not later than the first post Friday morning, the 21st inst.

JAMES TAYLOR,
Engineer and Manager.

Gas-Works, Mossley,
July 4, 1911.

THE Haworth Urban District Council

are prepared to receive TENDERS for the Supply of 3000 Tons of GAS COAL (Screened, Unscreened, and Gas Nuts) delivered at the Haworth Station during the ensuing Twelve Months.

Sealed Tenders, endorsed "Gas Coal Tender," to be forwarded to me the undersigned, not later than the 24th inst.

No Special Form of Tender.

WILLIAM ROBERTSHAW,

Clerk to the Council.

United Counties Bank Chambers,
North Street, Keighley.

URBAN DISTRICT COUNCIL OF LYMM.

THE above Council are prepared to receive TENDERS for the Supply of CANNEL and Best Screened GAS COAL, to be delivered at their Gas-Works in Lymm, for a term of Twelve Months from the 1st day of September, 1911.

The probable quantities required will be about 200 Tons of Cannel and about 2000 Tons of Gas Coal, which must be freshly Wrought, well Screened, and free from Sulphurous Pyrites and other objectionable matter; but the Council reserve the right of increasing or decreasing the quantities named.

The Person whose Tender is accepted will be required to enter into an Agreement with the Council for the due performance of his Contract.

Sealed Tenders, stating Price per Ton delivered by Boat alongside the Works, to be sent to the undersigned on or before the 20th of July, 1911, and endorsed "Coal Tender."

The Council do not bind themselves to accept the lowest or any Tender.

Forms of Tender are not Supplied.

Further Particulars may be had on Application to the Gas Manager, Mr. W. L. Donaldson.

W. MULLARD,

Clerk.

Council Offices, Lymm,
Cheshire, July 1, 1911.

TAR AND AMMONIACAL LIQUOR.

THE Lymm Urban District Council are prepared to receive TENDERS for the Purchase of the Surplus TAR and AMMONIACAL LIQUOR made at their Gas-Works for a term of One Year from the 1st day of September, 1911 (or for such longer term as may be contracted for with the consent of the Council).

Tar and Liquor will be delivered free into contractor's Boat on the Bridgewater Canal.

Tenders to be sent to the undersigned on or before the 20th day of July, 1911, endorsed "Tar."

The Purchaser will be required to enter into an Agreement with the Council for the due performance of his Contract.

The Council do not bind themselves to accept the highest or any Tender.

Forms of Tender are not Supplied.

Further Particulars may be had on Application to the Gas Manager, Mr. W. L. Donaldson.

W. MULLARD,

Clerk.

Council Offices, Lymm, Cheshire,
July 1, 1911.

NEW HUNSTANTON URBAN DISTRICT COUNCIL.

THE New Hunstanton Urban District Council invite TENDERS for the Supply of MATERIALS and the CONSTRUCTION of WATER-WORKS in the Parish of Hunstanton as follows:

CONTRACT No. 9, for the Supply of CAST-IRON MAINS.

CONTRACT No. 10, for the laying of MAIN PIPES.

Drawings and Specifications can be seen, and Forms of Tender and Quantities obtained, on and after Wednesday, the 12th inst., at the Offices of the undersigned, or of the Engineer, Mr. E. H. Stevenson, 38, Parliament Street, Westminster, on payment of Half-a-Guinea for each Form of Tender, which amount will be returned on receipt of a *bond-fide* Tender with the Schedule of Quantities properly filled up.

Sealed Tenders, properly endorsed, to be sent to the undersigned on or before Tuesday the 25th inst.

The Council do not bind themselves to accept the lowest or any Tender.

(Signed) J. S. B. GLASIER,

Clerk to the New Hunstanton
Urban District Council.

DOCKING (NORFOLK) RURAL DISTRICT COUNCIL.

THE Docking Rural District Council invite TENDERS for the Supply of MATERIALS and the CONSTRUCTION of WATER-WORKS in the Parish of Heacham as follows:

CONTRACT No. 1, for the Supply of CAST-IRON MAIN PIPES.

CONTRACT No. 2, for the Erection of a WATER TOWER and TANK and the LAYING of MAIN PIPES and APPENDAGES.

Drawings and Specifications can be seen, and Form of Tender and Quantities obtained, on and after Wednesday, the 12th inst., at the Offices of the Clerk to the Parish Council, Heacham, or at the Offices of the Engineer, Mr. E. H. Stevenson, 38, Parliament Street, Westminster, on payment of Half-a-Guinea for each Form of Tender, which amount will be returned on receipt of a *bond-fide* Tender, with the Schedule of Quantities properly filled up.

Sealed Tenders, properly endorsed, to be sent to the undersigned on or before Tuesday, the 25th inst.

The Council do not bind themselves to accept the lowest or any Tender.

(Signed) J. A. STOUTON,

Clerk to the Docking
Rural District Council.

CLACTON URBAN DISTRICT COUNCIL.

PIPES.

THE above Council are prepared to receive TENDERS for the Supply and Delivery of 50 Tons of British CAST-IRON PIPES and CONNECTIONS.

Copy of Specification and Form of Tender may be obtained from the Council's Engineer, Mr. Sydney Francis, A.M.I.M.E., Town Hall, Clacton-on-Sea.

Sealed Tenders, endorsed "Tender for Pipes," to be delivered to the undersigned not later than noon on Thursday, July 20, 1911.

The Council do not bind themselves to accept the lowest or any Tender.

GEO. T. LEWIS,

Clerk to the Council.

Town Hall, Clacton-on-Sea,
July 5, 1911.

CLACTON URBAN DISTRICT COUNCIL.

COAL.

THE above Council invite Tenders for the Supply and Delivery of about 5000 Tons of Best Screened GAS COAL, in quantities as may be required during the ensuing Twelve Months.

Particulars and Form of Tender may be obtained upon Application to the Consulting Engineer, Mr. Sydney Francis, A.M.I.M.E., Town Hall, Clacton-on-Sea.

Tenders, sealed and endorsed "Tender for Coal," to be delivered to the undersigned not later than noon on Thursday July 20, 1911.

The Council do not bind themselves to accept the lowest or any Tender.

GEO. T. LEWIS,

Clerk to the Council.

Town Hall, Clacton-on-Sea,
July 5, 1911.

SALES BY AUCTION OF GAS AND WATER STOCKS AND SHARES.

MESSRS. A. & W. RICHARDS beg to notify that their SALES BY AUCTION of NEW CAPITAL ISSUED UNDER PARLIAMENTARY POWERS, and of STOCKS and SHARES belonging to EXECUTORS and other PRIVATE OWNERS in LONDON, SUBURBAN, and PROVINCIAL GAS and WATER COMPANIES, take place PERIODICALLY at the Mart, TOKENHOUSE YARD, E.C.

Terms for Issuing New Capital, and also for including other Gas and Water Stocks and Shares in these Periodical Sales, will be forwarded on Application to MESSRS. A. & W. RICHARDS, at 18, FINSBURY CIRCUIS, E.C.

COMMERCIAL GAS COMPANY.

NOTICE is Hereby Given, that an ORDINARY MEETING of the Commercial Gas Company will be holden at the Cannon Street Hotel, in the City of London, on Thursday, the 10th of August, 1911, at Twelve o'clock at noon, to receive the Directors' Report and the Accounts of the Company for the Half Year ended the 30th of June, 1911; to declare a Dividend; and to determine the Remuneration of the Secretary.

The STOCK TRANSFER BOOKS WILL BE CLOSED from the 21st inst. to the 10th of August, both days inclusive; and the Dividends will be paid on the 1st of September next to the holders of Stock registered at the date of the closing.

By order of the Board,

F. J. BRADFIELD,

Secretary.

Offices: Stepney,
July 10, 1911.

Now Published. Price 1s. 6d. Post Free in the United Kingdom.

GAS MANUFACTURE AND GAS LIGHTING.

By HENRY O'CONNOR, Assoc.M.Inst.C.E., &c.

A Course of Five Lectures Delivered before the Royal Scottish Society of Arts.

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Gas Engineers' Agents and Contractors for METERS, FIRE-CLAY GOODS, OXIDE OF IRON, AND ALL OTHER GAS APPARATUS.

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STEEL OF ALL DESCRIPTIONS.

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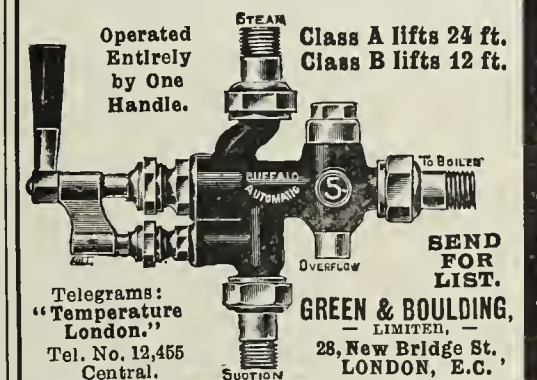
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FIRE-BRICKS, LUMPS, TILES, GAS RETORTS,

And every description of Fire-Clay Goods.

RETORTS CAREFULLY PACKED FOR SHIPMENT.

JAMES OAKES & CO.,

ALFRETON IRON-WORKS, DERBYSHIRE,

AND

Wenlock Iron Wharf, 21 & 22, Wharf Road, CITY ROAD, LONDON, N.

Manufacture and keep in Stock at their Works (also large Stock in London)

PIPES and CONNECTIONS, 1½ to 48 inches in diameter, and make and erect to order RETORTS, PURIFIERS and TANKS, with or without planed joints, COLUMNS, GIRDERS, SPECIAL CASTINGS, &c., required by Gas, Water, Railway, Telegraph, Chemical, Colliery, and other Companies.

NOTE.—Makers of HORSLEY SYPHONS. These are cast in one piece, without Chaplets; doing away with Bolts, Nuts, and Covers, and rendering Leakage impossible.

HEATHCOTE GAS COAL

from the

Grassmoor Collieries
CHESTERFIELD.Rich in Illuminating Power and Yield of Gas.
Above the Average in Weight and Quality
of Coke.

Maintains a High Standard in Residuals.

NEWBATTLE CANNEL.

Highest Results in Gas, & Excellent Coke.

QUOTATIONS ON APPLICATION TO
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— LIMITED, —
NEWBATTLE COLLIERIES,
NEWTONGRANGE, MIDLOTHIAN.**MIRFIELD GAS COAL****UNEQUALLED.**

Sperm Value 878·85 lbs. per ton.

Please apply for Price, Analyses, and Report to the

MIRFIELD COLLIERY COMPANY,
RAVENSTHORPE, near DEWSBURY.**GASHOLDERS.****WESTWOOD & WRIGHTS,**
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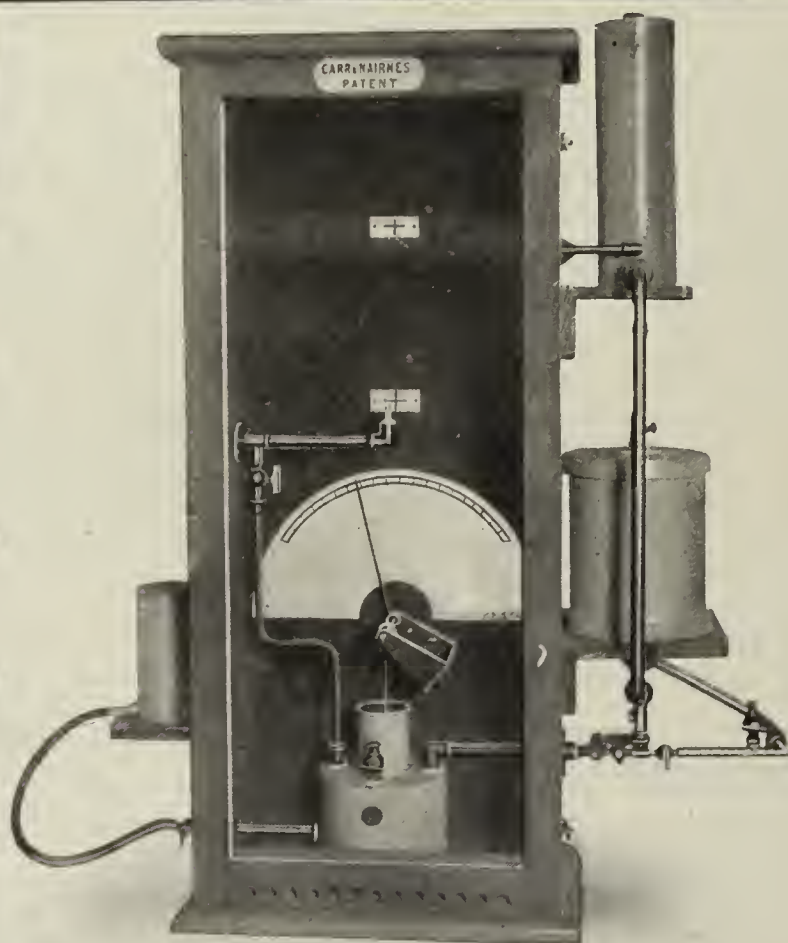
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30 CWT. MACHINES—HOISTING SPEED, 60 to 80 f.p.m.—TRAVELLING SPEED, 500 to 600 f.p.m.



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600 C.P. LOW PRESSURE LAMP.

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GAS REGULATION on the TOP of the LAMP.

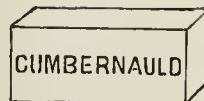
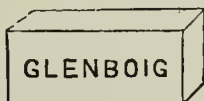
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THE GLENBOIG UNION FIRE-CLAY CO., LTD. GLENBOIG FIRE-BRICKS AND GAS-RETORTS.

Every Genuine Glenboig Brick, Block, Gas-Retort, &c., is legibly stamped with one or other of the Glenboig Company's Registered Trade Marks, as here shown.

**TRADE
MARKS.**

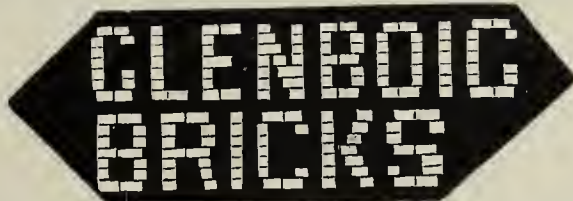


The Glenboig Trade Marks are imitated, and the Glenboig Name unfairly used by Makers of a lower Class of Goods, which, when sold under their own name, command much lower prices.

The Genuine Brand, Stamped on the Goods, is the only Reliable Guarantee to the Purchaser.

GAS-RETORTS, FIRE-BRICKS, BLOCKS, &c., &c.

The SPECIAL BRICKS used in the Construction of Gas Furnaces for Heating Retorts.



Works : GLENBOIG, LANARKSHIRE.
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57 Prize Medals and Diplomas
of Honour.
Grand Prix at Brussels International
Exhibition.
Highest Award wherever exhibited.

The GLENBOIG BRICKS, BLOCKS, AND RETORTS combine, in the highest degree, the qualities of not melting, and not splitting, when subjected to the highest heats and most sudden changes of temperature, and are, in consequence, found to be economical, even in districts where the local bricks can be had at half the price.

Undertaken we give a Table of Analysis and Physical Characteristics of a sample of Glenboig Fire-Clay by J. T. Norman, London; and, in submitting a report from a responsible and reliable public analyst, we would here draw attention to the unreliable character of some recently published analyses where a manufacturer selects not only his own samples, but also those of his competitor, and has them treated by a private analyst. SUCH STATEMENTS ARE ALTOGETHER UNTRUSTWORTHY.

ANALYSIS OF GLENBOIG FIRE-CLAY.

By JOHN T. NORMAN, Esq., F.C.S., &c., The City Central Laboratory, LONDON.

THE GLENBOIG UNION FIRE-CLAY CO., LTD., GLENBOIG, SCOTLAND.

23, LEADENHALL STREET,

LONDON, E.C., September 21st, 1909.

DEAR SIR,

I have completed the investigation of the samples of Clay received from you on the 10th inst., and now beg to report the results.

CHEMICAL ANALYSIS.

	Raw.	Fired.
Silica, free	9.08	3.49
Silica, combined	43.20	49.77
Alumina	36.55	42.10
Ferrio oxide	1.80	2.08
Titanio oxide	1.30	1.50
Lime	trace	trace
Magnesia	trace	trace
Alkaline oxides	trace	trace
Sulphates as trioxides	0.92	1.06
Loss on Ignition	13.20	—
	100.00	100.00

PHYSICAL RESULTS.

Density	2.65
Volume weight	1.90
Porosity	15.4 %
Linear shrinkage at 100° C.	3.70 %
" " " 1050° C.	4.7 %
" " " Total	8.46 %
Volume shrinkage at 100° C.	10.7 %
" " " 1050° C.	12.6 %
" " " Total	23.3 %
Plasticity	20.0 %
Fire Stability	1850° C. equiv. 3362° F.

(SEGER CONE 36.) (New Scale CONE 38.)
(Signed) J. T. NORMAN.

This Clay is remarkable for its high percentage of Alumina and for the almost complete absence of ingredients tending to lower the refractory properties; its fire stability is extremely high. For some years past I have been urging clients who are working the Clays of the Coal Measures to search for such a material, but you are the first to discover a supply. The possession of this Clay places you in a unique position amongst the manufacturers of refractory goods throughout the world, and I have no doubt will, if duly exploited, enable you to drive out of the market the large quantities of foreign fire-bricks which are being poured into this country for use in the construction of bye-product ovens and for other purposes. —I am, yours faithfully,

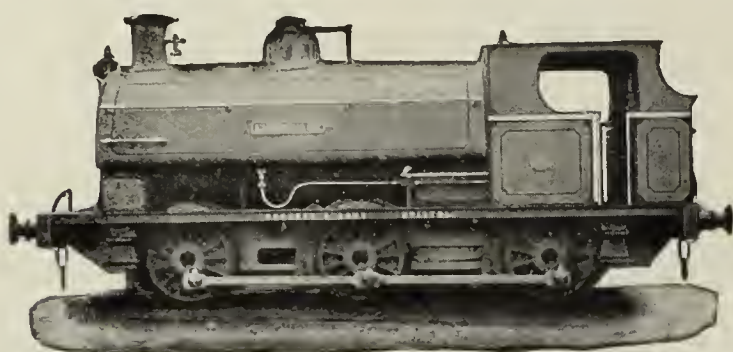
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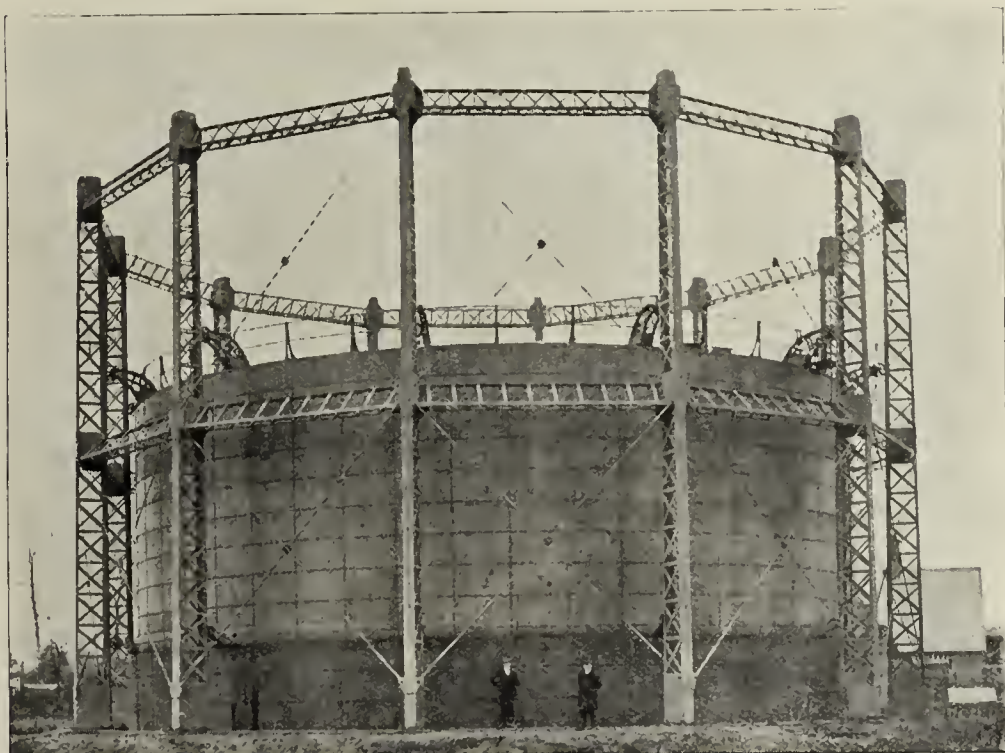
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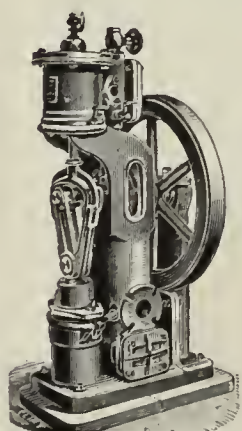


Fig. 705. "SINGLE RAM" STEAM-PUMP.

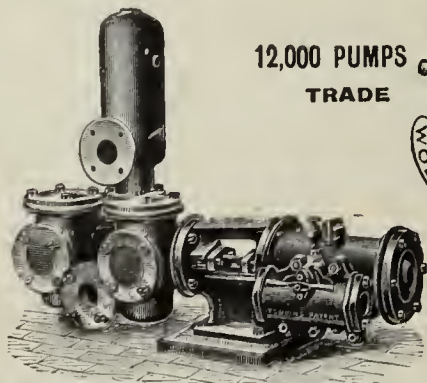


Fig. 598. "CORNISH" STEAM-PUMP FOR BOILER FEEDING, &c.

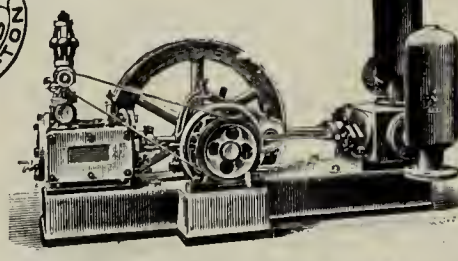


Fig. 688. "RELIABLE" STEAM PUMP FOR TAR AND THICK FLUIDS.

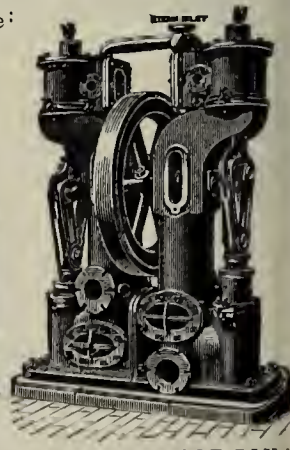
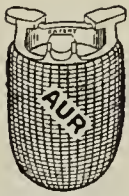


Fig. 712. "DOUBLE-RAM" STEAM-PUMP.



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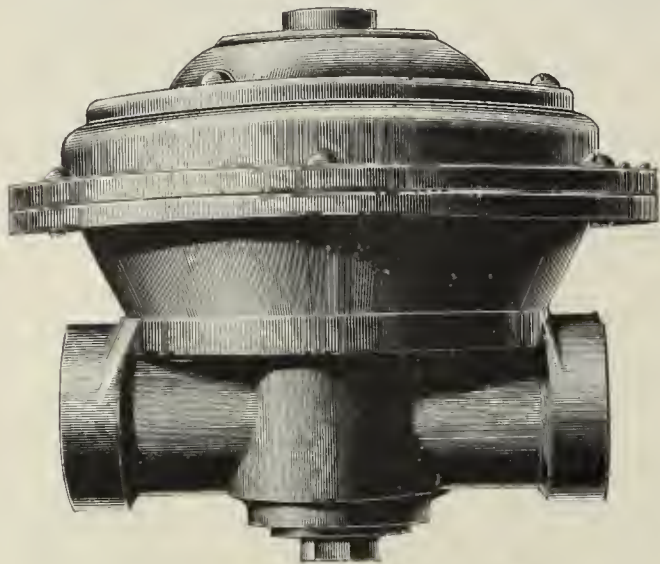
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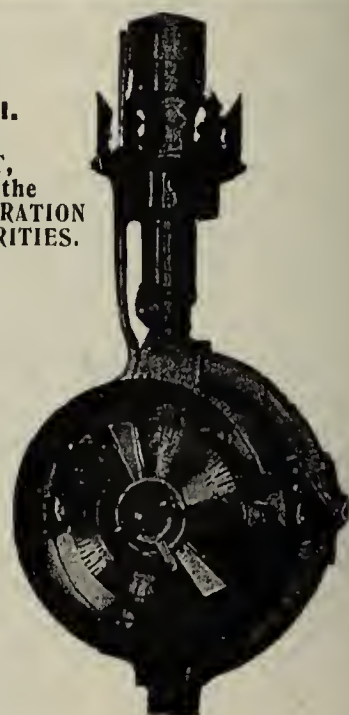
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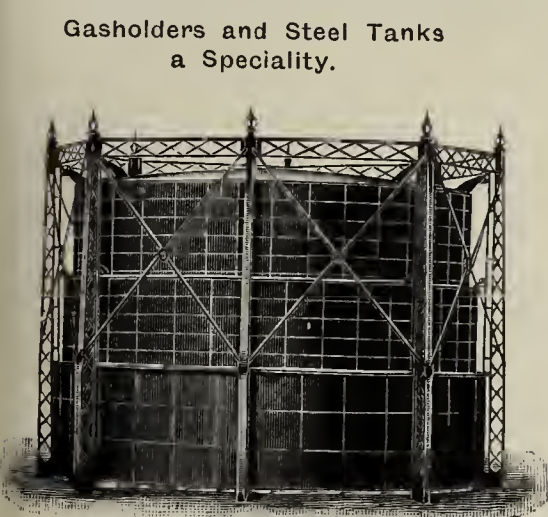
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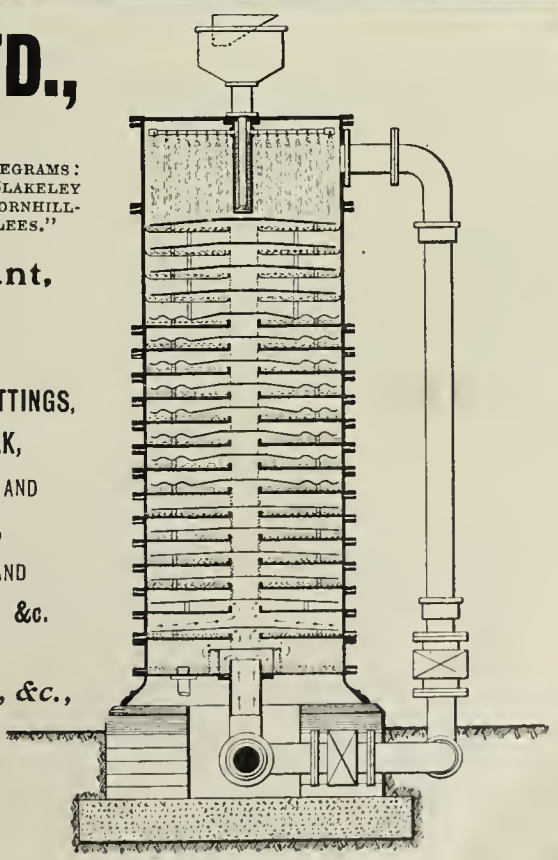
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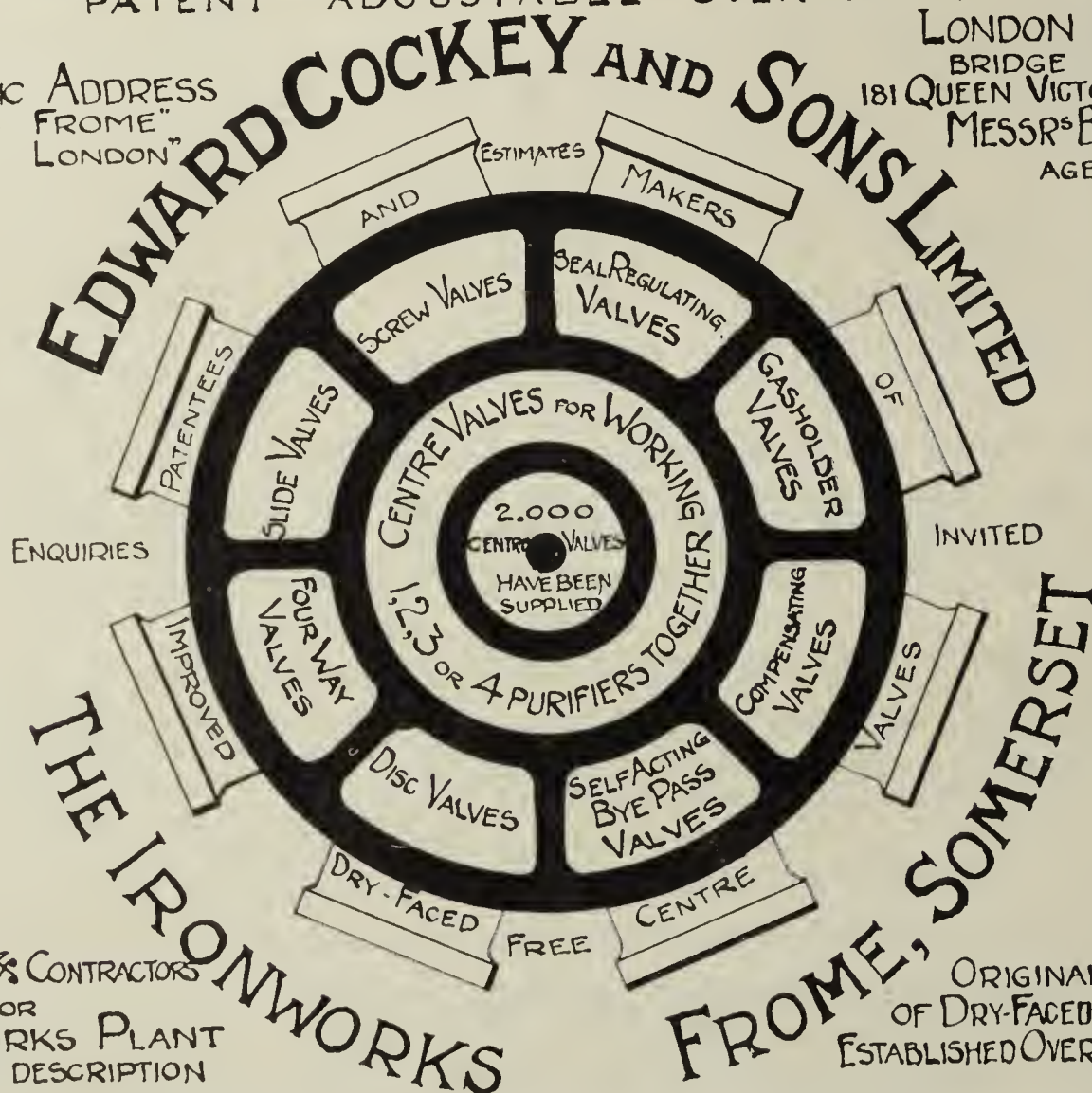
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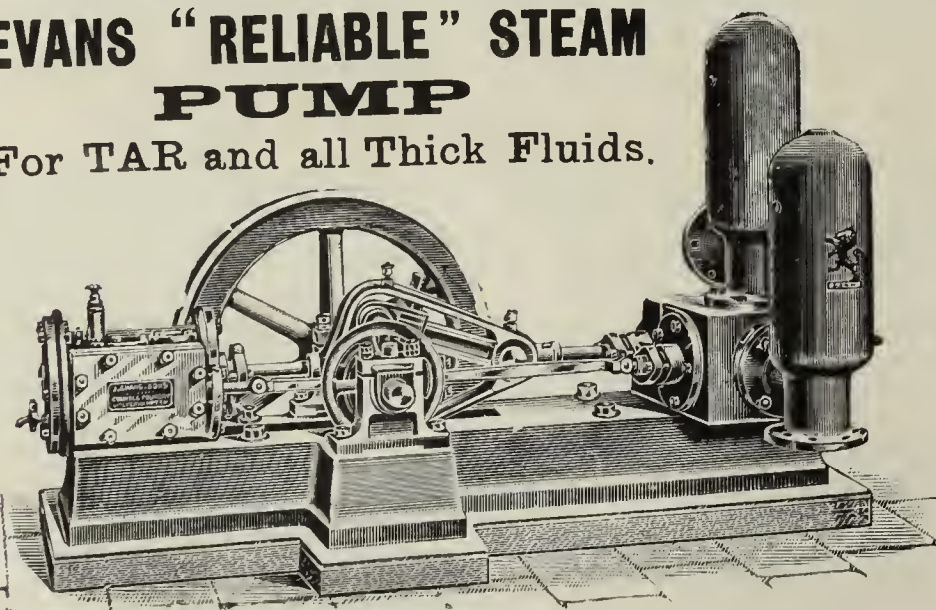
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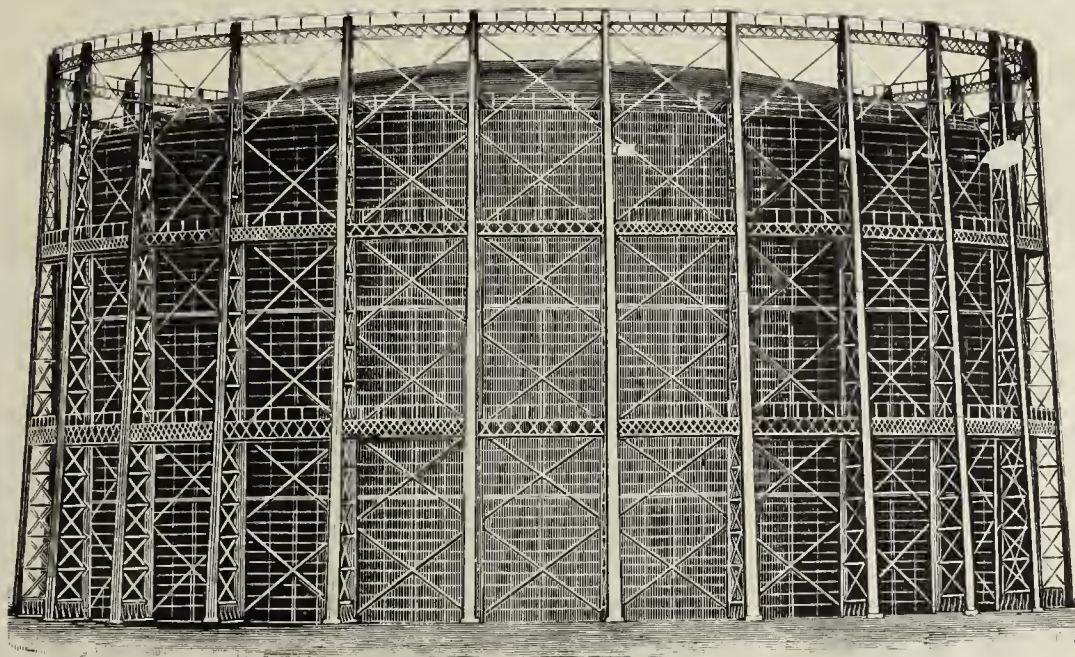
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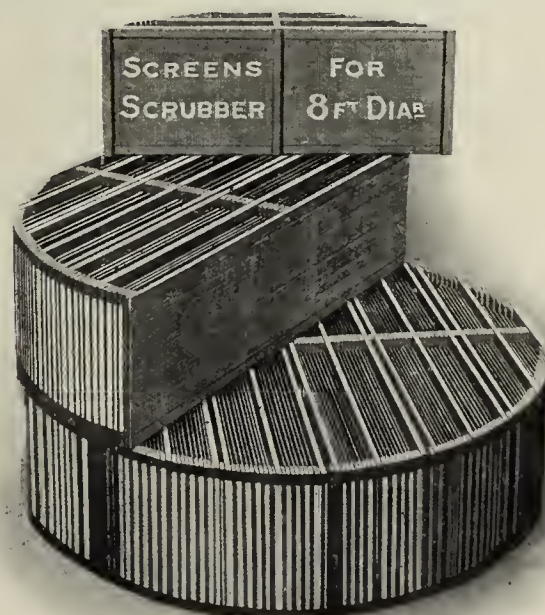
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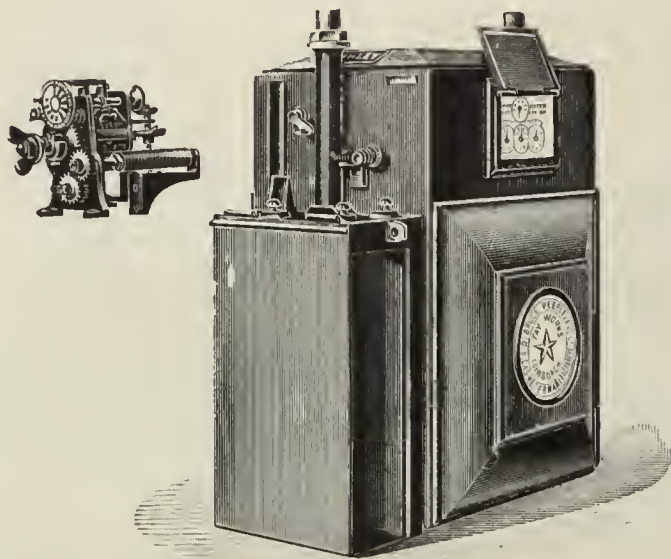
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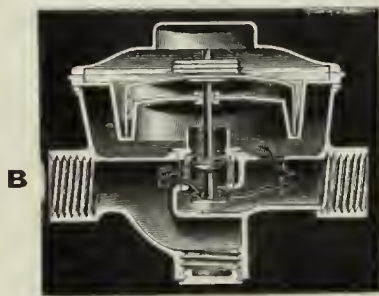
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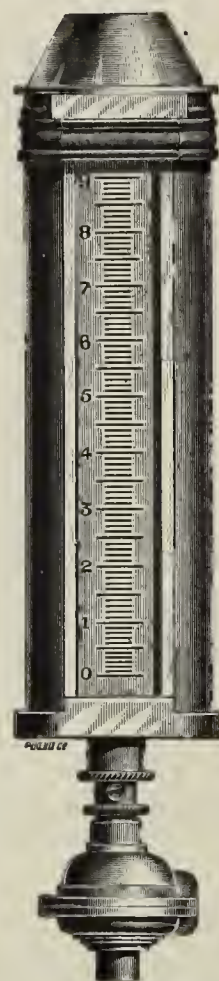
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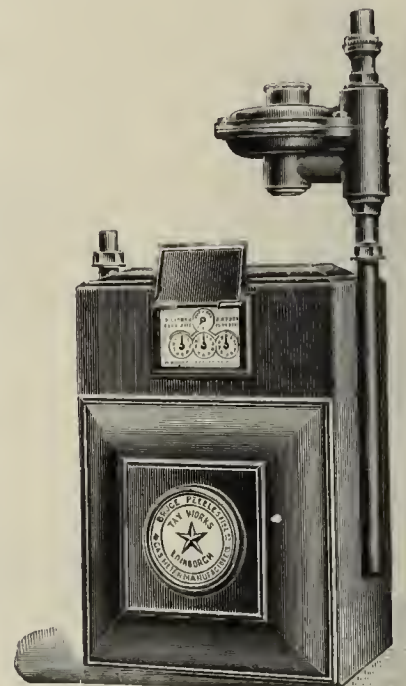
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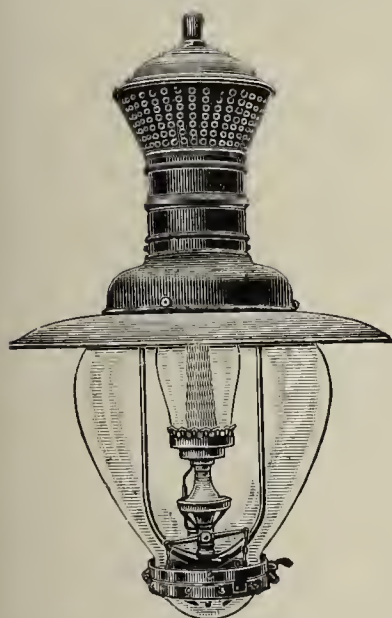
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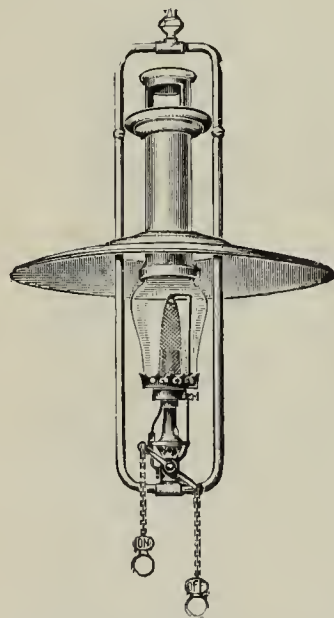
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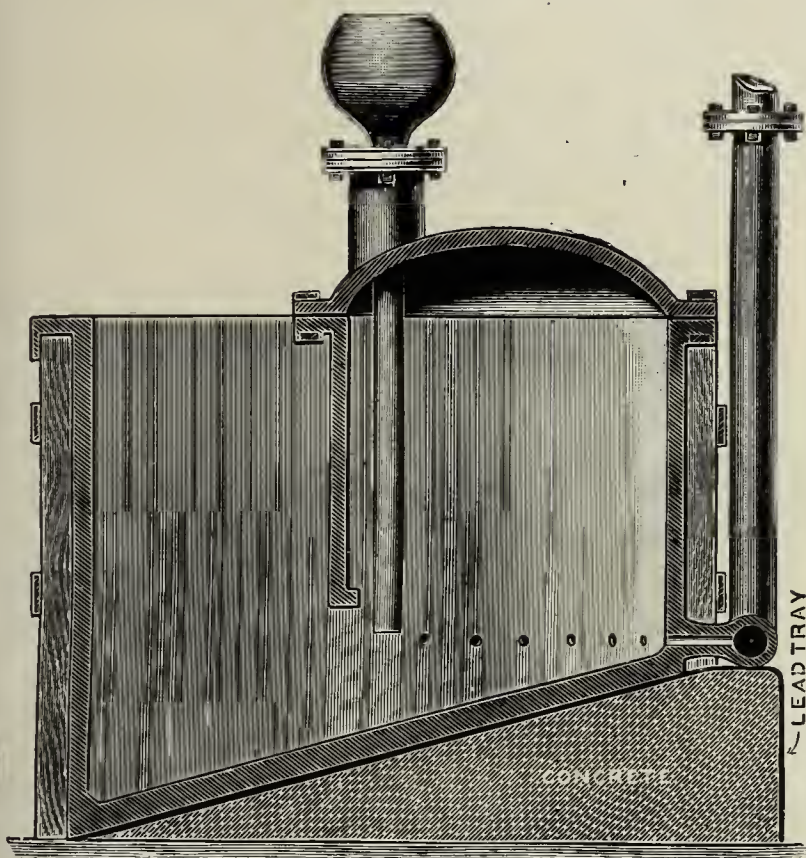
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Allenstein . . .	200,000	Cracow . . .	200,000	Leiden (2) . . .	575,000	San Paulo . . .	700,000
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Antwerp . . .	1,500,000	Crefeld . . .	500,000	Lemberg . . .	260,000	Scarborough . . .	800,000
Antwerp (2) . . .	1,000,000	Crewe . . .	700,000	Lemberg (2) . . .	500,000	Scarborough (2) . . .	200,000
Ashford . . .	250,000	Croydon . . .	1,250,000	Liège . . .	1,000,000	Schwelm . . .	100,000
Augsburg . . .	425,000	Croydon (2) . . .	625,000	Liège (2) . . .	750,000	Shanghai . . .	225,000
Aylesbury . . .	150,000	Croydon (3) . . .	625,000	Lincoln . . .	500,000	Shanghai (2) . . .	225,000
Barmen . . .	500,000	Croydon (4) . . .	550,000	Liverpool . . .	3,500,000	Shanghai (3) . . .	1,600,000
Barrow . . .	300,000	Debreczin . . .	100,000	Liverpool (2) . . .	4,500,000	Southampton . . .	800,000
Barrow (2) . . .	500,000	Deventer . . .	150,000	Liverpool (3) . . .	750,000	Southampton (2) . . .	500,000
Bath . . .	1,000,000	Deventer (2) . . .	200,000	Longton . . .	600,000	Southampton (3) . . .	600,000
Belfast . . .	1,700,000	Dorking . . .	150,000	Louvain . . .	800,000	Southgate . . .	400,000
Belfast (2) . . .	4,500,000	Dublin . . .	2,000,000	Lübeck . . .	400,000	Southgate (2) . . .	500,000
Benrath . . .	125,000	Dublin (2) . . .	2,000,000	Maastricht . . .	200,000	Southport . . .	750,000
Berlin : . . .		Dublin (3) . . .	650,000	Magdeburg . . .	1,400,000	Southport (2) . . .	900,000
Charlottenburg . . .	2,500,000	Dundee . . .	1,500,000	Maidenhead . . .	225,000	South Shields . . .	650,000
Rixdorf . . .	650,000	Dunedin . . .	150,000	Maidenhead (2) . . .	225,000	Stafford . . .	500,000
Rixdorf (2) . . .	700,000	Dunedin (2) . . .	275,000	Maidstone . . .	500,000	Staines . . .	600,000
Tegel . . .	3,500,000	Durham . . .	200,000	Malines . . .	500,000	Stettin . . .	880,000
Tegel (2) . . .	6,350,000	Düsseldorf . . .	1,000,000	Malmö . . .	350,000	Stockholm . . .	1,500,000
Bilston . . .	375,000	Eastbourne . . .	1,250,000	Malta . . .	400,000	Stockholm (2) . . .	1,750,000
Birmingham : . . .		Edinburgh . . .	2,000,000	Manchester . . .	3,500,000	Stockport . . .	600,000
Nechells . . .	3,000,000	Epsom . . .	225,000	Manchester (2) . . .	3,500,000	Stockport (2) . . .	600,000
Swan Village . . .	1,500,000	Epsom (2) . . .	300,000	Manchester (3) . . .	1,500,000	Stockport (3) . . .	400,000
Windsor Str. . .	3,000,000	Essen . . .	1,400,000	Mansfield . . .	330,000	Stockton . . .	500,000
Bishop Stortford . . .	200,000	Falmouth . . .	150,000	Marlborough . . .	100,000	Swansea . . .	750,000
Bochum . . .	530,000	Faversham . . .	200,000	Mayence . . .	700,000	Swansea (2) . . .	1,000,000
Bognor . . .	100,000	Flensburg . . .	300,000	McKeesport . . .	500,000	Swansea (3) . . .	450,000
Bordentown . . .	125,000	Flensburg (2) . . .	125,000	Merthyr Tydfil . . .	300,000	Swindon . . .	300,000
Bournemouth . . .	1,000,000	Forst . . .	300,000	Middlesbrough . . .	1,250,000	Swindon (2) . . .	450,000
Bournemouth (2) . . .	500,000	Frankenthal . . .	175,000	Moscow . . .	1,000,000	Sydney . . .	1,000,000
Bremen . . .	550,000	Gas Lt. & Coke Co. : . . .		Munich . . .	1,400,000	Harbour . . .	500,000
Bremen (2) . . .	950,000	Beckton . . .	2,250,000	Namur . . .	175,000	Harbour (2) . . .	500,000
Bremen (3) . . .	850,000	Beckton (2) . . .	10,750,000	Nelson . . .	400,000	Mortlake . . .	500,000
Brentford . . .	1,200,000	Beckton (3) . . .	5,000,000	Newburgh . . .	600,000	Mortlake (2) . . .	500,000
Brentford (2) . . .	850,000	Beckton (4) . . .	2,500,000	New York . . .	5,200,000	Syracuse . . .	850,000
Brentford (3) . . .	350,000	Bromley . . .	3,750,000	Nictheroy . . .	250,000	Taunton . . .	225,000
Bridgwater . . .	200,000	Fulham . . .	2,500,000	N. Middlesex . . .	150,000	Taunton (2) . . .	350,000
Bridlington . . .	150,000	Kensal Green . . .	2,250,000	N. Middlesex (2) . . .	200,000	The Hague . . .	1,000,000
Bridlington (2) . . .	200,000	Kensal Green (2) . . .	2,250,000	N. Middlesex (3) . . .	75,000	The Hague (2) . . .	500,000
Brieg . . .	100,000	Nine Elms . . .	2,750,000	Norwich . . .	1,000,000	Tilburg . . .	400,000
Brighton . . .	1,750,000	Gablonz . . .	140,000	Norwich (2) . . .	300,000	Torquay . . .	350,000
Brighton (2) . . .	1,850,000	Gelsenkirchen . . .	175,000	Norwich (3) . . .	500,000	Torquay (2) . . .	350,000
Brighton (3) . . .	750,000	Gelsenkirchen (2) . . .	350,000	Nottingham . . .	1,000,000	Tottenham . . .	750,000
Bristol . . .	2,250,000	Geneva . . .	500,000	Nottingham (2) . . .	1,000,000	Tottenham (2) . . .	750,000
Bromley . . .	1,500,000	Gosport . . .	200,000	Nuneaton . . .	125,000	Tottenham (3) . . .	350,000
Bruges . . .	200,000	Göteborg . . .	300,000	Oberhausen . . .	175,000	Tottenham (4) . . .	1,000,000
Brussels : . . .		Göteborg (2) . . .	600,000	Oldenburg . . .	200,000	Tottenham (5) . . .	1,000,000
Anderlecht . . .	350,000	Graudenz . . .	200,000	Ostend . . .	100,000	Tottenham (6) . . .	1,250,000
Anderlecht (2) . . .	350,000	Guildford . . .	350,000	Ostend (2) . . .	200,000	Tournai . . .	700,000
Forest . . .	1,000,000	Guildford (2) . . .	200,000	Perth, W.A. . . .	125,000	Tunbridge Wells . . .	1,000,000
Koekelberg . . .	1,000,000	Haarlem . . .	850,000	Poole . . .	1,500,000	Utrecht . . .	1,000,000
St. Gilles . . .	1,000,000	Hamburg . . .	1,750,000	Poole (2) . . .	1,000,000	Utrecht (2) . . .	1,000,000
St. Josse . . .	1,000,000	Hampton Court . . .	500,000	Port Elizabeth . . .	400,000	Verviers . . .	1,000,000
St. Josse (2) . . .	600,000	Hampton Court (2) . . .	600,000	Portsmouth . . .	1,000,000	Vienna . . .	3,500,000
St. Josse (3) . . .	775,000	Hartlepool . . .	750,000	Posen . . .	450,000	Vienna (2) . . .	2,500,000
Ville . . .	750,000	Hebden Bridge . . .	200,000	Posen (2) . . .	700,000	Waltham . . .	400,000
Ville (2) . . .	750,000	Heidelberg . . .	200,000	Prague . . .	140,000	Wandsworth . . .	1,800,000
Ville (3) . . .	1,500,000	Holyoke . . .	600,000	Preston . . .	1,400,000	Watford . . .	300,000
Ville (4) . . .	350,000	Hong Kong . . .	450,000	Reading . . .	1,000,000	Watford (2) . . .	350,000
Bucarest . . .	1,100,000	Hull . . .	1,500,000	Redhill . . .	275,000	Wellington, N.Z. . . .	350,000
Budapest . . .	50,000	Hull (2) . . .	1,000,000	Redhill (2) . . .	300,000	West Bromwich . . .	550,000
Budapest (2) . . .	17,50,000	Ilford . . .	650,000	Reichenberg . . .	200,000	West Ham . . .	1,500,000
Budapest (3) . . .	200,000	Innsbruck . . .	200,000	Reichenberg (2) . . .	200,000	West Ham (2) . . .	800,000
Carlisle . . .	600,000	Ipswich . . .	750,000	Reval . . .	350,000	Weston-Mare . . .	350,000
Carlsruhe . . .	500,000	Kampen . . .	350,000	Rhymney . . .	175,000	Weston-Mare (2) . . .	350,000
Chigwell . . .	350,000	Kiel . . .	1,000,000	Romford . . .	300,000	Wexford . . .	100,000
Chorley . . .	300,000	Kiel (2) . . .	880,000	Romford (2) . . .	350,000	Wiesbaden . . .	850,000
Commercial, L'n. . .	850,000	Kolozvar . . .	100,000	Rotterdam . . .	850,000	Winchester . . .	225,000
Commercial (2) . . .	850,000	Lausanne . . .	250,000	Rotterdam (2) . . .	1,500,000	Winchester (2) . . .	125,000
Commercial (3) . . .	1,250,000	Lausanne (2) . . .	385,000	Rotterdam (3) . . .	750,000	Wolverhampton . . .	1,500,000
Commercial (4) . . .	2,000,000	Lea Bridge . . .	350,000	Rotterdam (4) . . .	750,000	Zwolle . . .	200,000
Commercial (5) . . .	800,000	Lea Bridge (2) . . .	350,000	Rotterdam (5) . . .	600,000	Zwolle (2) . . .	200,000
Copenhagen . . .	700,000	Lea Bridge (3) . . .	400,000	Rotterdam (6) . . .	2,000,000	Zwolle (3) . . .	700,000
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The Importance of Interchangeability

is impressed upon those who have to deal with cookers made in the ordinary way, by the inconvenience, delay, and expense occasioned when renewals are required. In the

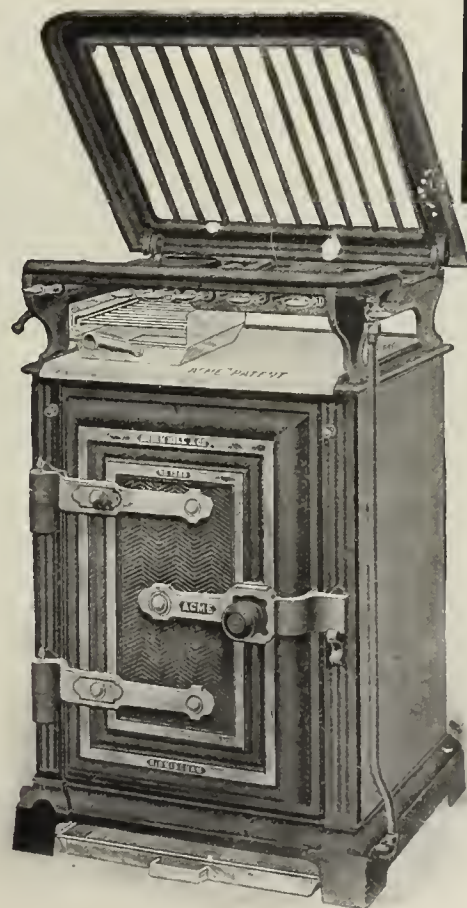
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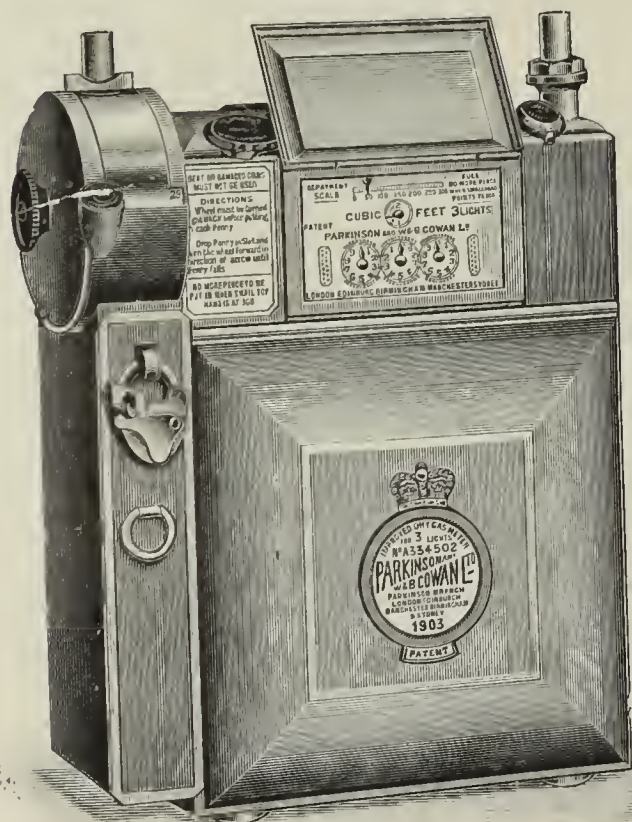
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EDITORIAL NOTES—GAS, &c.

Suction Gas—As Advertised and in Practice.

THERE is a certain class of advertisement in which a considerable amount of latitude is magnanimously allowed. As a rule, a majority of the public show a fair amount of skill and shrewdness in properly appraising the statements of the authors of such advertisements, although a still not inconsiderable proportion give as much credence to them as, for example, in mediæval times people gave to traditional superstition. A paper that Mr. R. M. Carr, the Electrical Engineer of Leek, read at the recent meeting of the Municipal Electrical Association at Brighton brings to mind a case in point. From the first, it has been patent to those technically acquainted with the subject that the cost and other claims of some of the suction and pressure gas plant manufacturers were not so comprehensive as was desirable to ensure that subsequent working results should supply testimony to the probity of the advertisements. We, as town-gas representatives, are not interested in the matter in relation to steam plant, which is the plant with which comparison is made by Mr. Carr when considering respective merits for central station working. In a measure, this gentleman may be said to be disinterested in his comparison, though, having pressure-gas plant (which has kinship with the suction-gas variety) in operation at his station, he naturally desires to make out for it the best possible case. Therefore, he can be declared free from prejudice, as against suction or pressure gas plant, in what he has written in his paper. This, from our point of point, makes certain of his statements of some value to the vendors of town gas. He gives credit to suction or pressure gas plant for securing a better thermal efficiency than is possible with steam plant; and (omitting consideration of the steam-turbine), it may be submitted, as a generally acceptable rule, that, below a certain capacity, a gas-driven electricity station costs less than one that is operated by steam, though, as the capacity increases, the figures are reversed in favour of steam. Another advantage to the small central station is that it is easier with gas-driven plant than steam plant to cater for a heating and power load. Gas-driven generating sets give a decidedly greater range in dealing with the diverse business and loads that fall upon a fortunate electricity station of the lower magnitudes in the matter of capacity.

Having made this preface to show the attitude of the author of the paper, we are at liberty to examine the parts of it in which there is for us especial interest, inasmuch as the experience of the author (who is an engineer, which the ordinary manufacturer requiring power, as a rule, is not), must also be the experience of the manufacturer who forsakes, on the seductive representations made to him, the always available town gas for the so-called cheaper suction or pressure gas plant. The adoption of this plant means the introduction of fresh trouble into a works or factory, so as to obtain the advertised lower cost per brake-horsepower. But the manufacturer is soon undeceived. Mr. Carr puts the matter bluntly when he says: The advertised figures of some of the makers of gas-engines using producer plant of the kind are "seldom, if ever, realized, under the "ordinary working conditions." Working conditions vary greatly; and it may, with a fair amount of confidence, be said that it is impossible in any factory to realize certain of the advertised results under the conditions and on the fluctuating loads that more often than not obtain, which are not in any sense the equivalent of the conditions under which the makers of the gas plants and engines would obtain the best possible out of their productions. It is admitted that the bare fuel costs of such plants are below those of a steam-driven plant of similar capacity; but there are other expenses which run up the cost of the one as compared with the other, and which have a substantial bearing upon the question of economy. Particularly is this the case in the matter of repairs and maintenance of engines which, in

Mr. Carr's opinion, will be somewhat greater, after a few years' running, for gas-engines driven by suction or pressure gas than for steam. It is clear that, employing town gas, the item of repairs and maintenance is not anything like what it would be—given similarity of age of engine, and conditions of working—using the product of suction or pressure gas plants. Moreover, with town gas, there is not any plant beyond the engine that is the equivalent of the suction or pressure gas plant for the gas-engine user to keep in order. It is not a matter altogether to be marvelled at that there is a difficulty in obtaining really reliable figures for repair and maintenance in connection with the plants under discussion.

There are other points that the author of the paper finds are not borne out in practice. Representation is made to the factory owner that the labour and attendance required for these plants are of a character that may be said to be negligible. It might almost be thought, from the statements made by some factory owners as to the representations of the "bag-men" of the makers of these plants, that a little child would suffice in the way of labour and attendance—the plant, in fact, can take care of itself if periodically fed with a few buckets of coal. It is found by Mr. Carr that a great number of the failures one has heard about are attributable to lack of knowledge and experience on the part of the attendants, and that there must be systematic and intelligent cleaning and attention generally if the plants are to be prevented from breaking down. In the paper, the misrepresentation to which allusion is made here is dealt with tenderly; but it is easy to see it is not of so insignificant a character that Mr. Carr's experience will allow him to countenance it as being of the nature of a venial sin.

The trouble from the clogging of valves by tar (a sawdust scrubber notwithstanding) is also spoken of; but this can be remedied at the expense of additional labour and time occupied in cleaning an obstructor to the tar placed near the gas-inlet to the engine. A further difficulty, involving additional labour and expense—light upon which comes after experience—is the disposal of the effluent from the washer of a producer plant. This effluent should never be turned into sewers while hot; if it is, it is certain there will be trouble. It seems that Mr. Carr has recently been taken to task by the County Council for allowing the washer effluent to find its way into a stream; but he is endeavouring to get over the difficulty by, instead of allowing the water to run away in a continuous stream, circulating it by means of a pump and tanks, and treating it with lime. This treatment has the effect "of throwing down sulphur compounds "in the form of mud," after which only a small quantity of the heated liquor is allowed to flow into the drain at intervals. There is, however, no certainty yet that this treatment and procedure will completely suppress the difficulty; but it is a trial that is being made at Leek.

It must not be supposed from this that Mr. Carr is writing against the use of suction and pressure plants. On the contrary, for his purposes—for an electricity generating station—he approves of them. But if he, a trained engineer, finds these difficulties, how much more will the factory owner, untrained and unskilled in engineering affairs, find them intensified. If, further, the managers of central electricity supply stations up to a given capacity are satisfied that suction-gas or pressure-gas driven engines are more suitable and more flexible for their use than steam-driven plants, is it not possible that, from the neighbouring gas-works, a supply of gas of even quality and purity—ensuring steady running, and avoiding the evils mentioned and others unmentioned—could be obtained at a price that would be worth paying to be free from the annoyance and expense caused by the suction or pressure gas producer? But perhaps there would be the objection to this that the use of town gas by the electricity station would be a good advertisement for the local competitor. But the fact of the use of the gas-engine remains, no matter the source of the gas. However, it is interesting to see this development of the use of gas-engines in central electricity stations, at a time

when, for the new forms of stoking machinery in gas-works—for the three acts with one machine of traversing the floor, and propelling and raising and lowering the working parts—small electric motors are found to be more serviceable and convenient than other forms of power.

High-Pressure Transmission and Out-Districts.

THERE are two themes that if both were missed in these times at any one of the annual meetings of the premier gas organizations of the world, the meeting would be looked upon as being abnormal in its technical character. The topics are carbonization and high-pressure gas distribution; and both are destined to play an important part in the economies of the gas industry and in enlarging the ability of the industry to serve. The subject of high-pressure distribution engaged the members of the German Gas Association at their recent meeting, through a paper contributed by Geh. Baurat E. Blum; and an abbreviated translation of the communication was published by us last week. High-pressure distribution schemes on the lines of the systems described by Herr Blum have of late been commanding the attention of gas engineers at home, especially the Tyne-mouth schemes carried out by Mr. William Hardie, whose communication upon the subject to our columns and the detailed particulars supplied in a paper to the North of England Association by Mr. F. C. Willis, are valuable contributions to the technical literature treating of this matter. The paper, however, that is fresh before us—that by Herr Blum—not only imparts information, but it throws further light upon the strenuous application of our German gas-engineering friends in their admirable intention to be second to none in the matter of gas achievement.

They early appreciated the economies of high-pressure distribution, and how the system widened the horizon of the gas engineer. They quickly saw that it placed a valuable commercial asset in their hands by enabling them to push out their business boundaries, and so to economically incorporate outlying townships and areas. The economy does not end with the initial cheapness with which districts can be linked-up with a distant gas-works through a high-pressure system. Outlying areas of the kind in mind are difficult of approach for heavy goods such as coal; and therefore carriage to them is often very expensive. The capital, manufacturing, and administrative expenses of a small isolated works for such areas are greater per unit of output than are those for a works the operations of which are on a larger scale. Generally speaking, too, the increments of business to be picked up in surrounding areas by the latter gas-works contribute to their economical operation. Therefore, from whichever way viewed, high-pressure distribution is synonymous with economy, and, through its aid, we shall, as time progresses, see the process of the centralization of gas production greatly developed. Furthermore, it largely increases the resources and power of a progressive and economically managed gas concern; and, in themselves, the high-pressure main and the pressure-raiser constitute a reserve which no low-pressure main, simply controlled by holder pressure and governors, can claim. The high-pressure main that carries a pressure sufficient for the needs of to-day will, as the demand for gas increases, have its carrying capacity increased by the simple means of raising the pressure of the gas. This has all been fully realized by German gas engineers; and the larger works have been silently but rapidly making use of the growing knowledge in linking-up the out-townships to the central gas-producing establishments.

At home, the electrical industry has been, through the power companies in certain quarters of the country, essaying much the same sort of thing. But the power companies are at a disadvantage compared with gas undertakings, in that they are comparatively modern creations, and their capital expenditure is heavy—in fact, in electricity supply generally, the capital expenditure on the basis of “per consumer” or given volume of business done is heavier than in the case of gas. However, the electrical industry is keeping close observation on the outer and rural areas; and it is looking (this apart from the power companies) to being allowed the facility of feeding these areas by the cheap system of transmission provided by overhead wires. The Government Departments do not like the idea; but periodically there are fresh attempts made to obtain sanction to some such system. There are also the coke-oven owners who are keen on marketing their gas by the aid of high-pressure

transmission. There is in the paper further discussion of the coke-oven gas question. But the main point is that to be first in the field is an important consideration which gas engineers will keep in sight. With the advantage of high-pressure gas transmission at command, the work of bringing into business communication the outer districts is greatly facilitated; and there should be no hesitation if the present conditions or immediate prospects warrant.

In this paper of Herr Blum, there is not technically a great deal beyond the descriptive part, and the record of progress in Germany, that was not formerly in possession. He finds a useful place in high-pressure practices for both turbo-blowers and compressors, and emphasizes the necessity of good automatic control and regulation, so that the quantity of gas transmitted corresponds constantly with the consumption. There are many interesting problems surrounding this question of automatic regulation; and it is a subject that will engage more and more attention. Among other subsidiary points, he touches upon the controversial one as to the effect of high pressures upon illuminating power and calorific power. There is just the spice of dogmatism in the remark: “The old idea that illuminating power suffers through high compression is no longer tenable.” Continental investigations confirm Herr Blum; investigations in America and in this country, so far as they have been conducted, do not. What has been found here (further experiments are, we hope, being made to corroborate or reject past findings) is that illuminating power suffers some deterioration, and calorific power to a less degree—in fact, the latter is almost of negligible quantity. It is, however, an interesting point upon which further experiment—under various conditions of pressure and with straight coal gas and mixtures of coal and carburetted water gas—will be useful and interesting.

Another point raised in the paper is the importance of gas that is to be transmitted at high pressures being free, or comparatively free, from naphthalene; and naturally this led Herr Blum to establish a compatibility between the low naphthalene content of vertical retort gas and high-pressure transmission. The risk that Herr Blum sees is not of naphthalene stoppages effected by condensation from the gas by the cooling of the compressor (which is never so effective as to prevent a slight rise of temperature of the compressed gas), but of cooling *after* it has been compressed. It is quite easy to realize the trouble that the separation of naphthalene might cause in a long-distance main controlling the supply of an entire district, in addition to the smaller drawbacks of deposits lessening the carrying capacity of the main, or producing some considerable pressure loss by the friction caused by naphthalene-coated mains. The chief value of Herr Blum's paper lies in its suggestiveness.

A Pipe Contract and Want of Candour.

THE litigation in which the Staveley Coal and Iron Company and the Lincoln Corporation have been involved in connection with claims made in respect of a pipe contract, has ended, in an almost dramatic fashion, by the complete surrender of the former. The Lincoln Corporation have been fully justified; and the Staveley Coal and Iron Company frankly acknowledge that, in this matter, through an attempt on the part of some one or more persons connected with their staff to cover the more than ordinarily numerous rejections of pipes by the Lincoln Corporation representatives, there has been fraudulent proceeding within the works unknown to the management. The fraud committed, and now acknowledged, was that the numbers of certain rejected pipes had been tampered with by the alteration of the terminal figures, and the pipes thereafter sent forward to Lincoln as having been passed by the Inspector. The allegation was a serious one, so serious that (attaching to a Company of the reputation of the Staveley) the limits of a single contract could hardly embrace the mischief that such an indictment would inflict. The confidence of the Lincoln Corporation in the matter, however, under such circumstances, is a very striking feature of the case; and in the prospective interests of the Staveley Company, it is to be deplored that there had been such an effective covering up of the tracks of the fraud that it was not found out by the management before being brought into open Court. Six sittings were occupied before information came to the knowledge of the management that induced them to take the only course open to them—admit the complete truth of the allegations of the Corporation, acknow-

ledge that the management had been wholly deceived, pay the Corporation £3000 under their counterclaim, and bear the whole of the costs of the action. These costs will amount to several thousands of pounds if Sir Edward Carson's estimate of £3 10s. a minute is correct; and all this, and all the trouble and worry, because someone on the staff, to preserve his own skin, had not the candour to admit a fault. Such a course, too, would have saved the reputation of the Company from being dragged in the mire. No one will believe that the management of the Staveley Company were cognizant of the fraud; but affairs of this kind have a way of leaving behind some indelible marks. That is the cruellest part of the business for a Company of such standing. But was the investigation of the charges sufficiently severe, under the circumstances, before entering upon litigation?

Seismic Disturbances and Gas-Mains.

It is something for which British gas engineers may be grateful that they are not subject to the property and nerve-wrecking disturbances to which some of their *confrères* are, through earthquakes, in more distant parts of the earth. There have been of late years the earthquakes in San Francisco, Valparaiso, and Messina, which have played sad havoc with the plant of the gas undertakings. Then there has been the more recent one in Mexico, which has fortunately not had any really serious effects on the Gas Company's property. One reason for this is that (as explained by Mr. Charles D. Lamson in an article reproduced by us from an American gas contemporary), in laying out the works and plant, special provision was made to meet any subterranean visitation of the kind; but a still further reason may have been that Mexico escaped such severe disturbances as were experienced by San Francisco and the other places mentioned. However that may be, the Mexican National Gas Company had stresses and strains put upon their manufacturing and distributing plant which proved that, to the extent of the violent test, the precautionary measures taken in designing the plant and distributory system were efficient and sufficient. The experience will be useful in other countries prone to seismic disturbances; and not altogether valueless in places where mains are subject to a great deal of vibratory motion. In our great cities and towns, the gas canalization is subject to more vibration than a few years since, through the altered character of the traffic—higher speeds and heavier weights having now to be taken into account. It speaks well for the sound methods originally adopted in laying the distribution systems that so little additional unaccounted-for gas has been experienced in consequence of the changed conditions in respect of road usage. There are worse enemies of gas and water pipes below the surface of the roadway than the vibrations and stresses set up from the surface.

The description in Mr. Lamson's article of the precautionary methods adopted is instructive. Flexibility is the pre-eminent safeguard. It is found freely on the works, and equally so in the district. On works, pipes are constructed of riveted steel plate, and are carried on hanger supports and roller bearings, while there is liberal use made of expansion joints at points of connection. The guide-rollers on the gasholders have also springs behind them which allow of plenty of play to the lifts. In the district the low-pressure pipes are of cast iron with bell and spigot joints; the only difference from ordinary practice in respect of these appears to be in the yarning and leading of the joints. The difference is not explained in detail; and it would be interesting to know more as to what really constitutes the variation in practice. The high-pressure pipes are freely fitted with expansion joints—on the average about eight to the mile; and these are placed in chambers so as to be easy of periodical inspection and repair. Previous investigators have advocated a telescopic form of pipe-joint for the purpose of meeting the longitudinal strains to which pipes are subject under similar circumstances. There is one thing that Mr. Lamson's instructive article lacks, and that is a brief descriptive interpretation of terms—such for example as "expansion joint." To distributing engineers at a distance, it would be helpful to know that what they have in mind from pure conjecture as the type used is the actual thing employed. For bends in a line of pipes, Mr. Lamson finds from this Mexican experience that a good radius is the best with long joints. The point in the distribution system at which the greatest damage was done by the earthquake was where service connection is made

with the mains. What is advised where services are tapped into mains is the use of brass elbows and service tees put together with graphite and oil applied to the male threads. These, it is said, will give absolute insurance against ruptured mains and sheared service-pipes. The conclusions at the end of the article sum up the instruction to be derived from it.

Practical Street Lighting.

It was a practical paper that Mr. H. E. Copp, of West Bromwich, read at the recent meeting of the Institution of Municipal and County Engineers, on the subject of street lighting. It was a paper that was not written for gas or electrical engineers, but for municipal engineers, who, while they have in most cases a considerable amount of influence in the matter of the lighting of our public thoroughfares, have not the same opportunities, owing to the multifarious duties devolving upon them, of making so close a study of the important details of the subject as gas and electrical engineers. The occasion for the presentation of a paper of the kind was a good one; and it reminds that, some time since, attention was called in these columns to the fact that gas men do not (as do electrical engineers and the makers of producer-gas plants) make sufficient use of the platforms of societies unassociated with the gas industry, but the members of which can, if kept informed of the advances of the applications of gas, be influentially useful to the industry. The members of the Institution of Municipal and County Engineers will, as the result of Mr. Copp's paper, have left the meeting, and travelled to their several spheres of action, fully impressed with the facts that for public-lighting purposes gas is well in front, and that its potentialities are such that the last word upon its advances will not be uttered in any immediate period, if ever. It is to be hoped that work of this kind among technical organizations not directly connected with the industry, but having influence on its trading, will be pursued with greater diligence in future.

Upon the subject-matter of Mr. Copp's paper, there is not a great deal to be said, seeing that it is very much, if not completely in every minor matter, in accord with the opinions generally held in the industry. Two points are very clear. The first is that the municipal and county engineers are not so thoroughly versed as they should be in the utility of the inverted gas-burner compared with the upright for ordinary street lighting. This is a matter that gas engineers should at once seek to correct. Few among those who were at the meeting had, prior to Mr. Copp's paper, any notion as to the economies of inverted burners, both in gas and mantle consumption. The figures regarding mantles that Mr. Copp gave, show that, in a lantern he has designed—by which he utilizes the misdirected rays from an inverted burner, and redirects them where they are required—the use of mantles only averages four per annum, as compared with 8·3 with the old "C" upright burner. There is another point that it is plain is taking strong hold of municipal engineers, and that is the uneconomy of the lamplighter, through the necessity of an early commencement of lighting and a late ending of extinguishing by the individual treatment of the lamps, as well as the delay that is occasioned in lighting-up under such exigent conditions as sudden fogs. Where automatic means are not adopted for doing the work—either by pressure or by clock-work control—there is no doubt that gas lighting, in this one respect, shows up unfavourably, in the public eye, in contrast with electricity. Sooner or later, through force of circumstances, the lamplighter will have to go.

Education and Training of Engineers.

Since the conference arranged by the Institution of Civil Engineers on the subject of the education and training of engineers, there has been in the technical and daily press a considerable addition to the outflow of the occasion. But from all the comment passed upon the proceedings, it is difficult to find very much in the way of hopefulness of any real good coming out of the proceedings. On the contrary, most writers, whatever they may have felt, have been careful not to say so in unequivocal terms. The impression that the proceedings made upon us was that it had been a fine opportunity for showing that the ideas and views existing on the subject are so varied and hostile that any selection and synthesis of ideas into a generally acceptable scheme would be quite out of the question. The views expressed in our

columns have the endorsement of the Engineering Correspondent of the "Daily Telegraph." He remarks: "In the matter of training for engineers, we shall never reach finality; and it is doubtful whether we shall ever reach a time when everyone is agreed as to the best method to be pursued. Indeed, it is probably undesirable that either of these things should take place. About 150 engineers discussed the subject, and almost as many different plans and opinions were suggested. The parent anxious to place his son into engineering work may well be advised not to read the report of the proceedings, or he will, indeed, wonder what is the best way to set about the matter."

The Trades Union Congress.

The greatness of the changes wrought by time is the subject of frequent reflection in connection with many matters—but not with regard to the programme of the Annual Trades Union Congress, which does not exhibit any very pronounced tendency towards wide variation as the years go by. The *agenda* for the forthcoming gathering—which will take place at Newcastle-on-Tyne during the first week in September—bears in some respects a strong family likeness to its predecessors; but we are told that the number of resolutions to be considered shows a slight increase on those dealt with last year. It may be imagined that many people will confidently assert that they can readily perceive the reason for, and the unreasonableness of, at any rate the one which desires the congress to state that, "realizing that militarism and the existence of a regular standing army constitute a menace to popular liberty, it is of opinion that the time has arrived for the institution of a real citizen army, free entirely from military law during time of peace, officered entirely by the selection of the rank and file, and to be used for defensive purposes only." Then a smaller matter will be dealt with in a motion calling attention to the "want of civility and the careless way in which the Registrar-General's department is conducted when dealing with Trade Societies on the registration of rules;" while other delegates will suggest that, as the extensive powers exercised by the higher permanent officials in the Government departments is detrimental to the democratic progress of the nation, it is essential that the business of each department should be controlled by a Standing Committee representative of all parties, elected periodically from the House of Commons. There is a suggestion that the Government should be approached, with the idea of persuading them to appoint a Royal Commission or a Parliamentary Committee to inquire into the whole field of industrial life assurance, with a view to its nationalization. A resolution of the "Practice principles" order is that which recommends that all Trade Unionists should wear only those boots and shoes which bear the Trade Union stamp. The National Insurance Bill forms the subject of a number of motions; and there have been placed on the *agenda* no less than five propositions relating to mines. The appointment of a Commission is to be asked for to inquire into the operation of the Workmen's Compensation Act from the point of view of its effect upon unemployment, especially as concerning workmen advanced in years, through the higher premiums required by the Insurance Companies. The resolution favouring the nationalization of railways and canals we have met with before; but a less familiar, though quite as ambitious, idea is that of the Parliamentary Committee—to ask for a Royal Commission "to inquire generally into the present method of administering justice as between plaintiff and defendant."

Competitive Prizes Offered by the Société Technique du Gaz.

We are again reminded by a circular received from the French Gas Society of the different classes of competitions, available to all, offered for the year 1911-12. They are for nearly all kinds of apparatus showing marked progress (1) in apparatus for gas manufacture; (2) in the industrial and domestic use of gas; (3) incandescent burners; (4) automatic distance lighting; (5) poor-gas or water-gas producers; and (6) for industrial or domestic apparatus for using gas coke. The last-named class is provided by the Comité Central des Cokes de France, which offers four prizes, one of 5000 frs., a second of 3000 frs., and two of 1000 frs. each. We should imagine that, in view of recent improvements made by certain English manufacturers in industrial and high-pressure gas apparatus, some British competitors ought to be forthcoming with a reasonable chance of success in some one or other of these categories. Full particulars can be obtained from the Société Technique du Gaz at No. 94, Rue Saint Lazare, Paris.

GAS STOCK AND SHARE MARKET.

(For Stock and Share List, see p. 195.)

TAKEN all round, the Stock Markets had a much more pleasant period last week than the week before. It had one big black spot in the weakness of Consols, which created a record for themselves by falling on Tuesday to $78\frac{3}{16}$ —the lowest price touched since they became a $2\frac{1}{2}$ per cent. stock. Happily, this price would seem to have cleared off the last of a large block awaiting liquidation, and a rapid move upward set in. Apart from the premier security, the general tone was cheerful, and the settlement produced no anxiety. The opening day was fair in most lines. Rails were rather buoyant; Americans stronger; the Foreign Market calm and steady. But Consols fell to $78\frac{1}{16}$. On Tuesday, they were down to $78\frac{3}{16}$, as stated above; and other of the gilt-edged class were unsettled in sympathy. But the other leading departments bore up very well. Wednesday brightened up considerably after the passing of the storm cloud; even the much tried Government issues being cheerful. Prices rose everywhere; Consols gaining $\frac{3}{16}$. Rails were strong and full of rise; and the chief markets participated. Thursday was another happy day. Consols improved $\frac{5}{16}$; and Rails continued to advance. Friday produced a good bit of profit-snatching after the sharp rises, and Consols were rather knocked about by some professional operations. Rails also suffered to a less extent. Saturday was very quiet; but the tone was pretty good. Consols were firmer at $78\frac{7}{16}$ - $79\frac{1}{16}$; Rails and other chief markets were generally firm. In the Money Market, the supply was superabundant, and could only find employment at very cheap rates. Discount terms were easier. In the Gas Market, business was moderate only—suffering perhaps from the extreme heat of the weather. The general tendency was firm and unmoved, with but few changes in quotation. In Gaslight and Coke issues, transactions in the ordinary were below the average. But prices were very steady; being within the same limits as the week before— $106\frac{3}{4}$ - $107\frac{1}{2}$. The secured issues were rather more brisk; the maximum making from $85\frac{3}{4}$ to 87, the preference from $103\frac{1}{2}$ to $104\frac{1}{2}$, and the debenture $78\frac{3}{4}$. South Metropolitan continued quiet and unchanged, realizing from 119 to $120\frac{1}{4}$. In Commercial, the 4 per cent. changed hands at from 114 to $115\frac{1}{2}$, the $3\frac{1}{2}$ per cent. at $108\frac{1}{4}$ and 109, and the debenture at $76\frac{1}{2}$. Among the Suburban and Provincial group, Alliance and Dublin was done at $83\frac{7}{8}$, Brentford new at $205\frac{1}{2}$ (with a nominal quotation of 200-210), Brighton ordinary at 160, South Suburban at $120\frac{3}{8}$, Tottenham "B" at 118, and (on the local Exchange) Liverpool "A" at 216. In the Continental companies, Imperial was very quiet and rather easier at $183\frac{1}{2}$ to $184\frac{1}{2}$, Union realized $94\frac{1}{4}$, and European $19\frac{5}{8}$ and $19\frac{3}{4}$. Among the undertakings of the remoter world, Bombay fully-paid changed hands at $6\frac{5}{16}$, Cape Town debenture at 80, Primitiva at $71\frac{7}{8}$ to $7\frac{3}{8}$, ditto preference at $51\frac{5}{8}$ to $51\frac{7}{8}$, ditto debenture at $97\frac{1}{8}$ and $97\frac{1}{4}$, River Plate debenture at $95\frac{1}{4}$ and 96, San Paulo at $21\frac{1}{2}$ and $21\frac{3}{8}$, and ditto preference at $12\frac{1}{4}$.

ELECTRICITY SUPPLY MEMORANDA.

A Discovery by the "Electrical Times"—Chairman and Engineer—Profits and Other Topics—The Wiring Barrier—Depth of the Mark of the Electrical Illuminations—Up Against the British Gas-Engine Makers—Costs.

THE "Electrical Times" appears to be the first among the electrical papers to discover there is anything worth writing about in connection with the lighting and power arrangements at the Crystal Palace. The heading to the descriptive article that it has published is "Electric Lighting at the Festival of Empire"—not "High Pressure Gas and Electric Lighting and Power." The writer of the article just manages to screw out the information that the North Nave of the Palace is illuminated by high-pressure gas-lamps; but the fact that the whole of the main lighting of the exhibition grounds is also by high-pressure gas-lamps, representing a total of 657,000-candle power (exclusive of the 107,600 candle power in the North Nave and Side Courts, and that of the lamps outside the Palace), seems to have been lost in the deep recesses of his mind in the strain occasioned by having to keep electricity in the forefront. Not overmuch is said as to the point that the whole of the electricity required in the exhibition buildings and grounds proper, save in the Canadian section, is supplied by gas-driven electric plant put in by the South Suburban Gas Company. In reading the article, too, we have missed—we hope not inadvertently—any reference to the fact that this same gas-driven plant furnishes the whole of the energy required by the "All Red Route." The fact has also been overlooked that the gas-driven electric generating plant represents the result of competition between the local Gas Company and the local electric supply undertakings. We see from the article that it is proposed to have an official inspection of the lighting and power equipment as soon as the plant in the power house is in full commission. When electrical journalistic friends make this inspection, they may—we think with all modesty—find some useful assistance in the descriptive article in the "JOURNAL" for May 16 last. At any rate, perhaps they will favour the gas industry by not omitting the points to which we have alluded, and moreover not fail to give honour to whom honour is due. It is remarked that the "Electrical

Times" states that the power house was put down by the South Suburban Gas Company, to the designs of Mr. Albion T. Snell, the Consulting Engineer to the Festival. Mr. Snell, we are sure, would be the last to wish that undeserved honour should be placed upon him by the other electrical papers; and therefore, if those papers will consult the plan printed on p. 443 of our issue for May 16, they can rectify to the full the error of their electrical contemporary. At any rate, drawings for the power house were prepared elsewhere than in the office of Mr. Albion T. Snell. How our contemporary came to make the blunder is a mystery. [Since this was put in type, we see the "Electrical Times" has made, in an unpretentious paragraph, the *amende honorable*.]

Returning to the proceedings at the Brighton meeting of the Incorporated Municipal Electrical Association, it is found that there is a large amount of dissatisfaction with the quality of the papers on this occasion; and wise counsellors have come to the front advising the Council as to what they should do in future. This external interest must give the Council much joy. One of the papers read was by Mr. Councillor Leese, the Chairman of the Stoke-on-Trent Electricity Committee; and his method of dealing with certain points seems to have grated on the ears of the municipal electrical engineers present—so much so, that he was asked point-blank whether he found any use for an electrical engineer in running the concern for which he is responsible head. Mr. F. Ayton (of Ipswich), for example—the "Electrician" says—took Councillor Leese severely to task for abrogating [*sic*] to himself, as he thought, the duties of chief engineer. This was not very generous; and it was not courteous. When a Chairman is speaking as Mr. Leese was doing, it must be taken that he is doing so from the responsible position in which he has been placed. We doubt not that Mr. Leese would be the last person to arrogate to himself a knowledge on technical matters superior to that of the Engineer with whom he works, and that he would admit that his views on technical questions are moulded entirely by the advice of the Engineer. There ought to be ability, from the knowledge generally possessed by engineers, to judge of the actual weight to be attached to words employed by one in the position of Mr. Leese. His paper was on "Electricity Supply Viewed from the Municipal Committee's Standpoint."

The communication contained some sound reasoning and argument. Mr. Leese is against profits going to the rates. On the great federation of Potteries towns (of which Stoke-on-Trent is a component), Parliament put an end to the profits being diverted to that object; and a good thing too. Mr. Leese pointed out one way in which injustice is done by electricity profits being used for lightening the rates. Take, as an instance, a large manufacturer who is using a considerable quantity of energy at the lowest fraction of a penny at which the Committee supply for power purposes. He is obtaining a large personal benefit from this, and yet his rateable value being heavy, he gets one of the biggest pulls out of any electrical profit appropriation in aid of the rates. Incidentally, Mr. Leese is not of opinion that charges for power are correctly determined. He thinks that they should be compounded of the costs of generation added to the cost of distribution in each individual case. One manufacturer may be quite close to the generating station, while another may be a considerable distance from it; and the one at a distance may be the cause of an expensive line of cable being needed. Among the speakers was Alderman Pearson, of Bristol; and he says it is found necessary there to "cut" prices for electricity for power, in order to compete with steam and gas. This frank acknowledgment is worthy of Alderman Pearson, who has in the past been subject to much criticism both in and out of Bristol. As to the disposal of profits (where there are any), there was general agreement that they should be used for the benefit of the undertaking and the consumers. Mr. Councillor Good, of Maidenhead, thought profits should be divided equally between the reserve fund, the consumers, and the reduction of charges for street lighting. On the other hand, Alderman Smith, of Liverpool, was against allocating profits made from private consumers to street lighting, more especially seeing that the charges for current for street lighting are already low. Electricity suppliers find the charges have to be low in order to compete with gas, notwithstanding the queer assertions that, at much higher prices per unit, electricity is cheaper than gas for private lighting. It is difficult to reconcile electrical arguments. Alderman Smith was also against Electricity Departments having control of the street lighting. The remark it was stated was met with a "chorus of groans." The selfishness of Electricity Departments was expressed by those groans. It does not conduce to good administration where there is competition for a public service, for one of the competitors to be both seller and purchaser, and to have control of the service in question. There was also some talk in connection with this paper as to the encouragement of electricity for cooking and heating. We heard again about the cables in many streets being insufficient for transient heavy loads when cooking might be in progress at the same hour. Combining with the heavy capital expenditure that would be necessitated for new cables, the fact that (according to Mr. Leese) cooking-ovens costing £5 each are flimsy things, and that a price of £10 puts the electric oven out of the running with the first expense for a gas-cooker, the big development of this business that the electricity engineer says he would like is beyond the range of practicability.

There is only one more barrier to be negotiated before the electrical industry enters into full possession of the lighting field. At least so we gather from a paper on wiring methods by Mr. J. W.

Beauchamp read at the same meeting. Being Chief Electrical Engineer of the Tunbridge Wells electricity undertaking, Mr. Beauchamp ought to know all about it. But it is obvious he is a long way in arrears in his knowledge of the history of the relations between the gas and electrical industry. That omniscient paper the "Electrical Review" long since was gloating over the death struggles of the gas industry in the last ditch, and nothing was then said about a barrier. However, we live; and, living, learn. At the same time, we do not accept all as gospel that has electrical origin. However, the last barrier, we are now informed, to the universal introduction of electric lighting, is the cost of wiring; and the electrical industry is asked to concentrate its thought and talents upon this point. But the paper and the discussion on it do not throw much guiding light on the path to be taken, which path, it is acknowledged, is beset with difficulties. The present wiring rules, the confident Mr. Beauchamp says, in effect, are all too complicated. Something simple has to be found in the way of a specification; and, when found, there must be insistence on its strict observance. There have been a multitude of schemes elbowing each other about in the electrical market place, all purporting to be good and conducive to cheap installation. But there does not appear to be anything yet—not even the much-lauded Stannos system—that is altogether free from fault and cheap per point of lighting. Caution and wisdom are seen in a sentence appearing in a comment made by the "Review" on the subject. It says: "Wiring may *perhaps* be made more reliable than the work of the gas-fitter; but it can *never* be so simple of specification." Well the difficulties of this particular barrier are immense; and most electrical engineers acknowledge it to be so. Many are for maintaining a high quality of work, and not jeopardizing established business by descending into "jerry" work in connection with small installations. The insurance companies, too, must not be overlooked; and landlords must be educated up to looking after their own interests, and not allow electrical installations to be made that may endanger their property. But talking of landlords, there are some electrical engineers who are still hankering after getting landlords of small property to become financially responsible for wiring installations; but if landlords are foolish enough to become responsible, then they had better see that the installations are of a character that will ensure them being in useful existence at the time the payments have finished. However, about that, in Mr. Beauchamp's view, only remaining barrier. We were going to suggest that modern gas lighting presented a few others; but we will not rub in facts only too well known to those who indulge publicly in make-believe.

They have a no small conceit of themselves in some quarters. "Electrical Industries," writing on "The Lesson of the Coronation," says: "Neither the solemn ceremonials nor the Royal processions, nor the pageantry, nor the profuse decorations, have made so deep a mark as the electrical illuminations." After this we ought surely to stand before the electrical industry in the deepest humility. But what is this? Notwithstanding the depth of the mark, "the public memory is short; and the attractiveness of electrical illuminations may soon be forgotten and may remain forgotten, until some special occasion of rejoicing comes round." If this is so, then how frightfully shallow must have been the mark made upon human memory by the solemn ceremonials, the Royal processions, and the pageantry of the great occasion; and how quickly they must have faded away. Thoughts are not strikingly consecutive and in harmony in "The Lesson of the Coronation" paragraph; but the writer must feel greatly indebted to their gracious Majesties for having given the electrical industry a chance to make a deeper mark than they themselves could effect with all the gloriousness of, and ceremony attaching to, their Coronation. It is also remarked that the prophet and dispenser of good things is again at work on the "Electrician." Also writing on the illuminations, he remarks on the unfriendly attitude of the elements on the occasion towards open gas-jets. Then he proceeds: "Where an attempt was made to protect the gas-flame with small coloured globes, the result was practically the same; the rain quickly filling up the globes and effectually dousing the gas-jet." Where were these globes that were water-tight at the bottom? "Surely our gas-friends should see in these signs and portents 'the writing on the wall.' If the elements are arranged [*? arrayed*] against them in this unfriendly way, they should realize that the day of gas as an illuminant is gone." Has this funny man never found out the difference between an open gas-jet and (say) an inverted gas burner? "*We are quite prepared to give them their legitimate position for heating and cooking.*" This is really magnanimous; but the fact is that this prophet and dispenser of good things cannot help himself, though it was not such a great while ago that he was predicting the early change-over of cooking and heating to the electrical industry.

Some new generating plant is required for the Kingston-on-Thames electricity station; and, as in other quarters, there is a disposition to favour the internal combustion engine—gas or oil. The internal combustion engine has been much maligned in the electrical industry; but it is a case of the intensity of the bark not representing the degree of inimicality. The internal combustion engine, as a matter of fact, is making rapid strides in installation in the central electricity generating-stations of this country; and, as said above, Kingston-on-Thames is looking in this direction. The Chairman, Vice-Chairman, and the Electrical Engineer are proposing to have a trip to Germany to see what is to be found there in the way of internal combustion engines. According to a report in one electrical contemporary, the Chairman of the

Committee (Mr. Lambourn) stated, when the matter was before the Council, that the Committee were determined to get the best they could, and would certainly give a preference to English-made goods if they were the best. But it seems the Chairman had already made up his mind. What chance do the English-made engines stand (if he is correctly reported)? seeing that, "as far as internal combustion engines are concerned, whether gas or oil, there can be no question that Germany is far in advance of this country." What have the British gas-engine makers to say to this. The Council agreed to the proposed deputation; and we are now ruminating over the chances of the deputation coming home with a report that after all the Chairman was mistaken as to Germany being far in advance of this country?

When will electrical engineers learn more of the truth about modern gas lighting? Mr. A. Preston, the Electrical Engineer of Ammanford, writes to the "Electrical Review" on the subject of the advantages of free-wiring. He has a system under which three points are wired, and tungsten lamps with opal shades are

fitted, on a payment of 5s. and energy at 6d. per unit. For extra lamps in bedrooms, &c., 6s. has to be paid. The tenant is held responsible for the lamps, and has to put them in thorough repair on leaving the house. Now Mr. Preston contends that this is the most economical light a labourer can use, inasmuch as he can obtain five-and-a-quarter hours' light from a 32-watt lamp for 1d., while the price of gas in the district is 4s. 3d. per 1000 cubic feet. The 32-watt lamp represents about 24-candle power. The same candle power can easily be obtained with a bijou inverted incandescent burner, using $1\frac{1}{2}$ cubic feet of gas an hour; and if Mr. Preston will trouble to make the calculation, he will find that about 20 cubic feet of gas can be bought for 1d., with gas at 4s. 3d. per 1000 cubic feet, and that 20 cubic feet will feed such a burner for about 16 hours. A 50-candle power inverted burner can be run for just about eight hours on a pennyworth of gas at the 4s. 3d. price. Does Mr. Preston see anything wrong about these figures? If so, we shall be pleased to hear from him, and to discuss the matter.

GERMAN ASSOCIATION OF GAS AND WATER ENGINEERS.

Committees' Reports.

INSTRUCTIONAL AND EXPERIMENTAL GAS-WORKS.

THE following is an abstract translation of the report for the past year of the Technical Committee of the German Association which is charged with the administration of the Instructional and Experimental Works of the Association at Carlsruhe, as presented at the meeting at Dresden last month. The report is signed on behalf of the Committee by Herr F. Reichard and Professor H. Bunte, both of Carlsruhe.

Coal-Testing.

The chief work pursued at the Instructional and Experimental Works during the last year was the examination of coals typical of those carbonized in German gas-works; and this work will be continued in future. In subsequent years, however, it is intended to extend researches more in the direction of the application of gas; and a number of fundamental and preliminary investigations have already been put in hand with this object in view. In regard to the tests of gas coal, samples of the principal native and English coals used on German gas-works were provided by: The Berlin works of the Imperial Continental Gas Association, the German Continental Gas Company, the Thuringian Gas Company, the Industrial Association of German Gas-Works, the Danish Gas Company, of Flensburg, and the Corporation Gas-Works of Königsberg, Lubeck, Stuttgart, and Wiesbaden.

All told, about eighty different coals have been investigated, the greater part of which represent entirely different descriptions, though a few are of the same description from different sources. It is contemplated publishing the results of the investigations in a form accessible to the general public; but the Committee consider that a few palpable *lacunæ* should be filled, so as to make the report, when issued, as complete as possible in regard to the coals ordinarily used in German gas-works. Provisionally, therefore, they are merely publishing a list of the coals examined, in order that contributors may indicate the coals in which they are specially interested, and either receive the results already obtained in regard to them or provide samples of the coals in question for examination. The list comprises 29 different descriptions of Ruhr or Westphalian coals, 18 of Saar coals, 7 of Silesian coals, and 7 of coal from Saxony. It also includes 17 descriptions of English coal, of which 12 are classed as Durham and 5 as Yorkshire. The Durham coals are: Auckland, Boldon, Dean's Primrose, Lambton, Levenson's Wallsend, Londonderry, Low Laithes, New Levenson, New Pelaw Main, New Pelton Main, Old Pelton Main, and Wearmouth. The five Yorkshire coals are Hedwig's Pit Silkstone, John Locke's Silkstone, Star unscreened, Star nuts, and Walker. The list is tolerably complete as regards the Ruhr and Saar coals.

The practical and economical result of the investigations has already been displayed by different works taking the results of the tests into consideration in making their contracts of coal; while other gas-works have stipulated that their purchases of coal are made subject to the results of a carbonizing trial at the Experimental Gas-Works. In most cases investigations already made have afforded sufficient criteria so far as Ruhr and Saar coals were concerned. A comparatively large number of examinations were made on English coals; the proportion about corresponding to the proportion of English coal carbonized in German gas-works—viz., 25 to 30 per cent. of the total. The works having access to water carriage are those which use the bulk of English coal; but the number of varieties investigated does not even approximately represent the number of varieties coming on the German market. Having regard, however, to the importance of the coals of Upper and Lower Silesia, it is to be regretted that a larger number of representative coals from these districts have not been submitted for examination. Apparently, the works concerned do not appreciate the purpose of the investigations made at the Experimental works. Further endeavours are being made to obtain representative samples of more of these coals for examination. Apart from gas coals proper, a few other descrip-

tions of coal have been examined in regard to their possible use on gas-works and their general behaviour on distillation.

The general examinations made by the Laboratory for gas-works have increased in number; and fees amounting to about £99 have been received for this work. Some forty samples of gas coal have thus been examined in regard to calorific power and content of volatile matter; and some twenty samples of coke, in which the question was mainly a comparison of the calorific value of gas coke and oven coke. Complete confirmation was obtained that a difference in calorific power depended solely on the proportion of ash or moisture being larger or smaller, and not on the origin of the coke. The report emphasizes the necessity for the greatest care in the taking of samples submitted for examination. It is pointed out that the most careful chemical examination of the samples becomes valueless if the samples are not representative. The Laboratory has issued a statement of directions for the taking of samples, which is printed as an appendix to the report. The substance of these directions is as follows:

Instructions for Sampling.

COAL OR COKE.

The coal or coke to be examined is sampled when a waggon is being loaded or unloaded by putting on one side in a basket or bucket every twentieth or thirtieth shovelful. The coal or coke so taken must contain the same proportion of large and small lumps as the consignment. The preliminary sample thus obtained should, if the coal or coke is in large lumps, amount to at least 6 cwt. This sample is to be spread on a firm, clean floor of iron or other hard material, and broken to pieces the size of a walnut. Care must be taken that hard pieces of slate are well broken. Lumps of wood or other extraneous matter should be rejected; but slate or other natural impurities of the coal should be retained. After breaking, the coal and coke are to be thoroughly mixed and spread in a square in a layer 3 to 4 inches deep. This square is to be quartered by two diagonals. The material in two opposite triangles is to be removed, the remainder is to be broken smaller—say, to the size of hazel nuts—well mixed, and spread out and quartered in the same manner as before. The same operation is to be repeated until a quantity of about 22 lbs. remains. This is to be retained in a well-closed vessel as the sample for examination. It is to be observed in the breaking and quartering described that in no case should the largest piece weigh one four-thousandth of the total of the sample at the time. If the determination of the moisture is of great importance, the sample must be prepared quickly, and hermetically sealed. Where the proportion of water is high, it is recommended that the whole of the original sample of about 6 cwt. should be weighed with care and spread in a dry, clean place till dry, then re-weighed, and a small sample taken from the bulk. In this manner the loss of water during the subsequent preparation of the sample is avoided. If the coals are in a store heap, samples of from 50 to 65 lbs. should be taken from at least ten different places, and mixed for the preparation of the average sample. The less uniform the size of the coal, and the more varied the amount of slate and moisture contained in it, the greater should be the amount taken for the first sample, and the more carefully should the breaking and mixing be carried out in order to secure a good average final sample. Such careful sampling of coal and coke is absolutely essential.

PURIFYING MATERIAL.

The same general directions apply for sampling oxide as for sampling coal and coke; but it is easier to break up, and it is only necessary to take care that clods are smashed with the shovel. The final sample should amount to from 4 to 6½ lbs., and should be packed in a well-closed glass vessel.

TAR.

In sampling tar from wells or tank-waggons, it should be remembered that tar may differ at different levels, and almost always does so in respect of the amount of water it contains. The sample should be taken by means of a plunger consisting of a pipe of from 2 to 4 inches in diameter. This pipe is slowly pushed down through the tar. After it has passed to the bottom of the tar, the lower end is closed by a plate with the help of a cord or wire attached to it. About 22 lbs. of tar constitute a suitable quantity for a sample.

Sundry Matters Investigated.

A number of samples of materials used on gas-works and of bye-products of gas manufacture were examined, including oil for

the extraction of naphthalene, fresh and spent purifying materials, gas liquor, benzol for carburetting, lubricating oil, &c.; but no special points arose in connection with them. Many samples of tar and tar products were examined, owing largely to the recent application of tar and tar oils as fuel in internal combustion engines. In consequence of disquieting reports as to the toxic character of gasholder tank water, due to the cyanogen it contains, a series of investigations was undertaken on seven samples of such water from different works. The water was found consistently to contain a very small proportion of cyanide and sulphocyanide; the amount being so small as to afford no justification for the rumours in regard to its poisonous character. Two samples of dust taken from service pipes were found to consist of oxide of iron mixed with elementary sulphur and some Prussian blue. The dust had doubtless been produced at some time through imperfectly purified gas. A number of examinations were made on different descriptions of gas-works' testing apparatus. The Laboratory is making a detailed investigation of the types of automatic flue-gas testing apparatus in use in Germany—viz., the Ados (two types), the Okonograph, Eckardt, Pintsch, Strache's Autolysator (two types), and the Schultze-Krell. A report will be issued on these types of apparatus later.

Burners and Heating Appliances.

A number of burners, lamps, water-heaters, gas-stoves and cookers have been methodically examined with a view to ascertaining if they conformed with practical requirements. The effect of variations in the quality of the gas and of the pressure on different burners, regulating nipples, &c., is now carried out according to a routine method. The efficiency of various gas-stoves at different rates of consumption, and the influence of variations in the draught on them, were investigated experimentally. Various other investigations have been made on gas-stoves and also on water-heaters. The Association of Gas-Cooker Manufacturers has applied to the Laboratory for a set of rules for testing gas-cookers. The compilation of these rules is now in hand.

The Laboratory staff have carried out investigations at various gas-works. At Munich and Halberstadt, long period efficiency trials were made on gas-making settings. At Munich, a six days' trial was first made of the settings at the new Dachauerstrasse works; and very interesting results were obtained. In a subsequent four days' trial of the older settings at the Kirchstein works, the results of the longer trial tests made by the gas-works' management were confirmed. Thanks are expressed to several firms for gifts of apparatus to the Laboratory, either for the completion of its equipment or for the study of their working. The accounts of the Laboratory for the 15 months ending March 31 show a loss on the working which is largely due, as compared with previous years, to the cessation of a grant of £250 a year previously made by the Rhenish Westphalian Coal Syndicate, in consideration of the investigations of samples of coal furnished by it. An appendix to the report states the fees charged by the Laboratory for the more usual tests of gas-works' materials. These fees are, speaking generally, somewhat higher than those charged for the same work by technical chemists in practice in this country.

The instructional work of the Laboratory has been directed to the practical training of young gas engineers who have passed their college course. A number of such students have participated in the work of the Laboratory for a considerable time as voluntary assistants. The Laboratory has also collaborated with the Karlsruhe Technical College in eight-day courses of practical training for gas engineers given in connection with lectures at the College.

The report records the resignation of Herr F. Reichard, who has been a prominent member of the Technical Committee of the Instructional and Experimental Works since its inception. Herr Helk, having succeeded to Herr Reichard's position at the Karlsruhe Gas-Works, has been nominated a member of the Committee. The works are under the directorship of Dr. Karl Bunte, son of Professor H. Bunte, who is a member of the Technical Committee who supervise the work of the Experimental Works.

WORKING OF GAS-WORKS.

This Committee, who were first appointed at last year's meeting of the Association, have for their object the treatment of technical works and economical questions of the gas industry. At the outset, the Committee regarded the compilation of statistics of the industry and the promulgation of a uniform scheme of book-keeping for gas undertakings as the most pressing matters. The Committee held three sittings to discuss them.

An attempt had been made to obtain fundamental figures for a compilation of gas statistics for three years ending with 1909-10, relating to all German gas-works. But the result showed that no answer could be expected from many of the small gas-works to some even of the most elementary questions. For 1909, however, statistics referring to 90 per cent. of the total make of gas, emanating from about 65 per cent. of the total number of gas-works, have been collected. The question is under consideration whether a less comprehensive series of questions should be put to all gas-works after the lapse of a few years. The annual statistics, which are collected by the German Association in regard to 287 gas-works, are, however, very valuable; and with a view to increasing their usefulness and extent, the questions on which

they are based will this year be sent to all German gas-works, in the hope of eliciting replies from a greater number. The questions have been somewhat simplified by the Committee. The Central Organization for Promoting the Sale of Gas has also collected monthly data relating to the increase in the sale of gas and in the number of prepayment meters in use. These figures have been very useful to it in its work of advertising, as they indicate the new and vigorous activity of the gas industry.

In the task of evolving a scheme or uniform system of book-keeping for adoption by all gas-works, great difficulties have been encountered; and while the Committee have agreed as to the necessity for the observance of certain general rules as to the writing off of depreciation &c., by all gas-works, the differences in the working conditions in different towns of Germany have so far prevented them formulating a complete scheme. Opportunity will be taken, however, to meet these difficulties, and to bring forward as soon as may be a model scheme.

The report is signed by Herr Prenger, of Cologne, the Chairman of the Committee and President of the Association. An appendix to the report summarizes some of the statistical information collected in regard to gas supply in Germany during the year 1909.

TECHNICAL INSTRUCTION COMMITTEE.

The following is a summary of the contents of the final report of the Committee appointed by the Association to investigate and report on Technical Instruction or Training. The report, which was submitted at the recent meeting in Dresden, is signed by Herr W. von Oechelhaeuser, the Chairman of the Committee.

It is announced at the outset that it was decided, at a meeting of the Committee with the Council of the Association held last March, that, in view of the facts that the District Gas Associations have now interested themselves directly with training courses for gas-works officials and foremen, and that the Instructional and Experimental Works of the Association are collaborating with the Karlsruhe Technical College and other bodies in providing courses of lectures and training, it was undesirable that this Committee should continue in existence. Their objects would be fulfilled by the Committee for the Karlsruhe works, and a multiplication of Committees was to be deprecated. Hence the Committee have not asked for re-appointment.

The report refers to the review of the work accomplished by the Committee, as given in the memorial volume published on the occasion of the jubilee of the Association two years ago [see "JOURNAL," Vol. CVII., pp. 41, 169]. The Committee have aimed, firstly, at advancing the training of gas engineers at technical colleges and, secondly, at creating and extending opportunities for the technical instruction of gas-works foremen and gas-fitters. In regard to the training of gas engineers, three different courses are provided at the Technical College at Karlsruhe. The first is an eight-term course, comprising grounding in chemistry and instruction in mechanics, electricity, and engineering as required for the practical work of a gas engineer. It is intended for students who at the outset have decided to enter the gas industry. The second course consists of two terms only, and is intended for students who, during their general engineering training, decide to specialize in gas manufacture and lighting. The third course, held at Easter time, is of fourteen days' duration, and is intended for engineers and assistants already engaged on gas-works who desire to improve their scientific and theoretical knowledge. This course is usually attended by from 35 to 40 persons. In addition to these courses at Karlsruhe, the Instructional and Experimental Works of the Association admit a certain number of students who, having finished their course at the Technical College, desire to have the opportunity of familiarizing themselves with the latest developments in the gas industry.

The Committee have prompted and collaborated in the foundation of courses of instruction for gas-works foremen and fitters, similar to those first established at Dessau, at the following places—viz., Altenburg, Aue i.S., Bremen, Breslau, Cologne, Munich, and Nuremberg. The results have proved that there is an increasing demand for such courses; and the Committee strongly recommend the District Associations, in whose districts such courses are not already provided, to endeavour to secure their provision. They also ask gas engineers to support existing classes, and to send their more promising young workmen to attend them. So much has already been accomplished in providing opportunities for technical instruction for gas engineers and fitters, and the lines on which such instruction should be afforded have been so well established, that the Committee consider that their purpose has been accomplished, and that the Committee of the Instructional and Experimental Works can now more appropriately deal with any questions as to technical training that may arise.

In conclusion, they call attention to the deficiency continuing to exist in the supply of properly trained gas-fitters, &c., and to the danger of accidents arising from fitting work being improperly executed, and recommend the District Associations and individual gas engineers to do all in their power to rectify these evils.

Masonic.—The Provincial Grand Lodge of Lincolnshire met at Lincoln on the 6th inst., when among the past grand honours conferred was that of Past Grand Warden on W. Bro. E. J. Brockway, of Cleethorpes.

PYROMETER INSTALLATION AT THE CAMBRIDGE GAS-WORKS.

THE desirability of ascertaining the working temperatures of gas-retorts has been emphasized by most up-to-date gas engineers within the past few years, and has indeed been brought forward to the front rank of interest by the recent investigations of the Refractory Materials Committee of the Institution of Gas Engineers. Hence the ingenious method lately adopted by the Cambridge Gas Company for the rapid reading of gas-retort temperatures deserves notice.

The pyrometer employed in the retort-house of this Company's works is of the well-known Féry radiation pattern, manufactured by the Cambridge Scientific Instrument Company. It was previously employed in the manner illustrated in fig. 1, where a telescope mounted on a tripod stand is sighted half-way into the



Fig. 1.—Portable Féry Radiation Pyrometer being used to take the Temperature of a Gas-Retort.

retort. Part of the heat radiating from this point strikes into the telescope, and is focussed on to a very small thermo-couple. An electro-motive force is thus generated in the couple, which causes a current to pass through and deflect a millivoltmeter connected to it. The millivoltmeter being calibrated in temperature degrees, the temperature of the retort is directly read off.

Since, however, a comparatively large number of temperature readings have to be taken each day, the new device shown in fig. 2 has been installed at the Cambridge Gas-Works so as to

avoid the re-sighting of the telescope for each new reading, and to allow of rapidity in reading off the temperature of each retort as soon as it has been discharged.

An iron runner is fixed overhead, parallel to, and in front of, the series of retort-beds. From this runner a small carriage is suspended on four wheels; and from the centre of this carriage hangs a long vertical rod on a ball-support. On this vertical rod a bracket, which holds the Féry telescope, is movable to three set positions, which are marked on the rod. These three positions correspond to the three tiers of retorts. The Féry telescope is focussed once for all half-way down the length of the retorts.

The millivoltmeter is permanently fixed at one end of the retort-house in a dust-tight box (see the extreme left-hand side of fig. 2); the scale being viewed through a window in the latter, and is illuminated by an electric light placed inside the latter. Leading from this indicator a two-way cable is attached to sockets fixed at suitable distances along the length of the retort-house (one socket to each retort-bed). A plug connection completes the circuit from the Féry telescope to the millivoltmeter; this plug being moved from one socket to another as required.

Immediately the "Pusher" is moved along from a newly-discharged retort to the next retort, the vertical rod supporting the Féry telescope is drawn along in front of the first retort—the correct position being found by observing through the sight-hole. The operator then indicates that all is ready, when the temperature is read off on the millivoltmeter and noted.

The installation is extremely neat; and, due to the rapidity with which the temperatures can be taken, it has become a systematic rule at these works to register the temperatures of all the settings in action every day. A row of retorts is taken each day; so that the temperature of every retort is obtained twice a week. When the pyrometer is not in use, the telescope with its support is run back to one end of the retort-house; and, to protect it from dust, the telescope is covered by a hood.

Fig. 3 illustrates the Féry spiral pyrometer, in which instrument the temperature-scale forms part of the telescope; so that the instrument is entirely self-contained, and no connecting leads are required. This allows the same observer to sight the telescope and read the temperature. It is largely used for taking gas-retort temperatures, though for a permanent installation the outfit previously described is more suitable.

This pyrometric installation indicates the trend of the scientific

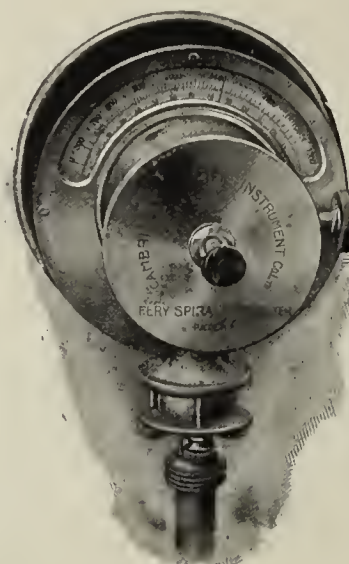


Fig. 3.—The Féry Spiral Pyrometer.



Fig. 2.—Féry Pyrometer Outfit permanently Installed at the Cambridge Gas-Works.



A—Intake Pipe from the flue. B—Soot-filter. C—Connecting piping. D—Recorder.

Fig. 4.—The “Bi-Meter CO₂ Recorder” in a Retort-House of the Cambridge Gas Company.

methods employed in the modern manufacture of gas; and it is especially to the credit of the Cambridge Gas Company that they are by no means behindhand in this movement.

Indeed, in addition to the above pyrometer, there is also installed an instrument for recording the percentage of carbon dioxide in the flue gases from the generator furnaces of one of their retort-benches. This instrument is one of the “Bi-Meter CO₂ Recorders,” of which the Cambridge Scientific Instrument Company are the sole British manufacturers.

Fig. 4 is a photograph of the actual recorder below the retort-house. The connecting piping leads to the eight beds of the retort-house, and the instrument can be connected at will to

analyze the gases in the generator furnaces of any of these beds.

The “Bi-Meter Recorder” has one great advantage which will appeal to all gas-works, in that the absorbent used for the carbon dioxide is ordinary slaked lime in the form of moist powder. The metal absorption chamber may be given to a labourer, who quickly learns how to refill it with slaked lime (necessary once every two days or so) after being instructed once or twice.

An actual record taken at the Cambridge Gas-Works is reproduced in fig. 5. The high percentage of carbon dioxide is interesting, as showing how perfect is the combustion in the retort-beds.

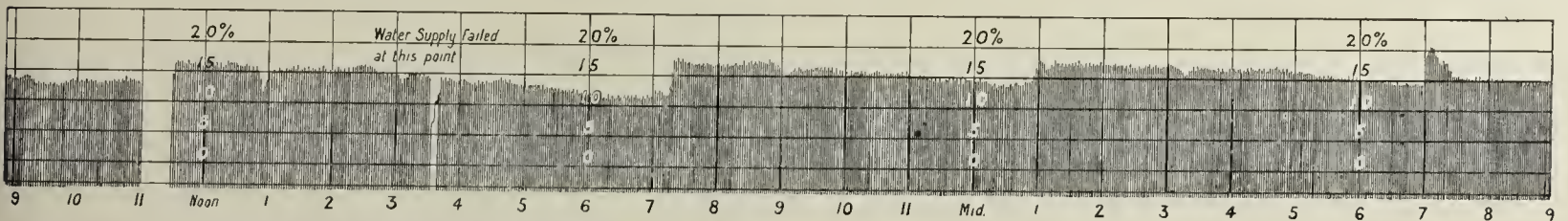


Fig. 5.—Record of Carbon Dioxide in the Flue Gases of a Retort-House of the Cambridge Gas-Works (Reproduced half-size).

CARBONIZING CONSIDERATIONS.

The Recent Vertical Retort Papers.

By T. SETTLE.

WIDER and greater interest has been raised as the result of the papers recently given on vertical retort carbonization. There is nothing complex in either data or figures set forth by the authors of the papers, yet there is a difference—as has always existed, and always will do—plainly showing that there is no standard in ideas, structural or otherwise, as applied to gas-works plants or the manufacture of gas.

Mr. Newbigging is going to put down a 4 million cubic feet vertical retort plant, where now stands a 2 million horizontal installation. Doubling the production on the same floor space is, of course, largely made up for by an increase in production of gas, ranging from 25 to 30 per cent., and, again, by the larger weight of coal carbonized per retort.

These allowances can hardly be sufficient to meet the figures for floor-space as given by Messrs. Drury and Hunt. The Sunderland bench stands on a site that is equal to 2·1 superficial feet per 1000 cubic feet of gas made—carbonizing 58½ tons of coal per 24 hours.

According to Mr. Hunt's calculations, a 250-ton plant would occupy the following minimum ground area:—

	Area Superficial Feet.
Five-metre Dessau	9,128
Woodall-Duckham	9,162
Glover-West	10,520
Horizontals	12,478

Taking as a basis the figures of production per ton given in the papers, the make per 24 hours with a 250-ton plant would be—

250-Ton Plant.	Make of Gas per 24 Hours. Cubic Feet.
Five-metre Dessau	3,149,750
Woodall-Duckham	3,169,000
Glover-West (average)	3,375,000

The above daily makes represented in superficial feet space per 1000 cubic feet made would be—

	Superficial Feet.
Five-metre Dessau	2·8
Woodall-Duckham	2·8
Glover-West	3·1

A fair basis for Mr. Hunt's 12,478 superficial feet for horizontals would be to take ten beds of horizontal retorts, 20 feet throughs (22 in. by 16 in.), carbonizing 96 tons of coal per 24 hours, at an average of 10,500 cubic feet—making 1,000,000 cubic feet per day. The space for this size of bench would be 2370 superficial feet, or 2·3 superficial feet per 1000 cubic feet of gas made—being only 0·2 per cent. less than the Sunderland figure. It becomes almost a puzzle how Mr. Newbigging is going to get 2 million cubic feet extra production of gas on only 0·8 per cent. increase of floor space, as the above figures tend to prove.

Neglecting the make per ton for the moment, the horizontal installation carbonizing 37½ tons more coal than the Sunderland bench is carried out on only 0·2 per cent. extra superficial area per 1000 cubic feet of gas made, with 1,000,000 cubic feet of gas for horizontal and 740,000 cubic feet for the Sunderland verticals in 24 hours. Mr. Hunt's figures of 12,478 cubic feet for horizontals, and 9600 cubic feet (average) for the three systems of verticals, show the latter is nearly 30 per cent. less—area for area—on gas made per 1000 cubic feet; the superficial area only varying 0·2 per cent. per 1000 cubic feet of gas made.

In regard to back-pressure in vertical retorts (charged in bulk), it has followed in all experiences, as in Mr. Drury's case—there has been a back-pressure ranging from 25·10ths to 75·10ths at the bottom of the retort, when first charged.

	Tenths.	
Dr. Bueb (1906), Dessau, gave	45	} Maximum Pressure.
Settle-Padfield (1903), Exeter, gave	75	
C. Dru Drury (1911), Sunderland, gave	65	

A writer asks in the “JOURNAL” for the 4th inst. (p. 33): “Is it not possible to provide a gas-outlet at the bottom of the (Dessau) retort, even at the expense of some structural difficulties?” It will have occurred to those having experience with continuous carbonizing processes with vertical retorts, that the provision of an outlet at the lower mouthpiece would be going back to unscien-

tific carbonization—the same as in the case of the ascension pipe being on the bottom mouthpiece of an inclined retort.

The results attending vertical retort carbonization compare favourably in volume and illuminating power obtained, as follows—

System.	Make Per Ton. Cubic Feet.	Candle Power.	
Sunderland (1911) . Dessau	12,647 ..	15'52	Aver- ages
Manchester (1911) . Glover-West. . .	13,500 ..	15'37	
Lausanne (1911) . Woodall-Duckham. .	12,676 ..	—	
Exeter (1903) . Settle-Padfield . . .	13,189 ..	14'56	
(Exeter—Average from eleven different kinds of coal.)			

Steaming the charge appears to be done only with the Dessau system; and, for this is claimed an extra 1000 cubic feet of gas per ton, with a loss on the bulk volume obtained of 0'37 candle in illuminating power. Practically, these results are confirmed at Dessau (1906) and Exeter (1904).

The Dessau system appears to stand alone in the claim that the "core" of the charge is the passage of least resistance for the travel of the gas evolved; and opinions expressed by Dr. Bueb (1906) and the writer (1903) are now fully confirmed by Mr. Drury, who finds "fissures" in the spent charges, in the same way as hollow diameters were found in the coke at Exeter when experimenting with whole charges dumped into the retort.

Mr. Drury's figures of the temperature of the gas leaving vertical and horizontal retorts at set points are given below, with some temperatures added as obtained at Exeter.

	Sunderland. Verticals. Deg. Fahr.		Horizontal. Deg. Fahr.	Exeter. Verticals. Deg. Fahr.	
Retort-lid.	815	939	..	460	Aver- ages.
Bridge-pipe	220	195	..	320	
Outlet of hydraulic main . . .	140	130	..	155	

Very little importance can be attached to temperatures, in the many recorded, in horizontal practice taken at the points given, as these vary to the extent of 66 per cent., as the different textbooks will show. The average hourly temperature of the gas evolved is important, in indicating that the gas when made is being subjected to a low, yet uniform, heat in its passage from the vertical retort. It will be seen from the following figures that the same regularity of temperature does not exist in the Dessau system, as compared with a continuous system of charging.

Hour.	Sunderland. C. Dru Drury. 1911.		Dessau. Dr. Bueb. 1906.	Exeter. T. Settle. 1903.
	Retort- Lid. Deg. Fahr.	Bridge Pipe. Deg. Fahr.	Hydraulic Main. Deg. Fahr.	Mouth- piece. Deg. Fahr.
1	568	238	157	374
2	727	252	158	590
3	750	262	149	599
4	766	274	136	504
5	753	261	135	422
6	775	268	128	419
7	792	266	133	415
8	780	254	150	410
9	776	243	143	401
10	767	235	132	338
11 Steaming. . .	780	215	135	
12 "	711	229	129	

It will be noticed that in Mr. Drury's figures there is a rise of temperature of the gas evolved from the first to the seventh hour; and in Dr. Bueb's results (1906) the temperature reaches its maximum at the end of the third hour. In the Dessau results of temperatures of gas, one point is marked with interest, in that it was not until the fourth hour after charging that the temperature of the centre of the charge exceeded the temperature of the gas evolved—

Centre of charge	370° C.
Gas evolved	318° C.

It is something to hope for that Messrs. Newbigging, Glover, and Leather will also furnish a record of temperatures of the gas hourly, with also the make and candle power in the same period of time. With these results at hand, it will be seen what degree of uniformity is obtained, and will demonstrate that continuous carbonization is the really scientific process.

Mr. Newbigging, in his paper, gives the candle power as running for five consecutive hours; and it is almost a pity the hourly makes are not included as well. These figures may be given, with some Exeter results added—

Hour.		Droylsden. Candle Power.	Exeter. Candle Power.
1	Commencement	15'20	Average 14'65
2	"	15'35	" 14'63
3	"	15'30	" 14'50
4	"	15'18	" 14'50
5	"	15'52	" 14'63
6	"	15'65	" 14'63

The uniformity of the calorific value as obtained and recorded at Droylsden, shows how remarkably constant this is; and it may be expected that the candle power will run in quite a straight and uniform a line as the calorific value does.

It would serve only one purpose to champion processes obtaining the greatest regularity of action without giving the same the support it deserves by also showing other processes for which so-called advantages are claimed. We have here some results of a chamber-oven system of carbonizing coal in bulk. The following table will be of interest as indicating the fall in make and the loss in candle power as time proceeds—

Hour.	Make Per Cent.	Candle Power. Per Cent.
1	Highest 100 ..	Highest 100
3	Dropped 30 ..	Dropped 51
6	" 37 ..	" 61
9	" 40 ..	" 58
12	" 40 ..	" 58
15	" 40 ..	" 67'5
18	" 52 ..	" 85'0
21	" 67 ..	" 94
24	" 92 ..	" Nil.

In the "full-up" retort practice, working results are scarce indeed. In one case, however, the candle power is given as the highest at the end of the first hour—20 candles. By the end of the fourth hour, the illuminating power has fallen 26 per cent.; and at the end of the eighth hour, 71'5 per cent. We have had it laid down hard and fast, for many years past, that the rate of production of gas from a charge in horizontal retorts is somewhat as follows, taking three different authorities:

Hour.	1. Per Cent. of Make.	2. Per Cent. of Make.	3. Per Cent. of Make.
1	52 ..	33'4 ..	52'0
2	34 ..	29'5 ..	34'5
3	12 ..	26'7 ..	12'0
4	2 ..	10'4 ..	1'5

Enough has been said, and results given, both for and against carbonizing systems at present in use; and it is still left open to decide what little remains to perfect and complete the scientific carbonization of coal—especially in these days, when high-standard illuminating powers are no longer considered. It is most appropriate, both in time and opportunity, to once again refer to the lecture given by Professor Lewes before the Irish Association, in 1904, when he told the members what he thought ideal carbonization should consist of, and concluded his lecture by saying: "It is at once evident that uniformity of action is really the key-note of success in any process of carbonization."

Serious Fire at the Bovisa Gas-Works, Milan.—We learn that on or about the 7th inst., at the new Bovisa works of the Union des Gaz Company at Milan, a fire broke out in the accumulated stocks of coke; some 5000 tons being affected. The efforts of the fire brigade were ineffective to put out the enormous mass involved, and their energies, with the assistance of some 200 labourers, were directed to cutting off, by means of a large trench, the remaining stock, the whole of which occupied an area of about 60 m. long by 20 m. wide by 10 m. high. It is said that the damage done amounts to about 300,000 lire (say, £12,000), and that the fire was not expected to burn itself out till Sunday last (the 16th inst.). There is, apparently, no ground for any suggestion that the fire was due in any way to the strike, but it may be that it was caused by inadequately quenching some of the drawn charges.

Coke-Oven Gas Proposed for Ostend.—The municipal authorities of Ostend were lately considering the question of reconstructing the gas-works, at a cost of about £100,000, when their attention was called to the use which has been made in Germany and the United States of coke-oven gas for light and power. According to "The Times," they have decided to demolish the existing works, and invite tenders for the supply of gas needed for a period of 26 years, about 212 million cubic feet per annum to start with, together with a supply of electricity. As no coke-ovens at present exist in the vicinity of the town, they will have to be erected by the contractors. For this purpose, the municipal authorities are prepared to let at a small rental a piece of land having an area of about 12 acres, with a frontage 900 feet long to a canal 20 feet deep, and connected with the railways, docks, and harbour.

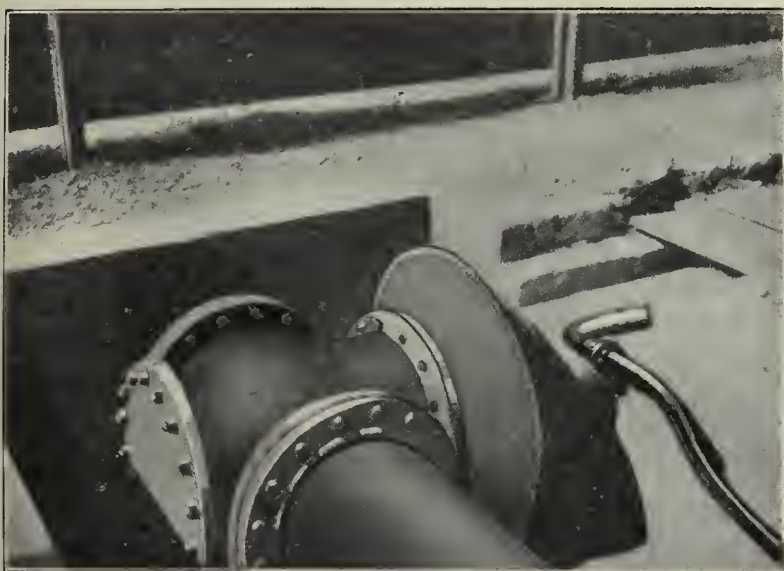
Gas Companies' Accounts for 1910.—We have received from Messrs. John Allan and Co. the "Gas World Analyses of Gas Companies' Accounts for 1910." The accounts of 54 gas companies, with makes ranging from 47 million up to 27,000 million cubic feet, are analyzed; all the items of revenue and expenditure being worked out at per 1000 cubic feet of gas sold, and the results set out on two large linen-backed sheets. On the left-hand one will be found particulars relating to the coal carbonized, the percentage of carburetted water gas produced, the quantity of gas made, sold, and unaccounted for, the yield of residuals, statistics of revenue, &c.; while on the right-hand sheet are given the distribution and management charges, bad debts, net cost of gas, mileage of mains, number of consumers and public lamps, total capital and the capital per ton and per 1000 cubic feet, and the reserve funds. Under the heading "Distribution Details," particulars are given of the test-burner; and it is interesting to note that about half the companies use the No. 2 "Metropolitan." As in the case of the "Analyses of Municipal Gas Accounts" issued early in the year, cardboard rules are supplied to facilitate comparison with figures of any of the undertakings given. The work is similar in appearance to its predecessors, and the price is 10s. 6d. net.

GAS PLANT IN AN EARTHQUAKE.

Effects in Mexico.

THE current number of the "American Gaslight Journal" opens with a special article by Mr. Charles D. Lamson on the earthquake in Mexico, and its effects upon the manufacturing and distributing plants of the Mexican National Gas Company. It is illustrated by a number of interesting reproductions of photographs; and from the accompanying descriptive matter we take the following particulars.

The earthquake which occurred at half-past four on the morning of the 7th of June, is described by Mr. Lamson as the most violent and terrifying one within the memory of the oldest inhabitant of the city of Mexico. This being the first earthquake of any consequence to visit the vicinity since the National Gas Company commenced operations, the works and plant were subjected to a test which the author says fully proved the value of the peculiar methods adopted in the installation of the machinery and connections and the laying of the mains, in so far as these methods were intended to withstand successfully the effects of earthquake shocks. It appears that in the works themselves the only damage done was to a 60,000 gallon water-tower, the underframing of which was badly twisted, and the tank rendered worthless for the time being by the inlet connection snapping off short at the point where it joined the conical-shaped bottom of the tank. It is considered that even this damage might have been avoided if the flexibility of the superstructure had not been destroyed through having been solidly bricked-up between the I-beam column supports, so as to form the walls of the pump-house. The pumps directly beneath the tank, and the steam and water connections thereto, were not disturbed in the least; this being due entirely to the use of full-sweep bends, and the avoidance of the use of fittings followed generally in making the steam and water pipe connections throughout the plant.

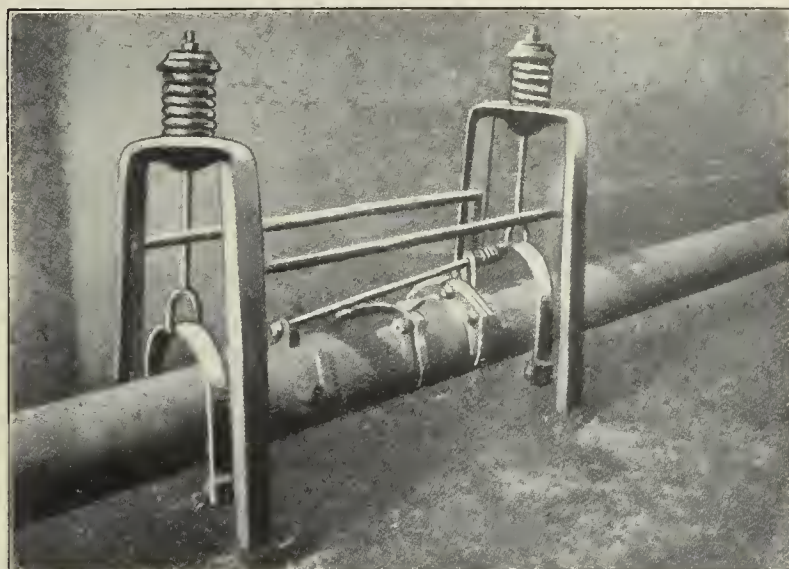


Bellows Expansion Joint to Protect Riveted Steel Pipe Lines round Works' Plant.

The main gas-piping is all of riveted steel plate, 20 and 16 inches diameter, held up by specially constructed hanger supports and roller bearings designed to take up automatically all horizontal, lateral, and perpendicular strains to which the piping, through its own gravity and the action of the spiral springs, may be subjected. Each set of apparatus, at the point of connection with the principal mains, is provided with an expansion joint, which allows the piping and apparatus to take up any motion independently of each other. Two types of expansion joint are used—one being the usual standard iron body and brass sleeve on the vertical line of pipe, and the other a wrought-iron bellows or diaphragm-shaped one, of the Company's own design and make, on the horizontal lines. Observations taken at the plant immediately after the earthquake showed the traverse made by the brass sleeves in the standard expansion joints to have varied from $2\frac{1}{2}$ to 4 inches. The expansion and contraction on the other type of joint could not be determined, as, owing to its construction, it resumed its original position without leaving anything to indicate the range of variation. As the main buildings around the plant are constructed of steel, with corrugated sides and roofing, no harm was done to the structures. The lampblack separator, the filter, and the underground water storage reservoir, being all of reinforced concrete, were likewise undamaged, though the strains to which they were subjected must have been terrific. The level of the water in the reservoir was 5 feet below the top; in the filter, 4 ft. 6 in. below the overflow. From both receptacles the water was thrown out and over the walls, flooding the surrounding yard.

Despite the shaking up, Mr. Lamson states that at no time was the gas supply shut off from the city, although for a period the pressure was reduced until the storage holder drips could be cleared to allow the booster to get a full supply. These drips

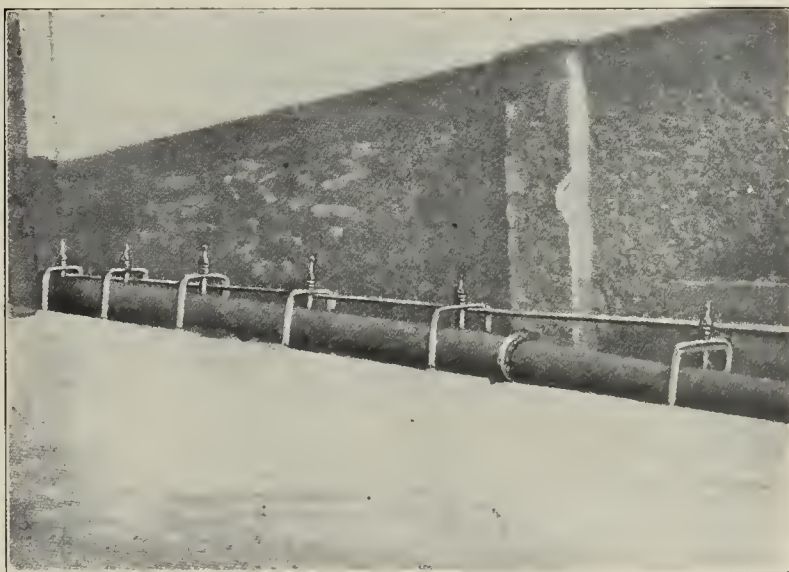
became partially sealed through the violent oscillatory motion of the water in the holder tank, which caused a slopping over into the inlet and outlet stand-pipes, and thence into the drip-pots. The normal level of the water in the gasholder tank was reduced 5 inches. As the springs behind the rollers allowed plenty of play for the holder in the guide-framing, the cups of the outer and middle lifts did not unscal.



Expansion Joint and Flexible Supports on High-Pressure Line just before same Connects with Compression Tanks. This Joint showed a Traverse of $6\frac{1}{2}$ Inches.

The distributing system is a combination one of high and low pressure; the high-pressure side being of standard wrought-iron pipe, which supplies the various sections of the city through double district governors, so placed that a uniform pressure of 36-10ths on the low-pressure side is maintained. The low-pressure mains are of cast-iron pipe (class "B") with bell-and-spigot joints, in lengths of 12 feet. At the time of the earthquake, there were in use 49 miles of mains and 73 miles of service-pipe; 42 miles of the latter being through services from main to meter, and the remainder from the main to the kerb only. The distributing system covers pretty nearly the entire area affected by the earthquake; the district that was most severely shaken being completely "gridironed" with low-pressure mains, besides having the greater part of the high-pressure line and three of the district governors within its boundaries. The system followed in laying this pipe was pretty much the same as that generally followed in the United States; the essential difference being mainly in the manner of yarning and leading the pipes.

Owing to the almost level surface of the streets, and the further fact that the telephone and electric lighting systems are supplied through underground conduits, a great many drips were necessary to avoid obstructions and to give proper drainage to the pipe-lines. To avoid the dead-weight incident to using the ordinary standard drip or syphon, and to maintain the flexibility horizontally in the line, the Company use a horizontal drip consisting of a piece of pipe from 36 to 48 inches long, and from 2 to $2\frac{1}{2}$ inches larger in diameter than the pipe to be drained. Thus a 4-inch main will



Flexible Hanger Supports on 20-Inch Main Pipe-Line at the Plant.

drain into a drip made of 10-inch pipe introduced into the run, and connected thereto by a 4 in. by 10 in. double bell; the bell of smaller diameter being cast eccentric to the larger one. The joints are made in the same way as the others in the line.

In running the high-pressure lines, expansion joints are used throughout—on an average about eight to a mile. They are set in masonry vaults, to facilitate regular inspection, and to allow of

repairs being made quickly. All turns in the lines are formed with long-sweep bands made of the pipe itself. An examination of these joints, made immediately after the earthquake, revealed the fact that they had drawn to the extent of 3 to 4½ inches. Subsequent examination, however, has shown that they have resumed their original positions. The services are connected to the mains by means of a T and a street elbow; the settings being so arranged as to form a swing joint. In entering the building, space is allowed for the pipe to swing where it passes through the foundation walls. The largest number of leaks after the earthquake developed in the services at the junction with the main. Here it was found that the street elbows had sheared off at the male thread, owing to the joint having been too solidly made when first installed. Several minor breaks were found in the reducing castings on the mains; but these were generally on dead-end lines, where the flexibility of the system had not been maintained owing to the absence of the connecting lines.

With this recent experience, coupled with the author's observations in earthquake countries in both hemispheres during a period extending over five years, the following deductions may, he says, be depended upon as reliable when applied to gas plant construction in localities subject to seismic disturbances:

1.—That cast-iron pipe, class "B" or heavier, with bell-and-spigot joints, securely blocked up, yarned thoroughly, and with

the lead properly cast into the joints, running same from 15 to 20 per cent. heavier in weight than in the usual practice, will withstand severe shocks, lateral or perpendicular, without fracture or permanent distension, especially when the piping system is tied in on all intersections.

2.—That, in reducing the size for branch lines, it is preferable to use branch fittings of the same diameter on all outlets, effecting the required reduction at a point at least a pipe length away from the branch fitting.

3.—That is, using wrought-iron or steel screw-pipe for mains, if proper expansion joints are used, so that they will average in number eight per mile, there will be no stripping of threads or buckling or rupture of pipe.

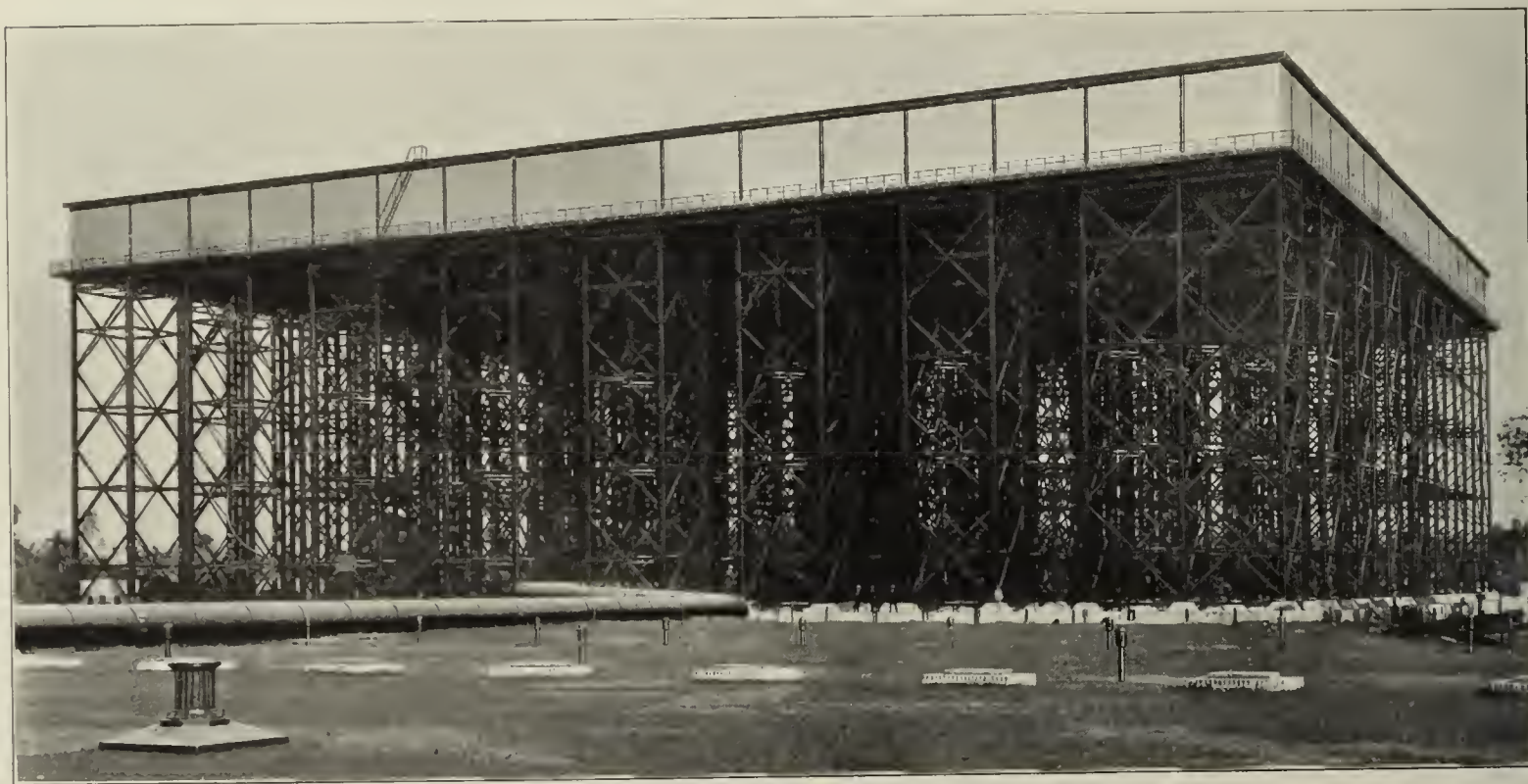
4.—That the use of cast-iron fittings in wrought-iron pipe-lines will result in the destruction of such fittings in the event of a sudden strain.

5.—That bends or off-sets, in wrought-iron or steel pipe-lines, should be of long radius, and made of the same class of pipe as that used in the line.

6.—That in running services, where these are tapped into the main, brass street elbows and service-tees, put together with graphite and oil applied to the male threads, to ensure tightness without sacrificing flexibility, are an absolute insurance against ruptured mains or sheared services.

GIGANTIC WATER-TANK IN CALCUTTA.

The Largest Elevated Reservoir in the World.



The Elevated Steel Water-Tank at Calcutta.

IN the "JOURNAL" for Jan. 26, 1909, it was announced that Messrs. Clayton, Son, and Co., Limited, of Leeds, had obtained the contract for the erection of an elevated steel water-tank, capable of holding 9 million gallons, for the Municipality of Calcutta; and in the number for the 20th of April following, some particulars were given of the structure. It was completed early in this year—three months within the specified time—and brought into use a few weeks ago, when the connection of the 6-foot mains with it was finished. We give a reproduction of a photograph of the tank, which presents some interesting constructional features.

The tank is 321 feet square and 16 feet deep, and is supported by steel stanchions; the height from the ground level to the top being 110 feet. As already mentioned, its capacity is 9 million gallons, equal to a weight of 40,000 tons; and it is divided into four compartments, each of which can be used independently of the other. The weight of steel employed in the structure is 7000 tons. The actual contract commenced with the steel shoes for the columns, which were connected one with the other by means of 6 in. by 3 in. joists. The columns consisted of broad-flanged beams, 17 in. by 12 in. They were made up in two lengths of 48 ft. 6 in. and 40 feet, and were jointed with plates on both the flanges and the web; 112 rivets being used to each joint. The bracing consisted of joist, channels, T, and flat bars, directly bolted to the columns or fixed to them with cleats. The main girders for carrying the tank consist of two steel joists, each 24 in. by 12 in. fixed at 15-inch centres to the caps of the columns,

and connected on their top and bottom flanges with 6 in. by ½ in. steel straps, three to each 20-foot space. The joints in the main girders were arranged to come over the columns, and a space of ¼ inch was left between each, so as to allow for expansion. These girders were connected by joint plates measuring 17 in. by 12 in. with 1-inch bolt-holes drilled in them. The corners of the tank, including the partition corners, were braced with three horizontal gussets and horizontal ties riveted to the angles.

The tank was completely roofed in; the roof being carried on columns composed of joists 16 feet in length and 8 in. by 5 in., connected to the floor of the tank by base plates. The roof girders, which are 12 in. by 5 in., were connected to the columns by cleats; and 8 in. by 4 in. cross joists were riveted to the former. T bars 2 inches square were riveted to these joists, so as to take the roofing slates, which are 12 inches wide and ¾ inch thick. The roof overhangs the tank by 12 inches; and the outer ends of the girders and joists are covered in with continuous plates. The under side of the overhang was also covered in either with plates or with ½-inch mesh brass wire gauze, so as to prevent birds, &c., from gaining access to the tank. The slates and other masonry work on the roof were not included in Messrs. Clayton's contract, which did, however, include the provision of overflow and ventilation pipes and pipes for filling the tank and drawing off the water, together with the necessary penstock chambers, valves, &c. A platform, protected by a railing, runs right round the tank at its bottom level; and staircases have been provided, so that access may be obtained to it from the ground. The insides of the four compartments can be reached through manholes.

The tank is designed to act as a balancer, and to assist the pumps when they cannot send sufficient water into the mains to

meet the demand. In a tropical city like Calcutta, there is naturally very considerable fluctuation between the minimum and maximum demand—varying from 75 gallons per head of the population at night to 75 gallons during the hours of maximum demand in the daytime; and the system of pumping direct into the mains is not elastic enough to meet this requirement. This is where the utility of a tank comes in. During the night hours, when the pumps are providing more water than is needed, the excess quantity will go into the tank as a reserve. Then when the great demand comes, and the main cannot be kept full by the pumps, the reserve supply from the tank comes into operation automatically, and thus keeps up the high-pressure supply. When the demand which the pumps cannot meet relapses, the full pressure from the pumps into the main automatically cuts off the flow from the tank; but it comes into operation again immediately the pumps are not keeping the main full.

The tank was to be made absolutely water-tight; and this we find, from a letter, which was at the same time the certificate of completion, written to Messrs. Clayton by Mr. W. B. MacCabe, M.Inst.C.E., the Chief Engineer to the Calcutta Corporation, to whose designs the tank was constructed, was most successfully accomplished. In the course of this letter, Mr. MacCabe said:

I have to express to you my high appreciation of the manner in which the work was carried out, as I am absolutely satisfied, from constant and close inspection of the work during its progress, that there is not the smallest item in the whole of this large structure which is not first class; and I am satisfied that no firm in the world could have put better material or workmanship into the job. I have also to express my thanks to your firm for the generous and willing spirit in which you met every suggestion for the improvement of the work made by me in course of erection.

Mr. MacCabe also expresses his admiration of the way in which Messrs. Clayton's staff kept to their work all through the job, under very trying circumstances, during tropical hot weather and a rainy season. He says they carried out their duties to his entire satisfaction, and handled the Indian artisans and labourers with the utmost tact and discretion, and without any of the friction which might easily have arisen had less tact been displayed. He is satisfied that in the elevated reservoir the Calcutta Corporation have a first-class job, and one which is a credit to all connected with it.

Messrs. Clayton are to be heartily congratulated upon the successful issue of this large contract, which, it should be mentioned, was taken by them in the face of international competition.

EXPERIENCES WITH DISTANCE IGNITION OF PUBLIC LAMPS.

By H. METZGER, of Bromberg.

[Abstract Translation of a Paper read before the Meeting of the German Gas Association.]

THE management of the Bromberg Gas-Works has for seven years been making trials, which concluded about a year ago, on distance igniters. In the result, all the public lamps have been equipped with them; and they have given satisfaction.

The district lighted comprises a population of about 80,000, but is more extended than that of most towns of that number of inhabitants. Some of the lamps are on high ground—130 feet above the level of the gas-works. West to east as the crow flies, the lamps extend for a distance of nearly 4 miles, and north to south for 2.8 miles. An extension of the district, which will give an extreme length of 4.7 miles, is contemplated. The gas-works are approximately in the centre of the district. In the central part, the mains are of sufficiently large size, but in the outskirts many are too narrow, though the new mains in the suburbs which are supplied from them are large enough. The pressure in the daytime is from 20-10ths to 22-10ths, and is increased in the evening to 31½-10ths to 35½-10ths. This increase is needed to maintain a sufficient pressure of supply with the inadequate mains. Until a short time previously, naphthalene washers were not used, and as a result great trouble arose through naphthalene stoppages. As thorough removal as possible of naphthalene from the gas is essential for distance ignition, because deposits of naphthalene in the mains seriously affect the working of the apparatus.

Bromberg, before distance ignition was adopted, had about 1470 public lamps, for which a staff of 22 attendants with a foreman was maintained. These men cleaned the lanterns and renewed mantles in the daytime, and lighted the lamps in the evening and extinguished them at night. They had plenty to do; and it is not pretended that the work was done as well as it might have been had greater expense been incurred. Each attendant looked after about 60 lamps, and was paid £4 10s. a month. The wages per lamp amounted to 19s. 6d. per annum. From the social standpoint, the system was bad, as the attendants' time was so broken up that they could scarcely spend any of it at home.

At first, 130 lamps in a street were fitted with distance lighters. A small trial such as this is, however, misleading, as it discloses all the faults of the system, while admitting of practically no saving of attendance. Many towns made similar trials; but comparatively few have adopted distance igniters exclusively. Trials also have been made with igniting clocks; but in the Bromberg

climate they have not answered well. Repairs were very numerous, and the regulation or setting of the clocks was a tedious operation. Possibly they have since been improved; but anyhow they require more skilled attention than the ordinary lamp cleaner could give. The first trial of distance igniters at Bromberg, made with the "Bamag" apparatus, was discontinued after a time. As already indicated, in a preliminary trial of this kind, faults become conspicuous, and the necessary organization for dealing with them is lacking. Moreover, at Bromberg, in this first trial, the lamp attendants were entrusted with the care of the new igniters; and naturally they were not disposed to regard or treat too favourably a novelty which would lead to their services being dispensed with. In this trial, complaints of the high-pressure wave were received from consumers, and the number of failures to act were disproportionately high. The pressure, at ignition and extinction, often rose so considerably that even the mantles were lifted from their props; and props of special design with closed tops had to be introduced. The necessity for the high pressure was caused by want of proper adjustment of the apparatus; and the frequency of the failures was due to faulty manipulation. This naturally was only discovered later. That, in face of this experience, it was subsequently decided to introduce distance igniters again must be ascribed to the energy of those interested in the systems and to their readiness to guarantee satisfactory results. Two systems have since been adopted; the apparatus having generally been so distributed that the whole of one side of any street would be on the same system. The apparatus was put in on the conditions: (1) That it would work with a difference of pressure of 6-10ths, measured at the lamp; (2) that the lamps would be reinstated in their former condition and the town indemnified in the event of a greater difference of pressure being required, or of the number of failures exceeding 1 per cent., or of more than four cleaners and two controllers being necessary for 800 lamps; (3) any faults to be rectified free of charge in the first two years; and (4) apparatus to be put in order for a payment of 9½d. each, if sent to the makers during a period of five years. It was further arranged that the apparatus should be paid for in four annual instalments. The liability incurred in these conditions appeared to be so small that the town decided to make the necessary capital expenditure of £1750 to £2000 for the whole equipment.

Distance lighters are not yet perfect, and a long time will no doubt elapse before everyone will accept them as a matter of course. The advantages and disadvantages of any novelty have to be set one against the other; and the author holds the view that in distance lighters advantages preponderate, and that there is no sufficient reason why they should not be adopted. The disadvantages will differ with local conditions. As to the advantages, one cleaner can by daytime keep 200 lanterns clean, and only one controller is needed for 400 lamps. The wages amount to 7s. 6d. a lamp per annum, as against 19s. 6d. previously. For 1600 lamps there would be a saving of £960 in wages. The controllers are provided with bicycles; and they have to replace mantles and chimneys according to the reports of the cleaners, whose work they supervise, and to adjust as required and keep in order the igniting apparatus. After the pressure has been put on, they go through their district to rectify and note any failures. At midnight, when a number of lamps are extinguished, they do not make a similar round, because a failure then would not be of great importance. They make a second round at dawn, when the rest of the lamps are extinguished. The cleaners have thus only regular daytime work, while the controller's work is not so trying as that of the former lamp attendants. The ladders used by the cleaners have a detachable plank tread, as the ordinary rungs proved very trying as treads to men who were on them practically all their working hours.

An advantage of distance lighting is that the lighting and extinguishing may be accommodated to the brightness of the evening and morning of the particular day, while the lamps are only lighted a few minutes before the proper time; whereas the lamp-lighter formerly had to light those situated at the beginning of his round at least half-an-hour before that time. There is thus a saving of gas. As to the faults of the system, the allowance of 1 per cent. of failures is interpreted to mean that of 100 lamps one may fail to ignite and one fail to go out in the succeeding extinction. Thus with 1500 lamps there might all told be thirty failures in the twenty-four hours. The failures have been recorded and plotted on a diagram, from which it appears that they are gradually diminishing. The number is greater in the winter than in the summer months; but the average is well below the percentage named in the contracts. The records of failures are kept so that it may be readily seen if failure repeatedly occurs with the same lamp, in which case the igniting apparatus is overhauled, or to a series of adjacent lamps, in which case insufficient pressure and perhaps a fault in the mains may be suspected. Close observation of failures has thus assisted in bringing about a reduction of their number.

In fitting the apparatus, careful adjustment to the pressure prevailing at the spot is essential. Frequently this adjustment is not successful at the first attempt, and repeated adjustments may result in a considerable waste of mantles, the cost of which is properly chargeable to the expenses of installation of the distance lighting system. The observations of pressure in all the mains of the district are useful in detecting cases of inadequate pressure in consumer's supplies, which is an indirect but real advantage of the provision of distance igniters in a town. Faulty supplies have been located and rectified through the introduction of the distance

lighting system. The use of the latter, however, precludes the changing of the gas pressure at random, and this may at times be troublesome to the gas-works; but it is an advantage to the consumer to have his supply maintained constantly at about the same pressure. On the other hand, suburbs have bargained for lamps which may be extinguished at eleven o'clock instead of midnight, and for no all-night lamps in the summer months. It would be possible to adapt the distance lighting apparatus and the mode of using it to meet these conditions as well as those prevailing in the central districts on the same system of mains; but, on the whole, it has been found most convenient to give these suburbs the extra lighting which was not stipulated for in their contracts. This is mentioned merely to indicate conditions which may be involved in the introduction of distance lighting. It may occasionally occur that particular lamps or those in a certain district are extinguished through an unintentional wave of pressure reaching them. The probable cause has not been certainly established; but the number of such cases is decreasing. Most of them have occurred in the winter months, and have coincided with the hour for cooking the breakfast.

The pressure wave should last for five minutes, as the apparatus is more sensitive on some than on other lamps. It can be observed that the lamps light up spasmodically and not in series according to their distance from the gas-works. Particular lamps in a district where others have lighted remain unlighted until near the end of the period of increased pressure. At first, the wave was given at dusk about the same time that shop-windows were being lit up. This proved to be a mistake, and conduced to more failures. Now the wave is given five to ten minutes before the heavy evening consumption is beginning. The extra amount of gas thereby consumed is not comparable with that due to the lamplighter's early commencement of his round.

The apparatus used in Bromberg is of two kinds—the "Bamag" and the "Meteor." Although both have been used together, the author cannot express a preference. They seem equally good; some will prefer the construction of the one, some that of the other. The casing of the "Bamag" apparatus is all but indestructible; and the adjustment to the local pressure can be made very simply. The "Meteor" responds to a smaller pressure. The curves of the failures with the two types of apparatus are, however, almost exactly parallel, indicating that the failures were not for the most part caused by the apparatus, but by faulty imposition of the pressure.

The points on which the decision of a gas-works management will really rest in regard to the installation of distance lighters will, however, be: (1) Economy of wages, (2) saving of gas, (3) economy of mantles and glass chimneys, and (4) saving in respect of broken panes of glass in lanterns, and of lamplighters' equipment.

The economy of wages at Bromberg has amounted to at least 12s. per lamp per annum. This assumes that each cleaner attends to only 200 lanterns, whereas in some towns one man cleans 300 lanterns. Where pensions are given, the reduction of the staff involves a corresponding reduction in the charge on the pension fund. The saving of gas due to rapid ignition and extinction is less well established. The difference will be the smaller the better organized was the old lamp-lighting system, and obviously it will not be the same in all towns. The igniting jet or pilot-flame which is kept burning continuously is sometimes regarded as a special charge against distance ignition; but most towns have in any case adopted it irrespective of the use of a distance lighting system. Some authorities have reported a reduction in the consumption of mantles and chimneys consequent on the introduction of distance igniters; but in the author's experience, there has been an increase. It may be that this is really accounted for by better supervision leading to more frequent renewal of mantles, and is not really due to distance ignition. However it may be, a distinct saving in mantles cannot be counted upon. In regard to broken panes and lamplighters' equipment, it has been found that expenses have been reduced by about 1s. per lantern.

The author's experience indicates an annual saving of 13s. per lamp. Against this have to be set the charges for interest, depreciation, and maintenance of the distance lighters. These will be amply covered by 15 per cent., which gives 3s. 9d. The controllers for 1600 lamps require four bicycles, which could be obtained on the hire system for £20 per annum, which represents 3d. per lamp. The total charges therefore are 4s. per lamp per annum, making a net saving of 9s. With 1600 lamps, this gives a yearly economy of £720.

The author has endeavoured in this calculation not to favour the distance lighting system. Even if it showed no saving, however, he would prefer it on the score of its independence of a large staff of attendants, and its other advantages. In small towns, having only 50 to 200 public lamps, the night watchman frequently is responsible for lighting, extinguishing, and cleaning them. In such cases the service is apt to be faultily carried out, and distance-ignition is imperatively called for, though no distinct saving will be realized. It is quite true that distance lighting and extinguishing apparatus is not yet perfect; but the author does not consider that the gas manager should wait until the perfect apparatus has been devised. Advantages already obtainable are thereby foregone, and an allowance of 15 per cent. for interest and depreciation charges will admit of existing apparatus being replaced by something better after the lapse of a reasonable term.

Note by Herr Kobbert (Manager of the Königsberg Gas-Works).

In this author's experience, the organization of the ordinary lamp-lighting staff is troublesome, owing to the restlessness of the

men due to the varying times of work. Hence it is desirable to reduce it as far as possible by replacing manual attendance by mechanical control. There are available for the latter purpose: (1) Electrical and pneumatic lighters and extinguishers, (2) igniting clocks, and (3) pressure distance lighters.

The first class entails connections with the lamps, which are exposed to liability to injury, and involve much expense in supervision and maintenance. The first cost of the installation is high. These systems are more applicable to certain descriptions of private lighting. The second class—viz., lighting clocks—has been extensively tried. In Königsberg, it was first tested about ten years ago. Its faults are the sensitiveness of the clockwork to changes of temperature, and the want of punctuality in lighting lamps which should be lighted simultaneously. Improvements have since been effected which appear to dispose of these objections. Though rather dear, the clocks effect economies which allow of their cost being quickly written off. An advantage possessed by them is independence of the distributing arrangements, and they do not affect private consumers at all. A disadvantage is that they do not adapt themselves to the actual conditions of light and darkness, but work according to a fixed calendar. The necessary regulation of the clocks prevents one man attending to more than 250 lanterns. The life of the clocks has not been certainly established.

The third class of apparatus—that which operates through a wave of pressure in the distributing system—is most commonly constructed with a diaphragm. The cost is 20 to 30 per cent. lower than that of clocks, and it may be written off in about two years through the economies effected. Nothing definite can yet be said as to the durability of the membrane of the diaphragms; but the life may be provisionally reckoned at about ten years. The cost of renewal of this or other parts of the apparatus is not, however, serious. The introduction of distance pressure lighters must be preceded by exhaustive investigation of the distributing system. Pressure records must be taken by recording gauges at different places, and trial lighting appliances should be fixed at spots where the pressure differs most from the mean, and where the variations are greatest. The necessary sensitiveness for the apparatus and the increase of pressure for operating the system, can be determined from the observations thus made.

It may be best to equip a few bad sections with lighting clocks. The pressure wave is noticeable by consumers, and serves as a useful check on the proper regulation of their own incandescent burners. The wave of pressure will do no harm if the burner is properly regulated; there will be a slight roaring and a moderate brightening of the light and that is all. Wet meters and governors must, however, have the water-overflow closed in to prevent any escape of gas. The pressure-wave must be given shortly before the increased evening consumption comes on. It should last for two to three minutes. By extending it, the increase of pressure required is reduced. Each apparatus should have a lever so that it may, when necessary, be operated by a crook from the ground. A cyclist can supervise from 250 to 400 lamps. The simultaneous lighting and extinguishing of the street-lamps renders it possible to ascertain—for the first time—approximately correctly the consumption of gas for public lighting. The unaccounted-for gas also is more correctly determined. There is considerable economy in lantern-panes, chimneys, and mantles.

The systems used in Königsberg, apart from a few trial installations, have been the "Bamag" and the "Meteor;" and both have answered well. With the latter, the igniting jet is extinguished while the lamp is alight, and the apparatus does not act a second time until after the pressure has been reduced, as it naturally is in ordinary use. There is thus a certain protection afforded against unintentional operating of the apparatus by vibration, &c. In small towns, where the night watchman relieves the gas-works of the duty of lighting and extinguishing the street lamps, distance ignition does not present any considerable economical advantages. Distance lighters also do not answer well in cases where the pressure is controlled from several gas-works. Gas undertakings with a central gas-works and a good distributing system are in the best position to reap the full advantages, direct and indirect, of pressure distance ignition of public lamps.

End of the Milan Gas Strike.—The Milanese newspapers have been following in minute detail, day by day, the progress of the strike of the employees of the Compagnie L'Union des Gaz at Milan. They were able to announce on the 3rd inst. that the conflict had been happily terminated on the previous day. After protracted negotiations, an agreement was arrived at between the parties, and was put into writing and signed by the men's representatives and by the Manager (Sig. Grüss) on the 2nd inst. In substance, its terms were that the strikers were to resume work, but that ten of their number were at once to withdraw and to receive an agreed sum in compensation. The Company were not to proceed with any more dismissals until certain arrangements had been made. The question of the right of the Company to have dismissed on June 10 the 99 men (which gave rise to the strike) was to be submitted to arbitration. Each employee is in future to deposit security with the Company of 50 lire, as a guarantee against unjustifiable cessation of work, which sum, in such an eventuality, will be absolutely forfeited. Interest at 4 per cent. will be paid annually on such sums. After a banquet to the English and German substitutes who worked during the strike, they left Milan, and the strikers resumed work.

NOTES ON STREET LIGHTING, FROM A PRACTICAL POINT OF VIEW.

By H. E. COPP, Gas Engineer to the West Bromwich Corporation.

[A Paper presented at the Annual Meeting of the Institution of Municipal and County Engineers.]

The subject, at any rate as regards the first portion of its title, is doubtless a somewhat hackneyed one. Of recent years there have been numberless communications to the press and to technical societies dealing with street lighting. They are for the most part written for the purpose of advocating one or another particular form of illumination in which the writer is more especially interested. In the present instance, however, the author proposes to set out in plain language, and with the avoidance of all technicalities and refinements of doubtful utility, a few points which have come under his personal notice, in the hope that some of the members who are responsible for public lighting in the towns they represent may find some further points of interest in the subject, the importance of which deserves more critical consideration than it has hitherto been accorded. The fact that in most of the towns no standard of lighting is recognized—some spots being lighted most extravagantly, and others left in almost complete darkness (a remark applying in some cases to whole districts)—is in itself a sufficient justification for bringing the matter to the further notice of members of the Institution. The author would, therefore, endeavour to present in an impartial manner a general review of the subject in its present state of development.

The communications referred to, which have for their sole object the advertisement of one particular system of lighting, seldom have any technical value, as it requires an expert to discriminate between truth and fiction. Only recently a technical journal devoted a whole issue to a studied rodomontade on the subject of its rival illuminant for street lighting purposes, which contained many misrepresentations and photographs of street lighting, which could only serve to illustrate the skill and patience of the photographer. Indeed, a reader without technical knowledge would at least expect the condemned system to be supplanted forthwith. Such methods cannot be regarded seriously, and do little or nothing to advance knowledge of the subject under consideration. On the other hand, a paper was read before the Institution of Gas Engineers in June last year by Mr. Jacques Abady, of London, which treats of the subject of public lighting by both gas and electricity in a most able and impartial manner, and must have exercised a sobering influence on partisans of both systems.*

The standard of lighting must necessarily vary in different towns. It would be absurd to adopt the same standard of lighting, say in some parts of London, where public thoroughfares are congested with heavy traffic, as in a small country town. It must be borne in mind, however, that two kinds of lighting are required—the one strictly utilitarian, and the other extravagant, such as would be deemed necessary for certain localities and places of resort as a species of advertisement in seaside towns, watering-places, and the like. In the present instance, however, the author proposes to deal more particularly with the former phase of the question, from which it would seem that the standard to be adopted in any town or locality should bear some relationship to its rateable value per head of the population.

A keen competition is at present in progress in London between gas and electricity for public lighting, which can only result in great improvements in the application of both systems of lighting, but probably at considerable cost to the community, as a standard of lighting is being established which in some cases exceeds the public requirements. An instance of this will be found in the lighting of Victoria Street, Westminster, which is lighted by high-pressure gas, the average illuminating power of the lamps being 3274 candles; while in other places lavish grouping of flame arc lamps will be found. In Marylebone, there is an example of what can be done, on a more moderate scale, with metallic filament lamps—there being over 2000 in use. But in spite of this competition, it is certain both gas and electricity will continue to be used for street lighting for many years to come, and advances of one system will be met by corresponding advances of its rival. It is well known that in Germany great progress has been made in the science of public lighting in recent years, and perhaps a higher standard has been established in Berlin than in any other city. But notwithstanding the enormous increase in the uses of electricity, the municipal authority is annually spending more than £50,000 on the improvement of its public lighting by gas alone.

The essential conditions for satisfactory street lighting are: (1) Even illumination of the ground, or objects near the ground; (2) uniformity of colour; (3) absence of glare. In order to fulfil the first condition, the lights must be placed at a height above the pavement corresponding with their power and spacing. A great objection to large units of light is that they must be fixed so high above the pavement that the light shines directly in the first floor windows. As regards the second condition, looking along a street there is nothing more distressing to the eye than a marked diversity in the colour of lights in a business thoroughfare. Such diversity would constitute a positive disadvantage to shopkeepers, as it would nullify to some extent their own efforts in this direction. With regard to the third condition, it is to be regretted that "glare" is often preferred to good illumination, and, indeed,

is regarded by the average individual as such. Ideal street illumination would be by reflected light only, with the source of light invisible to the eye; in practice, however, such a system would be prohibitively costly. But every one knows how much better an object may be viewed when looking away from the sun than when looking towards it. The spectacular effect of a theatrical scene would be ruined were not the lights carefully screened from the eyes of the audience.

SPACING OF LAMPS.

In modernizing the lighting of a district, and having decided on the power of the lamps to be installed, the better plan is to re-arrange the spacing of the lamp-posts. On account of the low first cost, however, there is a strong temptation to fix two or three burners in the lanterns instead. This is usually an unsatisfactory arrangement, as the lamp-posts will probably be too low for the proper distribution of light. "The greater the candle power of the lamp, the higher it should be placed," may be regarded as a general axiom. For instance, if the low standard of a minimum illumination of 0.1 candle-foot were required, and the lamps were 50 yards apart and 12 feet high, a unit of no less than 1850-candle power would be necessary, whereas if the lamps were 20 feet high only 1200-candle power would suffice. On the other hand, if the lamp-posts were 30 yards apart, 400-candle power would be required if fixed at a height of 12 feet, and 300-candle power if 20 feet. In other words, for even distribution of light, the rays from two adjacent lamps should intersect at the ground level when about 15° below the horizontal. If this rule is followed, contrasts in the degree of lighting, which are such a source of danger to traffic, will be avoided, and there will be a minimum waste of light and a maximum of efficiency. In rural districts, the angle may be reduced to 10° below the horizontal.

The following is a portion of a table given by Mr. Abady in his paper, to which reference has already been made; and it will be found to be an extremely useful guide:—

Height of Lamp, Feet.	Distance Apart 10° Intersecting.	Distance Apart 15° Intersecting.
12	136	90
15	170	112
20	227	150

It may be here mentioned that centre lighting is generally regarded as preferable to side lighting; but this system can only be utilized in comparatively narrow streets. An experimental installation will be found in Cannon Street, London. Apparatus for suspending both gas and electric lamps centrally is manufactured by the London Electric Firm, of Croydon.

CHOICE OF LIGHTS—UPRIGHT v. INVERTED BURNERS.

During the past three years, the inverted burner has largely supplanted the upright burner for street lighting. The reason for this is that the former gives a much higher efficiency than the latter, and is less costly in maintenance. The upright burner gives its maximum light at an angle between 15° and 20° above

the horizontal; whereas the inverted burner gives its maximum light at about 45° below the horizontal. The chief reason for the greater efficiency of the latter is that the burner is to some extent regenerative; the injected air and gas being more or less heated before reaching the point of combustion. This increased efficiency will more than compensate for the proportion of light lost through being emitted in the wrong direction. The author has designed a lamp in which an attempt is made to utilize the misdirected rays from an inverted burner, and redirect them where they are required—i.e., along the road about 15° below the horizontal. A sectional drawing of the lamp is shown in fig. 1, and polar curves of the lighting effects under different conditions are given in fig. 2. It will be seen that the burner used throughout the tests was not a particularly efficient one, but the comparative values of the tests are not thereby vitiated. The chief features of the lamps are as follows: (1) The top of the lamp is hinged; and it can be swung

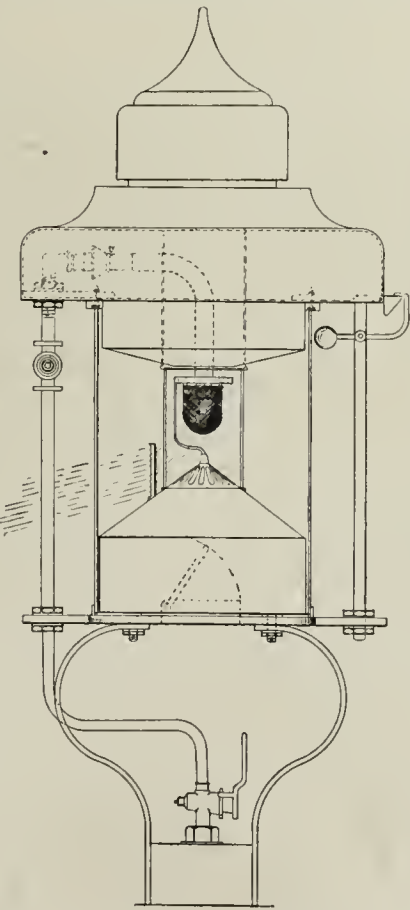


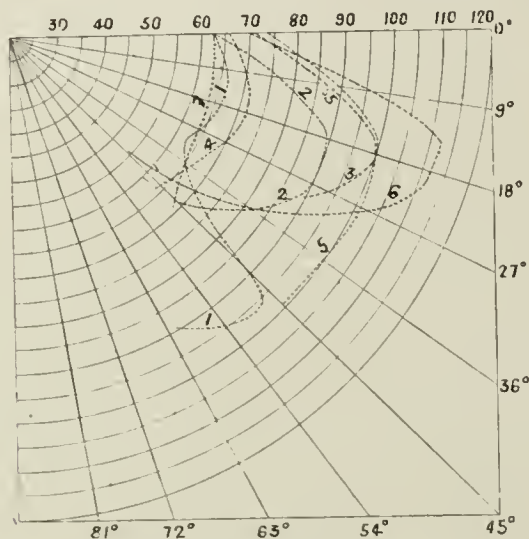
Fig. 1.—Copp's Double-Reflector Inverted Gas-Lamp.

* See "JOURNAL," Vol. CX., p. 795.

back to facilitate cleaning. (2) Reflectors are fitted at the top and bottom of the lamp, in both of which a reflection of the mantle can be observed if viewed at an angle of 15° below the horizontal. (3) The burner is attached to the top of the lamp, and is consequently removed with it, whereas the mantle is protected from wind while the inner and outer glasses are cleaned in turn. It will be noticed that there is no circulation of air between the inner and outer glasses, so that the annular space is practically dust-proof—a feature which is utilized in a manner which is described hereafter.

REFLECTORS.

Electric lamps possess the great advantage over gas that reflectors of almost any type can be utilized. Holophane globes have long been used in connection with the former, but are generally inapplicable to the latter. These globes consist of a series of glass prisms for the purpose of refracting and distributing the light. Mr. Abady found that the "Excello" flame arc lamp, which is fitted with dioptric globe, gave an almost ideal curve of



- Curve 1.—Top reflector only, bottom of lamp removed.
 " 2.—Lamp complete, with both reflectors blackened.
 " 3.—Same as No. 2, but with prismatic glass plate at bottom.
 " 4.—Both reflectors blackened, with outer cylinder removed.
 " 5.—Lamp complete, and both reflectors bright.
 " 6.—Same as No. 5, but with prismatic glass plate at bottom.
 " 7.—Parkinson's one-light street-lamp.

[The same burner and pressure were used in each test.]

Fig. 2.—Candle-Power Curves from Copp's Lamp.

illumination; and it occurred to the author to introduce a plate of prismatic glass between the inner and outer glass cylinders of the gas-lamp previously referred to, for the purpose of refracting the rays of light from the bottom of the mantle in the desired direction. A reference to fig. 2, curve No. 6, plainly shows the advantage obtained by this simple arrangement. It can only be applied, however, where the refractor is absolutely protected from dust. The top reflectors of a lamp fitted with inverted burners should always be conical or convexed in shape. Some manufacturers have made the error of adopting a concave reflector.

PUBLIC LIGHTING IN WEST BROMWICH.

Although West Bromwich cannot be considered a criterion as regards public lighting (the cost of which is borne chiefly by the Gas Department, the gas being charged at considerably less than cost price), nevertheless examples of almost every modern system will be found in the town. Experiments with high-pressure gas lighting were conducted as long ago as in 1903—indeed, to West Bromwich belongs the distinction of possessing one of the first, if not the first, public lighting installation on this system. It was, however, eventually abandoned as being unsuitable for the requirements then existing. The installation, on what was known as the "Millennium" system, consisted of an electrically driven compressor, in which the gas pressure was raised to 10 inches water column. The lamps each contained one upright burner, consuming 20 cubic feet of gas per hour, and giving a nominal light of 800 candles.

A further system was tried in another portion of the town, in which air was used at a pressure of 2 lbs. per square inch, by means of which the gas was injected through an annular space in the nipple—upright burners being used. The system was kept at work for some three years with fairly satisfactory results, but was replaced on the advent of high efficiency multiple inverted burner low-pressure lamps. From experiments he has made, the author is of opinion that very high efficiencies can be obtained with suitable inverted burners and highly superheated compressed air.

Mention must also be made of the arc lighting in High Street. This is an example of unfortunate disposition of the lamps. The tram poles are too close together to permit of the use of two lamps on each pole, and too far apart to give a good distribution of light as fixed on every alternate pole; whereas if only one lamp per pole had been used, it must have been fixed on the top of the pole, and would consequently have been too high for practical purposes.

Examples of modern high-pressure inverted gas-lamps, working at a pressure of 2 lbs. per square inch, will also be found in St.

Michael's Street. These lamps are fitted with automatic lighters by means of which any number can be turned on or off at will. These lamps are of the Keith type, similar to those in use at Westminster. The author has found them to give an efficiency of 55 candles per cubic foot of gas per hour, when tested at a range of 15 feet and 20° below the horizontal with West Bromwich gas (which averages 16.5 candles, "No. 1" standard burner, and 620 B.Th.U.); but when using gas of a lower grade, such as that supplied in London, it is found that these lamps give an efficiency of over 60 candles per cubic foot. The author has, however, observed still higher efficiencies with high-pressure lamps of the Graetzin type when working at 2 lbs. per square inch.

The increased efficiency of high-pressure burners is due to the fact that a greater proportion of the air necessary for combustion can be injected with the gas; there is consequently less cooling effect on the flame. Moreover, complete combustion can be obtained with a smaller flame, which is another way of saying that a higher temperature is developed. The highest flame temperature would be developed if the whole of the air necessary for combustion could be injected with the gas; but this is, of course, unattainable in practice. A small increase in the temperature of the flame produces a comparatively large increase in the amount of light developed. From the foregoing it will be seen that the inverted burner lends itself much better to a high gas pressure than the upright burner, and pre-heating may be carried to a higher degree. In all probability much higher efficiencies will yet be attained in this direction. The essential conditions in high-pressure gas lighting, however, are that the pressure and quality of the gas shall remain absolutely constant. Failure to observe these conditions has, in some instances, caused dissatisfaction with the system.

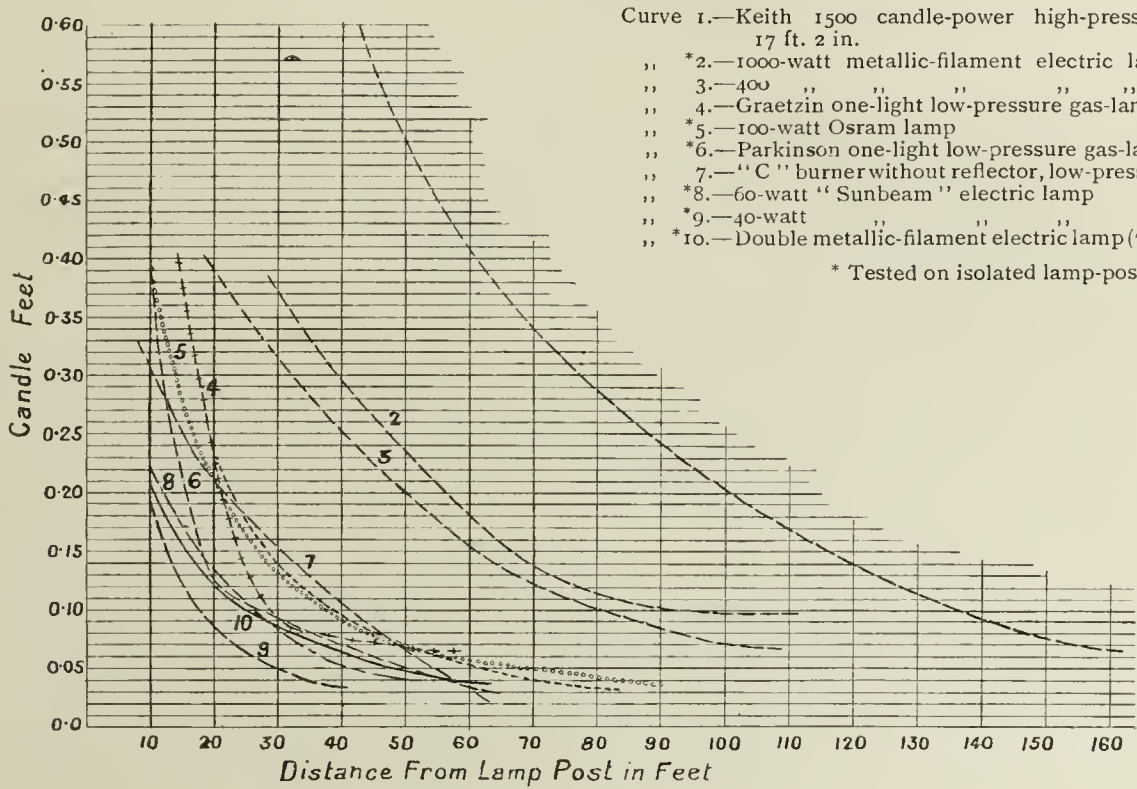
TESTING.

The most notable feature in connection with the large number of comparative tests of gas and electrical units which are published from time to time is the singular discrepancy in the observed results. Only recently a series of tests were published, showing results which turned out to be little more than half of those obtained by the officials of the municipal authority which were subsequently published. It seems, therefore, that unless the methods of testing are clearly stated, the results can possess very little value. It is not reasonable to expect such accurate results in the street as in the photometer-room, where all extraneous light can be excluded. Indeed, a street photometer can only be used with precision where a whole street is illuminated with similar units; and even then the results are generally vitiated by the varying reflecting power of the roadway or adjacent buildings. The longer the range at which the observation is taken, the greater is the error from this source. The results shown in fig. 3 were to some extent affected in this manner; but curves Nos. 2, 5, 6, 8, 9, and 10 on the figure were taken in an open space, with no other lights visible, and should therefore possess a greater degree of accuracy. For practical purposes, the author prefers a set of observations taken in the photometer-room at the critical angles. Polar curves of tests taken in this manner are shown on figs. 4 and 5.

It may here be explained that the tests of inverted burners were taken without a globe, in order to eliminate any error due to reflection; but a globe is essential to an inverted burner to develop its true efficiency. For testing electric lamps, a clockwork rotating arrangement was used, with metallic contacts of ample area bearing on glass rings mounted on the spindle, which was properly insulated. The ten-candle Harcourt standard pentane lamp and the Simmance-Abady flicker photometer were employed. For the tests of street-lamps, a photometer was used which was kindly lent to the author by Messrs. Alexander Wright and Co., Limited, of Westminster. This consisted of a metallic filament electric lamp worked from a battery in circuit with which a suitable rheostat and finely calibrated ammeter were placed. A flicker photometer fitted with an angle-finder was again used. The observations were made by varying the resistance and consequently the light emitted by the electric lamp. The reading of the ammeter was then carefully noted, as well as the angle and distance from the lamp. Before starting, and also at the conclusion of the tests, the electric lamp was tested in the photometer-room through the whole range of the ammeter. The observations were taken at right angles to the direction of the light ray from the lamp, and at a height of 4 feet from the ground. This plan was adopted in order that the curves that are shown in fig. 3 might be more intelligible. It is well known that a flame arc lamp, unless fitted with a suitable reflector or dioptric globe, emits its maximum light at angles unsuitable for street lighting. It has therefore become customary to quote the illuminating value of these lamps in mean spherical candle powers. The term, however, conveys no meaning as to the value of the lamp *per se* for street lighting, and its use must be condemned, if for no other reason than its clumsiness and the time required for ascertaining it. It is surely a poor street-lamp that does not illuminate the ground in its immediate vicinity.

METHODS OF CHARGING FOR PUBLIC LIGHTING.

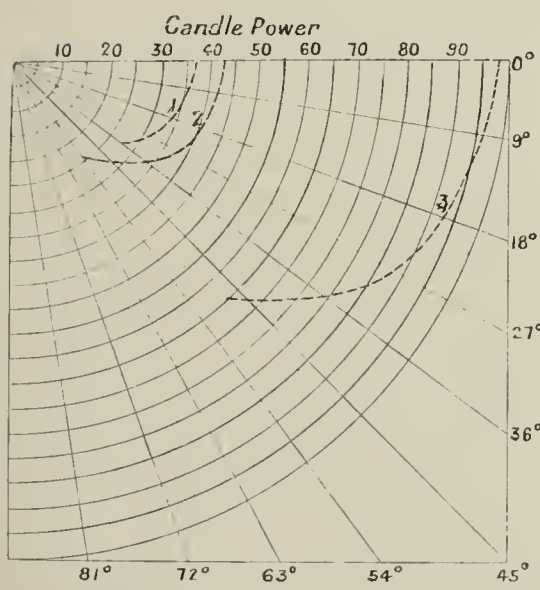
The usual method of charging is to assume a certain consumption of gas or current and to price out at so many lighting hours per annum. This method is satisfactory where the local authority supplies both gas and electricity. When this is not the case, however, difficulties may arise; and it would seem that some other method should be employed. A contract for the gas lighting of Calcutta was recently arranged in which the size of the gas



- Curve 1.—Keith 1500 candle-power high-pressure gas-lamp; height 17 ft. 2 in.
- " 2.—1000-watt metallic-filament electric lamp; height, 20 ft. 9 in.
- " 3.—400 " " " " " " 17 " 11 "
- " 4.—Graetzin one-light low-pressure gas-lamp " " 15 " 6 "
- " 5.—100-watt Osram lamp " " 11 " 6 "
- " 6.—Parkinson one-light low-pressure gas-lamp " " 11 " 6 "
- " 7.—"C" burner without reflector, low-pressure gas " " 11 " 5 "
- " 8.—60-watt "Sunbeam" electric lamp " " 15 " 6 "
- " 9.—40-watt " " " " " 15 " 6 "
- " 10.—Double metallic-filament electric lamp (78 watts), " " 11 " 6 "

* Tested on isolated lamp-post.

Fig. 3.—Candle Feet Curves from Various Lamps.

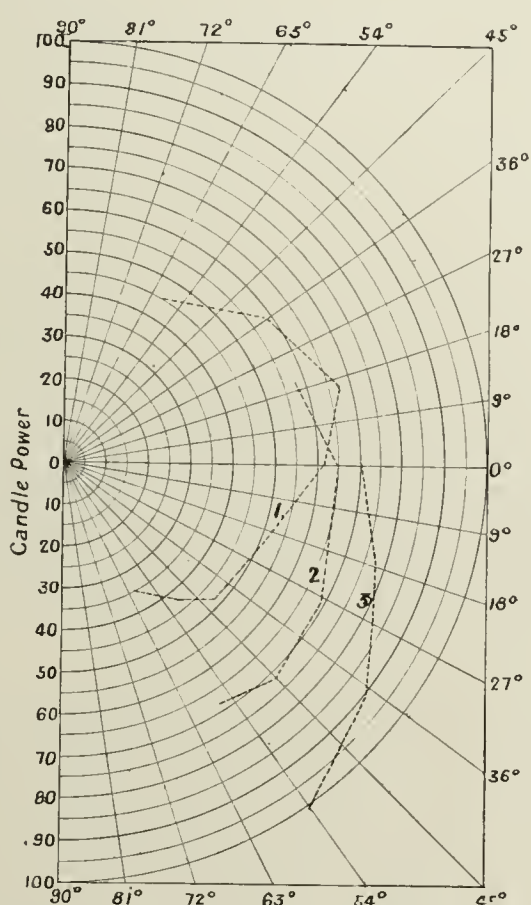


- Curve 1.—60-watt "Sunbeam" (actual consumption, 59.25 watts at 237 volts).
- " 2.—Double metallic-filament (actual consumption, 78.54 watts at 238 volts).
- " 3.—100-watt Osram (actual consumption, 109.5 watts at 238 volts).

Fig. 4.—Candle-Power Curves of Electric Lamps.

nipples and the composition of the gas were specified. The author has found that the gas in passing through the nipple exercises a cutting effect on the metal. Any increased consumption due to this cause would be at the cost of the gas supplier, and would rank as unaccounted-for gas. On the other hand, adjustable nipples are too easily tampered with, and generally give a lower efficiency than a properly drilled one-hole nipple. It may here be noted that when an admixture of water gas is used, the specific gravity being higher, a nipple with a hole of a given size will pass less gas than if coal gas only were used; and in determining the size of the nipple, due attention must be given to this point, as well as to the pressure of the gas during lighting hours in the district in which the burners are to be used. A governor fixed on each lamp is an invaluable adjunct. Higher efficiencies are generally obtainable with a reasonable admixture of water gas; the flame temperature being somewhat higher than that of coal gas.

Still another method of charging for public lighting is that of adopting a fixed price for a definite illuminating power—a system which has recently come into vogue in London, being particularly convenient where high-power units are concerned. This method, however, involves the frequent use of a street photometer. The portable photometers which are principally used in this country are the Harrison, the Weber portable photometer, the Trotter universal photometer, and the Simmance and Abady. The latter has been adopted by the Westminster City Council. It is an ingenious instrument and possesses many advantages; not the least being that it is a direct-reading photometer, and does not involve the interposition of an empirical standard. The principle of the photometer is, briefly, an arrangement by which the amount of light falling upon one side of the photometer disc can be so varied by means of the simple turning of a graduated drum that it can be made exactly equal to the light falling upon the other side of the disc from the street-lamp under test. The graduations of the drum can be read off in 100ths of candles or 20ths of



- Curve 1.—Welsbach "C" burner, without reflector (consumption, 3.85 cubic feet per hour).
- " 2.—Darwin inverted burner (consumption, 3.5 cubic feet per hour).
- " 3.—Ditto No. 2, with reflector-globe.

Fig. 5.—Candle-Power Curves of Gas-Burners.

candles according to whether the lamp to be tested is of very high power or of ordinary intensity.

The method of producing the variations of power of the standard light is by the opening and closing of a shutter, which allows more or less of a light of invariable intensity to pass through and impinge upon the disc. It may be best understood by reference to an ordinary photographic camera. In this the rays from an illumined object are projected upon a ground-glass screen, their images being seen inverted. The shutting or opening of a diaphragm such as the iris does not vary the size of the picture, but only the amount of light, which is in proportion to the size of the orifice. In the street photometer, the illuminated object is the interior of the whitened sphere, which is brilliantly illuminated by two electric lamps. The picture of the interior of this sphere is projected, much reduced, upon the white disc of the photometer, always of one size, but varied in luminosity, by the opening or closing of the shutter. The turning of the graduated drum affects the opening in perfect proportion. The accurate determination of the angle at which the test is made, independently of any inclination in the surface of the road, has an important bearing on the accuracy of the tests. This photometer is fitted with an instrument consisting of a combined level and quadrant, weighted so that it will assume a truly vertical position

whereby the angle can be determined with great precision; the reduced image of the lamp being projected through a lens on to the photometric centre.

AUTHORITY FOR CONTROLLING PUBLIC LIGHTING.

There will doubtless be a considerable diversity of opinion among the members of the Institution as to which department of a local authority should be entrusted with the control of the public lighting. From the foregoing, it will be observed and generally conceded that modern exigencies demand the possession of considerable technical knowledge; and if full advantage is to be taken of improvements in the utilization of gas and electricity, the co-operation of the chief officers of both departments should be secured, while the arrangement and disposition of the lamps should be in the hands of a local surveyor or engineer. Only by such co-operation between officials can the interests of the public best be served. It is much to be regretted that in many towns the interests of one department have been deliberately permitted to suffer to the advantage of the other. Personal predilections are indefensible where the public welfare is concerned.

MAINTENANCE.

In discussing the subject of public lighting by gas, the first question that will probably be asked is: "What mantles do you use?" The author's reply to such a question would be that mantles vary very much in quality from time to time, and that in consequence a great variety of mantles are used. For several years in West Bromwich it has been customary, as far as possible, to purchase mantles in the stocking form, impregnated with a standard solution, and not collodionized. The mantles are burnt off and seasoned with high-pressure gas, and carried out in metal boxes fitted with suitable supports. In this way a mantle of the highest quality and strength is obtained. As regards ordinary collodionized mantles, a good quality will be found to be cheapest in the long run. In the choice of a mantle, due consideration must be given to the question of texture. Whereas a mantle of open mesh is suitable for a "lazy" flame, one of closer texture should be used for a strong, active, and well aerated flame. The Woodall-Moon mantle-testing machine will be found to be a most useful apparatus for detecting any falling-off in the quality of the mantles supplied.

MAINTENANCE OF PUBLIC LAMPS IN WEST BROMWICH.

Type of Lamp.	Average Number of Mantles Used per Burner per Annum.
Old pattern with "C" burner	8.3
14-inch lamp with angle burner	6.8
16 " " " double inverted burners	7.6
14 " new pattern lamp, with single inverted burner	4.0

The author regrets that he has no authentic particulars of the life of electric lamps of the newest form. This must depend in a large measure upon the regularity of the voltage, which shows considerably more variation in the case of the circuits at the gas-works than would be found in the town supply, though kept perfectly constant during the testing of the lamps for illuminating power.

AUTOMATIC LIGHTING.

A paper on street lighting would in these days be incomplete without some reference to this subject. The average number of lamps lighted and extinguished by a lamplighter appears to be something like 100, and the time occupied in each operation about 1½ hours. So that by the use of automatic lighters the lighting time may be reduced by nearly two hours per day. Automatic lighters, of which there are almost numberless forms, may be divided into two classes—those operated by clockwork and those operated by momentary increase in the pressure of gas in the mains. The latter way may be subdivided into two classes—one in which the gas-valve is operated by a bell floating on mercury or other liquid, and the other in which the gas acts on a diaphragm contained in the instrument which opens and closes the gas-way. The latter form of apparatus is probably the more reliable; but before deciding on an installation, a careful study must be made of the gas pressure in the mains in all parts of the district, or failure will result. If the mains in any part of the town are overworked during lighting hours, there is considerable difficulty in timing the pressure wave so that it may not be excessive and cause the blowing of meters, but shall be sufficient to reach the remote parts of the district, and not be absorbed by the rapid increase which is taking place in the consumption of gas *en route*. Installations of both systems have been used in West Bromwich. But it has been found that the atmospheric conditions have a deleterious effect on the mechanism of the clockwork; and until the distributing system is reorganized, the conditions will be unfavourable to the use of the latter type, unless adopted throughout the town.

The chief cause of failure of automatic lighters is found to be in the bye-pass. It is probable that in the near future pyrophoric ignition will be successfully applied to public lamps. The use of Hertzian waves is also not beyond the bounds of possibility.

CONCLUSION.

The author has found much difficulty in dealing with the many aspects of interest presented by the subject under consideration within the limited compass of a paper; and it has only been possible to refer briefly to many of them. But, in conclusion, he would again express the conviction that, for the satisfactory lighting of our thoroughfares, units of comparatively small power

should be employed, and that they should be so spaced that contrasts in the intensity of the light falling on the road surface should be reduced to a minimum. The Councils of the Institution of Electrical Engineers and the Illuminating Engineering Society have recently appointed Committees for the consideration of the subject of street lighting, and have invited the co-operation of the Council of the Institution of Municipal and County Engineers and of the Institution of Gas Engineers; and it is to be hoped that, as the result of their deliberations, a satisfactory specification will be evolved which will be generally applicable.

Discussion.

Mr. GILBERT WHYATT (Grimsby) said there were two or three remarks in the paper with which he quite disagreed. The author had stated that, in modernizing the lighting of a district, and having decided on the power of the lamps to be installed, the better plan was to rearrange the spacing of the lamp-posts. Personally, he quite admitted the correctness of this view as regarded the residential roads of a town not cut up much by cross streets. But in the centre of a town, where there were a large number of cross streets, it would be different; for if they rearranged their lamps they had to double the number. A suitable distance at which the lamps should be placed apart was 83 yards; but if they put in intermediate lamps, making the space between each 41½ yards, they made the residents in the rest of the town jealous. Therefore it was better, in streets of the kind he had mentioned, to put a double burner in the lantern. Mr. Copp had stated that centre lighting was generally regarded as preferable to side lighting. He (the speaker) did not at all admit this. Road vehicles carried their own lights, and the lighting of thoroughfares was intended for the convenience of foot passengers. His view was that side lighting was the correct thing; centre lighting not being generally regarded as preferable. As to the methods of charging for public lighting, in Grimsby they had lately revised their lighting specification. Only recently they had a specification that the burners should be a certain size, and consume a stated number of cubic feet of gas per hour. But their Electrical Engineer having expressed a desire to light the streets by electricity, they had changed to a definite illuminating power, and specified that at a particular distance from a lamp a certain candle power should be obtained. The Electrical Engineer was prepared to light certain streets at the same rate as that charged for gas—viz., £3 12s. 10d. per lamp; it being specified that there must be 50-candle power at a distance of one foot from the lamps. They had 600 gas-lamps; and the Electrical Engineer had tendered for, and put up, 300 lamps. With regard to the measurement of the light, they admitted that a street photometer could only be used with precision under extraordinary circumstances; but it gave an indication of what the light was. If there was any allegation that the street lighting was not up to the specification, he did not quite see how Mr. Copp was going to take the observations for practical purposes in the photometer room; the work must be done in the street. Beyond these criticisms, he had nothing but commendation for the paper. He had, however, been struck by the lighting-up time in West Bromwich. It seemed that in the summer the lamps were lit fully an hour before sunset, which was an absolute waste of money. For example, the previous night half-past ten—an hour-and-a-quarter after sunset—would have been early enough. The town could save money by deferring lighting-up to, at any rate, an hour after sunset.

The PRESIDENT (Mr. A. D. Greatorex, M.Inst.C.E., Borough Engineer and Surveyor of West Bromwich) remarked that it took an hour-and-a-half to light the lamps.

Mr. WHYATT said if that were so they were much too late in the winter. In November and December they ought to have the lighting completed before sunset. He was prepared to suggest that their atmosphere was very much less clear than that of Grimsby; and in the months he had mentioned probably they ought to finish lighting by three o'clock in the afternoon.

Mr. T. CAINK (Worcester) remarked that it was hardly up-to-date for the lamplighter to go round and light and extinguish each lamp in the case of the ordinary gas lighting as compared with electric light, which could be put on and shut off at a moment's notice. The problem of automatic street lighting was one which he had endeavoured to solve by manipulating the pressure in the gas-mains. This method had obvious advantages over that of clockwork systems, inasmuch as advantage could be taken of economizing on light evenings. On the other hand, on dark evenings the light could be turned on as early as the gas manager thought desirable. This meant the saving of a large quantity of gas, and the public were not inconvenienced by the lamps being lighted too late. The difficulties one was confronted with were the variations of pressure in the mains due to the varying consumption; and in the case of lamps which were extinguished by a reduction of pressure an unexpectedly heavy run on the mains might lower the pressure to a point at which the lights would be put out. In order to meet this difficulty, it seemed to him necessary to adopt quite a different form of station governor from that generally in use. The ordinary one was designed for the purpose of maintaining a uniform pressure on the distributing mains—a pressure such as the engineer considered sufficient to meet the demands of the moment; and a governor of this kind seemed to him to render it altogether uncertain what would be the minimum pressure in the remote parts of the district. With the object of overcoming this difficulty, it seemed necessary to devise a governor which would change the pressure so as to suit the demands on the

mains from time to time. Such a governor had been designed; and it had been found to answer the purpose very well. He should like to know whether Mr. Copp had had any experience of a governor of the kind, for it seemed to him (the speaker) that the question of automatic lighting depended upon the use of an appliance which would automatically change the pressure to suit the consumption, and thus render the pressure uniform throughout. In regard to maintaining the bye-passes in the lamps, these were apt to become choked up. The difficulty, he thought, could be overcome by the use of electric ignition. It could be quite easily done by having a small battery in each lamp-post. Automatic gas lighting could thus be made successful; and in this respect it would not stand at the same disadvantage as at present in comparison with electric lighting.

Mr. A. RICHARDSON (Handsworth) inquired whether Mr. Copp had made use of the tramway poles for street lighting purposes. If he had tried fixing incandescent gas-lamps on to the poles, he (the speaker) would like to know whether he had found the life of the mantles satisfactory.

Mr. S. DOUGLAS (Kenilworth) asked whether the street-lamp described in the paper was on the market; also, who was the maker, and what was the approximate price. With respect to the governors, he should like to have Mr. Copp's opinion about the cheaper form of governors at (say) 1s. 6d. and 2s. each, for use in connection with vertical incandescent burners.

Mr. W. JONES (Colwyn Bay) said he should much like to know whether advantage was taken by local authorities generally of dispensing with lighting on the five nights when the moon was full, for it seemed to be the practice in his own neighbourhood to economize in this way.

Mr. NELSON F. DENNIS (West Hartlepool) said he was one of those who agreed with the writer of the paper when he stated that "the better plan was to rearrange the spaces between the lamps." The object they had in view in street lighting was of course, to get the best results they could; but people in his part of the country would not be satisfied with lamps 83 yards apart. In his town, the lamps in what he would call first-class thoroughfares were from 28 to 37 yards apart; and in streets the distance was not more than 56 yards. But even then they were not entirely free from complaints. He thought the idea of gas lighting was to distribute the light over the whole street; but if they were going to duplicate the burners, they would double the cost of gas without distributing the light over a doubled area. His view was that where it was possible the best thing was to rearrange the spacing of the lamps rather than put an increased number of lamps at the corners of streets.

Mr. J. BIRCH (East Ham) inquired whether Mr. Copp had had any experience of, or information to give with regard to, the efficiency, with reference to both lighting and maintenance, of the inverted burner, either single or in duplicate, in the lantern.

Mr. F. OSCAR KIRBY (Doncaster) said Mr. Copp had dealt with his subject in an exhaustive manner. There was a great deal of information in the paper, and many points of value for future reference. He should like, however, to ask the author one or two questions. In the first place, he wished a further explanation of the statement that "the standard to be adopted in any town or locality should bear some relationship to its rateable value per head of the population." It seemed to him (the speaker) that such a standard would not be generally applicable. Was it intended to convey the idea of a standard rising *pro rata* with the rateable value of the locality lighted? If so, one might instance the case of a side street with highly-assessed factories or warehouses on both sides, and practically no population or pedestrian traffic during the lighting hours. Farther on in the paper three essential conditions for street lighting were quoted. He would suggest a fourth, which one might term depth of illumination. For satisfactory, uniform illumination there must be sufficient light for high vehicles—for instance, motor omnibuses—though, of course, it might be said that all vehicles should furnish their own means of illumination. Mr. Copp mentioned the fact that large units of light placed fairly high might shine through the first-floor windows. This would not appear to be a serious objection, as in thoroughfares, such as Victoria Street, Westminster, where large units were necessary, the first-floor rooms were not generally in use during lighting hours, being mostly offices or store rooms. Mr. Copp's figures of the relative candle power, height, and spacing of lamps did not appear exactly to confirm the axiom quoted in his paper—and with which he (the speaker) entirely concurred—that the greater the candle power of the lamp the higher it should be placed. But this might be due to some subtle polar characteristics of the sources of light compared, with which he was unacquainted. Could he take it that the figures adduced were the results of actual tests? At any rate, they did not appear to be in accord with the law of inverse squares. They were indebted to Mr. Copp for drawing their attention to the doubtful utility for general use of the term "mean spherical candle power" as a standard for illumination. This standard had been adopted in connection with the Westminster lighting contract, and might be the most satisfactory one for the conditions obtaining in that case. But there was perhaps a tendency to look upon it as a guide and precedent for every case. It was therefore important to bear in mind that the practical value of a lighting source should be computed on a basis which had reference to the conditions of usage. As Mr. Copp pertinently stated, it was a poor street-lamp that did not illuminate the ground in its immediate vicinity.

Mr. H. A. GARRETT (Torquay), alluding to the question of methods

of charging for public lighting, said he had not heard any mention of the average meter system adopted in some towns. He noticed that it was stated in the paper that it was usual to assume a certain consumption of gas or of current. But this was capable of being widely dealt with; and the question was whether it was not better to adopt the average meter system, and pay for the actual consumption. Had Mr. Copp any experience of the method he referred to?

The PRESIDENT said, before calling upon Mr. Copp to reply, he would ask the meeting to pass a very hearty vote of thanks to him for his paper. When he asked him to prepare the paper, he did so for the reason that he noticed, from the volumes of "Transactions," that they had not for many years had a contribution on the subject from the practical point of view. It was an important question, and one upon which he knew Mr. Copp was able to give them some valuable information. With regard to the spacing of the lamps, the hours of lighting, and similar matters in West Bromwich, these were in the hands of the Highways Committee; the Gas Committee being only responsible for the supply of gas and lighting the lamps in the same way as a private company. The other question was a matter which practically belonged to his own department. Of course, in arranging these things, they worked together in the amicable way in which he thought the officials of every public authority should do.

The vote of thanks having been accorded,

Mr. COPP, in acknowledgment, said he was grateful for the kind reception which had been given to his paper. At the same time, he welcomed the criticism upon it, which, of course, was what he had written the paper for. They all had their own opinions, and the discussion of papers often resulted in their modifying their views on different points. He had some difficulty in answering Mr. Eayr's question as to where the various lamps were to be seen, for they were dotted promiscuously about the town. They were improving the more important thoroughfares first; but they recognized that there was a great deal yet to be done to improve the lighting of the town as a whole. Some high-pressure lamps would be found in St. Michael's Street, and the new form of inverted burner could be seen in Beeches Road. In the High Street they would see the electric arc lights, which, in fairness to the Electricity Department, he ought to say were somewhat antiquated. At eleven o'clock these were turned out, and metallic filament lamps, which were fixed lower down the poles, were switched on; and the question was whether the road was not better lighted after this was done than before. At any rate, there was not much difference. As to Mr. Whyatt's remarks with respect to the spacing of lamps, the remedy there seemed to be to have higher lamp-posts and raise the unit of illumination. In regard to centre lighting, he had been very careful in his paper to avoid saying that he was in favour of it. He was not; but, judging by what he read in the Technical Press, and by what had been done in Germany, and having in mind also the experiments which had been carried out in Cannon Street, London, he thought it was very probable that centre lighting would take a very important place in the future. Personally, however, as he had said, he did not agree with it. Unless the unit of light were very high, a horse and cart proceeding down the centre of the road would throw a shadow on the pavement; and the system would be objectionable on this account. Several places in England had tried it; but it was very common on the Continent. As to the lighting in Grimsby, they who read communications on the subject of lighting were forced to the conclusion that in this connection Grimsby was more or less a law unto itself. He had carefully refrained from giving the comparative costs of gas and electric light. But everyone there knew the efficiency obtainable from ordinary town gas; and they must know also the consumption of electricity by ordinary metallic filament lamps. Of course, some people preferred electric lighting for reasons to which he had alluded in the paper. One would not expect to find gas lighting on the Brighton Front, for instance. There were places suitable for both kinds of illumination; and they should keep open minds on the subject, and adopt each illuminant as the circumstances of the case warranted. The times of lighting up and extinguishing which he had given were the actual figures for the previous year; but the climatic peculiarities of West Bromwich made the subject a rather difficult one. With reference to Mr. Caink's remarks as to pressure lighting, this was very good in a flat district, where there was an equable pressure all over the town; otherwise they had a large number of failures. Therefore he preferred a clockwork automatic lighting and extinguishing system. They had had every form at work; and they flattered themselves that they knew something about it. The extinguishing of the lamps was not effected by taking off the pressure; it was invariably done by another wave of pressure. As regarded the governor for proportioning the pressure to the consumption of gas, this object was accomplished by means of a Braddock governor, which was a double valve governor. The method of applying the pressure was usually to lower a tank of water on to the top of the governor; and a tap gradually discharged the water—the pressure assuming its usual height when the tank was emptied. Mr. Caink seemed to assume that automatic lighting was more or less experimental. This was not so; it was an established fact, as regarded both pressure and clockwork systems. There were at the present time whole districts lighted automatically; one of the most notable cases being Newcastle-on-Tyne, where several thousand lamps were dealt with in this way. With regard to Mr. Richardson's question as to lamps on tramway poles, he had found inverted lamps fixed in

this way perfectly satisfactory, and the renewals less than with the ordinary poles. As to the question put by Mr. Douglas, he (Mr. Copp) was afraid the lamp referred to could not be obtained at present. It was not "a thing of beauty" yet; but he had re-designed it in a way that made it considerably more presentable. One of the main points of the lamp was that the reflectors could be kept clean, because the air was absolutely excluded. He knew of no satisfactory governors for street-lamps at the price of 1s. 6d. or 2s. As to the cessation of lighting at certain periods, this was perfectly satisfactory for country districts, but totally inadmissible for urban districts. He should not like to contemplate the effects of leaving the town of West Bromwich unlighted during the period of full moon, for very frequently this period passed without their knowing it. He could not give figures as to the double-burner gas-lamps. He did not favour these at all. With regard to Mr. Kirby's remarks, when he said the standard should bear some relationship to the rateable value of the town, he meant this as a general statement. He quite agreed that he should have included depth of illumination as one of the essential conditions of satisfactory street lighting. His axiom that "the greater the candle power of the lamp the higher it should be placed" had been criticized by Mr. Kirby. But he had put in figures to illustrate the truth of the statement; and if Mr. Kirby would examine them, he would admit that he (Mr. Copp) was correct. As to Mr. Garrett's observations in regard to the average meter system, there was not so much necessity for it nowadays. They had tried the electric ignition method in West Bromwich, and he really thought it was a practical system. But some three months ago he decided to do away with the by-passes, some of which were exceedingly extravagant, and light by means of an acetylene torch. This was an extremely handy arrangement, and possessed the advantage that it did not blow out in the worst weather. He had not received any complaint with regard to it from the lamplighters, which was a sure sign that it was satisfactory. He desired to emphasize the point as to the question of testing. He knew he would be criticized by his friends in the electrical world for taking the observations at right angles to the direction of the light-ray, and at a height of 4 feet from the ground; but, as he had said, he adopted this plan in order that the curves might be more intelligible on the chart.

SOCIETY OF CHEMICAL INDUSTRY.

Annual Meeting in Sheffield.

The Annual Meeting of the Society was held at Sheffield last week, under the chairmanship of Mr. WALTER F. REID, of London, the retiring President.

At the business meeting, on Wednesday, the members were accorded a hearty welcome by the Master Cutler (Alderman Senior) and by Councillor Cecil Wilson. In acknowledging the welcome, the retiring President said there was no city in the United Kingdom which offered more points of interest than Sheffield, especially to those engaged in industrial pursuits.

PRESIDENTIAL ADDRESS.

In opening his address, Mr. REID expressed the opinion that the chemical industry had never known more active and progressive times than the present. New apparatus, methods, and products appeared with such rapidity that it had become extremely difficult to keep pace with all the applications of science to the industry. The tendency of the present age was towards specialization; but too minute subdivision had its disadvantages. The higher officials of a chemical factory must have some knowledge of a number of subjects besides chemistry. There would always be a demand for trained men who had a good knowledge of science generally, and especially of the methods of applying it. The chemical industry was far ahead of any other industry in the percentage of trained people it employed. It was similarly placed in regard to the value per head of the products of those employed. Iron and steel came second.

It was sometimes alleged that the nature of the training given to students in Great Britain was not of a sufficiently practical character, and that some foreign nations were superior to us in this respect. In his view, it could not be said at present that the facilities for acquiring knowledge were less in Great Britain than in any other country. In fact, in some of our institutions they were superior. Quite recently, industrial bursaries had been instituted, which went a little farther than the ordinary scholarships in that they provided assistance for the student after he had gone through the university course. The object aimed at was to provide practical instruction in factories for a period varying from a year to three years. He urged the need for information as to the careers of students after they left their scholarships at the universities and technical schools, and declared that information of this character was the only test of the final measure of success. He had engaged hundreds of young men; and when they came to him, the first thing they told him was that they had a certain degree. It was especially those students he had found, as a rule, wanting in the practical faculty. The fact that they had obtained their degree was one point upon which they were expecting to get employment in some industrial concern. An employer, if he was experienced in the employment of young men, did not generally attach first importance to a degree, however high it might be.

Students, of course, had great difficulty in obtaining practical technical experience.

Doubts had recently been expressed as to the utility of research work for students. Probably these doubts were due to the use of the word in more than one sense. From the scientific point of view, the working-out of any new problem might be called research work; but technologically research work should have a definite aim and some application of the knowledge gained for the benefit of mankind. Much of the so-called research work was unfortunately of the poorest possible description from the mental point of view. Simple facts, easily ascertained, were strung together without literary ability, and without the slightest attempt at drawing any useful conclusions. Regarded as a means of mental development, technological research had much higher value than so-called pure scientific research; for it not only included the latter, but added to it. As things were at present, the problem for the student was how to acquire practical knowledge at the commencement of his career. In this employers might incidentally assist by giving their younger employees more leisure to attend meetings of such societies as the Society of Chemical Industry, and by procuring journals and other literature that the assistant was unable to purchase. A good factory library was of the greatest pecuniary benefit both to employer and employed. But in how many factories was one to be found? The rapid march of progress in chemical industry necessitated continuous study if they wished to keep up to date. Whether they liked it or not, they were all, and must remain, students.

One often heard complaints that the times were not so good as they used to be, and that profits on manufactured goods were now small. In the older industries, this was, no doubt, true. But there were many new industries in which the manufacturer reaped a very satisfactory harvest, sometimes from an extremely small beginning. Bearing this in mind, every manufacturer should encourage his assistants to make observations and investigations bearing upon his business. Sometimes an apparently casual observation might lead to important results if it was followed up; but if the factory chemist was taught to consider himself merely as a kind of testing-machine, and original observation was discouraged, the business could not progress.

At the close of the address, a vote of thanks was accorded to the retiring President, on the motion of Dr. RUDOLPH MESSEL, of London, the new President, seconded by Dr. RUSSELL MOORE, of New York.

The Annual Report.

In their annual report, which was adopted, the Council stated that the number of members now is 4300, compared with 4299 at the last meeting. The New York Section has availed itself of the opportunity of the meeting of the Eighth International Congress of Affiliated Chemistry in America next year to invite the Society to hold its next annual meeting in New York. This invitation has been accepted. On the report of Dr. Divers, urging the need of a Department of Chemical Technology at the Imperial College of Science and Technology, the Council passed a resolution expressing the opinion that the governing body should forthwith proceed to formulate and carry out some complete scheme of training in chemical technology; and they authorized Dr. Divers, as the Society's representative on the Board, to express this formally as the opinion of the Council.

Social Functions and Visits to Works.

At the close of the morning session, the members and their ladies had luncheon at the Grand Hotel, on the invitation of the President of the Yorkshire Section of the Society, Mr. E. A. Brotherton. In his unavoidable absence, Mr. F. W. Branson (Leeds) presided. In the afternoon, parties visited various works; and the annual dinner of the Society was held at the Grand Hotel in the evening.

Those of the members of the Society who remained in Sheffield on Thursday saw quite enough to justify the President's declaration, in the opening of his address, that no other city in the United Kingdom presents so many points of interest to people engaged in industrial pursuits. Some of the members spent the day at the works of Messrs. Newton, Chambers, and Co., Limited, at Rockingham, and of the Wharnccliffe Silkstone Colliery Company, Limited, at Tankersley. Others, during the morning, visited the Grimsthorpe works of the Sheffield Gas Company, and the Metallurgical and Engineering Department of the University. Over the latter the party were conducted by Professors Arnold and M'William. The tour of inspection included a visit to the crucible furnace, where two ingots were cast, and the effect shown of a trace of aluminium on the steel; the ore containing the aluminium being about 3 inches shorter than the other, owing to the elimination by it of the gas of the ingot. In the afternoon, other works and the University buildings and laboratories were visited. In the evening, there was a reception by the Lord Mayor and Lady Mayoress in the Town Hall, followed by a dance.

The members concluded their visit to Sheffield with a delightful trip on Friday to Chatsworth and Haddon Hall; the party numbering about 150. At Chatsworth, luncheon was served in the coach-house, under the presidency of Mr. Reid. At the conclusion of the repast, the party drove to Haddon Hall, where the afternoon was spent—tea being served in the grounds. In the evening, a smoking concert was held at the Grand Hotel, Sheffield.

CHARGING CHAMBER RETORTS.

In the "JOURNAL" for the 17th of January last (p. 156), there was an illustrated description of an arrangement for charging chamber retorts, for which a patent had been taken out for France by the Compagnie Générale de Construction de Fours, of Paris. Some changes have since been made which are the subject of an addition to the original patent; and the following particulars are taken from the specification.

According to the first patent, the arrangement consisted of a closed discharge channel or shoot running from the fixed hopper to the retort to be filled. The addition relates to another form of construction, in which the shoot, instead of being fixed to the opening of the hopper, is placed upon a movable carriage, so that it can be run in front of each of the chambers forming one or

several benches of retorts. The object of the arrangement is to reduce considerably the cost of the plant, by dispensing with the use of a separate shoot for each retort. The improved form of construction is shown, by way of example, in the accompanying illustrations.

Fig. 1 is a transverse elevation of the truck carrying the shoot in the position for filling the retort; fig. 2, a longitudinal view of the shoot; and fig. 3, a similar view to fig. 1, the parts of the shoot being in the position for moving.

The shoot consists of two pipes, A and B, oscillating on common axes C, supported by a frame D suspended from another E mounted on wheels. These frames form a carriage which can be moved lengthwise above the settings on rails supported by posts fixed to the iron bars between which the hoppers are placed. The pipe B is in the shape of a funnel (one of its sides being raised) provided with an opening communicating with the chimney shaft F, which, in this position, is also supported by the truck. The other pipe is composed of two cheeks situated between the side

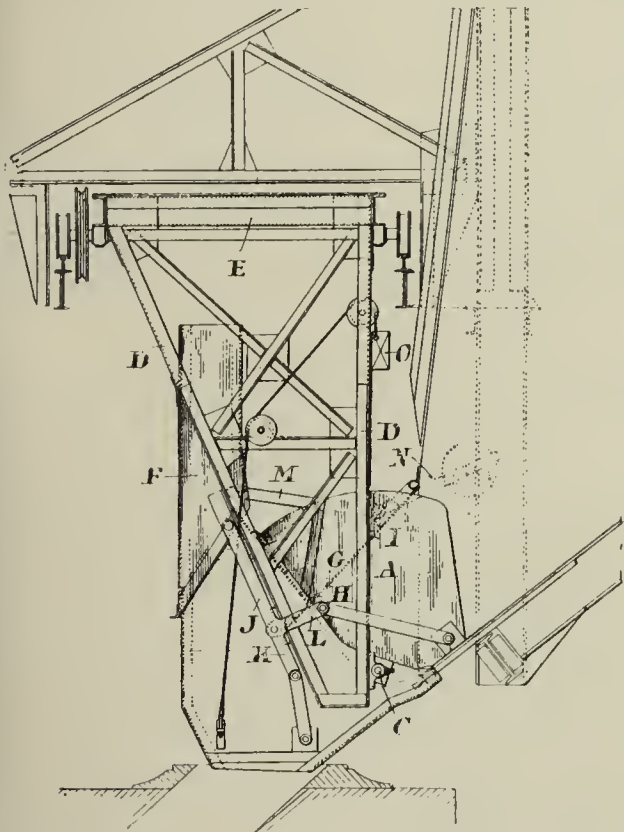


Fig. 1.

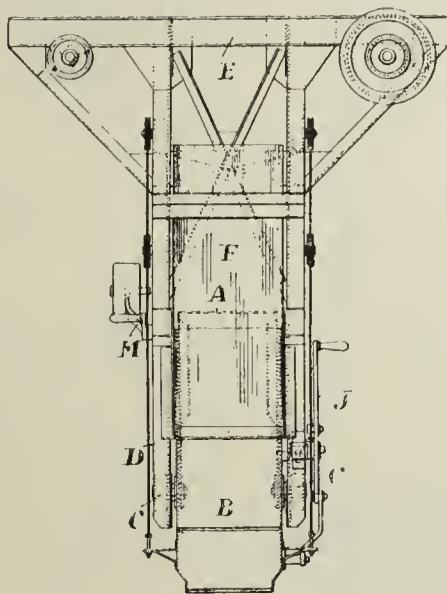


Fig. 2.

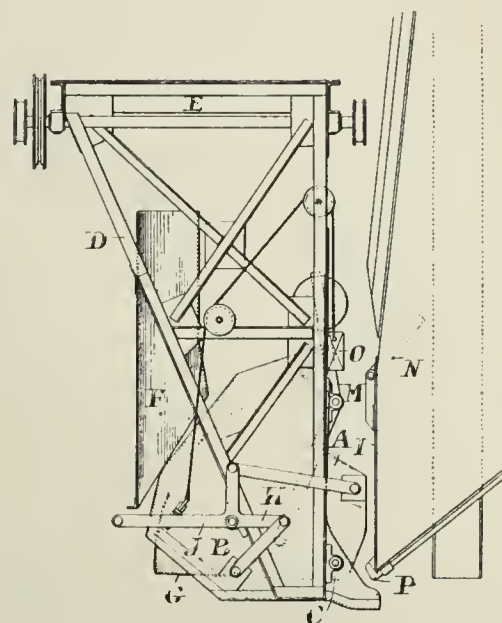


Fig. 3.

walls of the first pipe, and united with each other by a partition G, designed to guide the products of combustion from the retort into the chimney-shaft. The lower edge of this partition terminates in an angle-iron H, against which the door of the hopper I rests when open.

On one of the rear sides of the framework there is a hinged hand lever J, provided with two arms K L, one connected by a rod with the pipe B, and the other in a similar way with the pipe A. The hinges of the lever J and the two connecting-rods are fixed so that when the lever is pulled down, the pipes A and B tend to swing in the opposite direction while engaging one with the other (see fig. 3); and, on the contrary, when the lever is raised they move to a position of prolongation, as in fig. 1.

On one of its front sides, the framework supports the hinge axis of a lever M, furnished with a counterweight. By the aid of this lever the arm N can be worked so as to keep the hopper door open. The two pipes are equilibrated by a counterweight O, sliding against a plate which is fixed on the framework. This counterweight is connected with the pipe B by a rope running over pulleys as shown.

The working of the appliance is as follows: In their ordinary position of rest, the pipes A B are brought one towards the other, so that the pipe B will be raised to such a height as to escape the mouth of the retort and its lid, and the pipe A will be disengaged from the sides of the hopper, as in fig. 3. In this position of the parts, the counterweight of the lever M is lifted sufficiently to be outside the face of the hopper. Thus arranged, the truck and everything it carries can be run lengthwise over the settings without coming in contact with any obstacle.

To charge a retort, the lid is opened, and the truck run forward so that it will present the pipe B above the opening. The lever J is then raised; the effect being to cause the pipe to drop into the mouth of the retort, and the cheeks of the pipe A to be pressed against each side of the walls of the hopper. All that has now to be done is to open the hopper door by turning the catch P which secures it, and letting down the counterweight against the arm N forming part of the door. The latter, both from the pressure of the coal and the action of the counterweight, is moved against the angle-iron H of the partition G, and constitutes the upper slanting wall of the shoot, of which the cheeks of the pipe A form the side walls. The coal running from the hopper thus passes through

a closed channel, which conveys it safely into the mouth of the retort. The products of combustion given off during the operation of charging are collected by the pipe B, and led into the chimney shaft F, so as to avoid accidents to the workmen.

Gas-Chambers at Elbeuf.

From the last "Revue Bibliographique" of the Société Technique du Gaz en France, we take the following particulars of a bench of Koppers ovens erected at the new gas-works at Elbeuf. There are six chambers divided into three sets; each set having its producer, regenerator, and hydraulic main. Two units work together, leaving the third in reserve. Each chamber measures 5.60 m. long by 0.475 m. wide by 2.80 m. high. The charge is about 5 $\frac{3}{4}$ tons; and the carbonization takes 24 hours. The charge is made in the morning, after which only the producers require attention—being filled every three hours. Clinkering is done once in 24 hours. Besides the foreman, a squad of seven men is required for the day, and two men at night. Tests made from March 21 to 28 gave the following results: With English coal, having 13.66 per cent. of ash and giving 75.10 per cent. of coke, and with the weight of charge already given, the gas produced was 296 cubic metres per metric ton. The fuel consumed was 15.3 per cent. of the coal carbonized. The calorific power was 5253 calories. During the latter days of the test, the percentage gas analysis was:—

Hydrogen	50	Carbonic acid	1.8
Methane	34	Carbonic oxide	4.9
Other hydrocarbons	3.3	Nitrogen	6.0

The coke was like metallurgical coke, but less hard, and gave but little dust. The maximum daily output is 6000 cubic metres.

Mr. HENRY FURNELL PEATY, who is on the staff of the Hornsey Gas Company, obtained, on the 8th inst., the degree of Master of Science (Engineering) by thesis, at the Victoria University, Manchester.

Mr. J. W. BROADHEAD, Managing-Director of Messrs. Robert Dempster and Sons, Limited, has been elected Chairman of Section III. of the Society of British Gas Industries, in place of the late Mr. W. J. Jenkins.

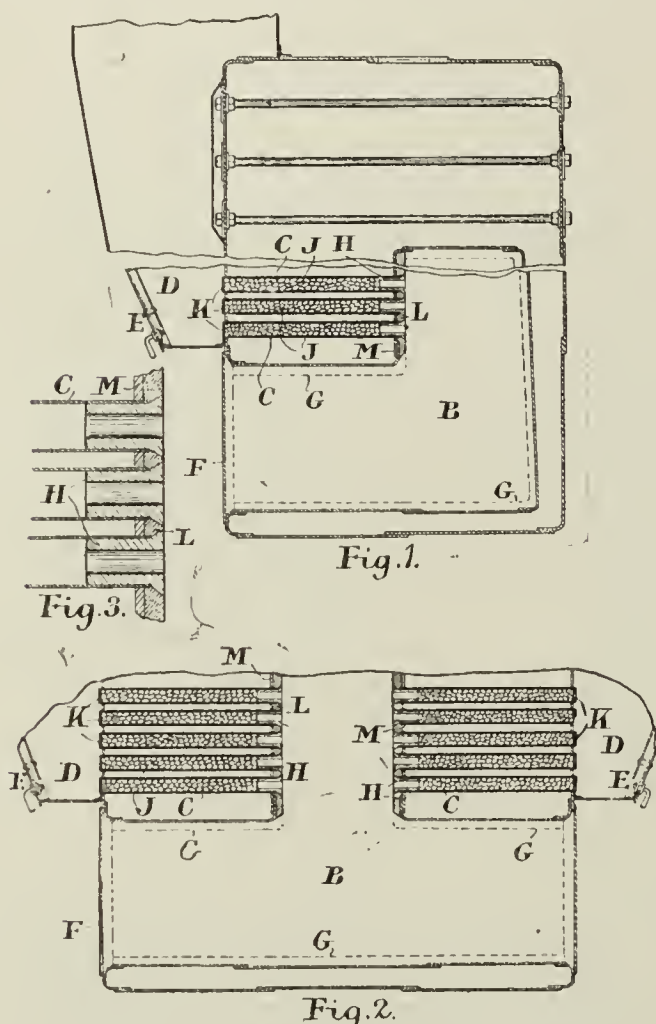
REGISTER OF PATENTS.

Gas Steam-Generators.

BONE, W. A., of Leeds University, WILSON, J. W., of Armley, Leeds, and M'COURT, C. D., of Balham Hill, S.W.

No. 17,560; July 25, 1910.

According to this invention, liquid or gaseous fuel is burned in a combustion chamber situated within (or in proximity to) the shell of the boiler. The boiler tubes through which the products of combustion pass after leaving the combustion chamber are packed with refractory material in a fragmentary, granular, or globular condition; and, "owing to this packing, a much higher heat transmission is obtainable per unit area of tube surface," and the patentees are "thereby enabled to reduce greatly the length of tube necessary to effect a given cooling of the furnace gases as compared with the length heretofore generally in use."



The Bone-Wilson-M'Court Gas-Heated Steam-Boiler.

Figs. 1 and 2 show sectional elevations of steam-generators constructed according to the invention. Fig. 3 shows a means of protecting the tube-plate from excessive heating.

In figs. 1 and 2, the cylindrical boiler shell is provided with an internal combustion chamber B and boiler-tubes C. D is an off-take connected with a fan or other suction device (not shown) provided with a door E adapted to give easy access to the tubes for the purpose of charging with granular material as hereafter described. The combustion chamber is provided with a door F (lined with fire-clay) furnished with openings for the introduction and lighting of burners of any approved pattern. The air required for combustion, entering the combustion chamber through the openings in the door, is drawn in under the action of a fan, and, in the case of liquid fuel, is also forced in by the injection of the compressed air or steam supplied to the liquid fuel burners.

The boiler-tubes are provided with fire-clay perforated plugs or ferrules H adapted to fit the tubes, and are packed with granular refractory material J—for example, fire-brick crushed to such a size as will pass a sieve of one mesh to the linear inch; the finer material, such as will pass a sieve of two meshes to the linear inch, being rejected. The refractory material is retained in position at the other ends of the tubes by metallic grids or spiders K.

The fire-clay plugs or ferrules, while serving to retain the granular material in the tubes, serve also to protect the tubes at their entrance ends from excessive heating and to direct centrally the hot gases into the granular material, and thus producing at or about the place where the gases enter the granular material a temperature higher than would be obtained if the gases were allowed free entrance over the entire open end of the tube.

The plugs H are so constructed that, while a portion of their length tightly fits the tubes or can be made so to do by winding with asbestos cord or the like, the projecting part tapers outwardly so as to retain in position a gannister or like lining L adjacent to the usual tube plate M, which carries the tubes C and through which the projecting plugs pass. This is shown in detail in fig. 3. Where, however, the tubes are too closely assembled to admit of this arrangement, the projecting ends of the plugs may be enlarged in such a manner as to cover, or nearly cover, the tube plate M when the plugs are assembled in

position—the interstices (if any) being filled with fire-clay, gannister, or other refractory material of such a nature as to undergo but little shrinkage in burning.

The granular material with which the tubes are packed "serves to greatly increase the heat transmission through the walls of the tubes to the surrounding water," and in so doing appears (according to the patentees) to act in the following manner. Part of the heat conveyed to the granular material is radiated thence to the walls of the containing tube, while at the same time the granular material serves to mix the gases in transit, continually deflecting gases from the centre to the sides, and *vice versa*, and repeatedly causing the hot gases to impinge on the walls of the containing tube. The part of the granular material which becomes incandescent serves to assist the combustion of any part of the fuel which on leaving the combustion chamber is not completely burnt.

The inventors have found, as the result of numerous experiments, that the intensity of heat transmission through the walls of the tubes depends, among other things, on the size of the fragments with which the tubes are packed. The larger the fragments employed, the longer will be the tubes necessary to effect a given cooling of the furnace gases. They have found that when the size of the fragments employed is such as will pass a sieve of one mesh to the linear inch but will not pass a sieve of two meshes to the linear inch, a boiler-tube 3 feet long and of 3-inch bore is sufficient to cool the furnace gases to a temperature at which they may conveniently be passed to a feed-water heater.

The feed-water heater may conveniently consist of tubes packed with granular material to which the products of combustion are passed on leaving the boiler; the feed-water being caused to pass around the tubes on its way to the boiler. They find that if the tubes in the feed-water heater be of the same number and the same bore as those employed in the boiler, the length of the tubes in the feed-water heater may conveniently be one-third the length of the tubes in the boiler.

Manufacture of Ammonium Sulphate.

CHRISTIE, M. G., of Crigglesstone, near Wakefield.

No. 15,817; July 1, 1910.

In order to avoid the separate manufacture of sulphuric acid for absorbing ammonia from gases containing it, it has been proposed, the patentee points out, to pass gases containing sulphur dioxide, or a solution of sulphurous acid or bisulphite, into the absorbing vessel—such as the ordinary saturator—whereby ammonium sulphite is chiefly produced. This is subsequently oxidized by the air, so that much of it becomes ammonium sulphate. But this procedure is impossible when the temperature of the gases passing into the saturator is maintained high enough to prevent condensation of the water vapour which they contain, and involves difficulty on account of the escape of sulphur dioxide into the purified gas unless the temperature of the saturator is kept very low.

According to the present invention, the same object (of avoiding the separate manufacture of sulphuric acid) is attained, and difficulties in connection with the temperature of the saturator are said to be avoided, by passing sulphur dioxide, or gases containing it, into the liquid in the saturator or absorbing vessel and at the same time subjecting the liquid to electrolysis—"thus taking advantage of the known fact that sulphuric acid is formed when sulphur dioxide is passed into a bath in which electrolysis of an acid or salt is proceeding." Preferably, the sulphur dioxide gases, obtained in any known manner, are passed into the liquid only around the anode or anodes.

It is in some cases preferable, he says, to have an electrolytic bath apart from the saturator and to circulate the liquor through both the saturator and the bath. The sulphurous gases are passed into the anode compartment of the electrolytic bath, and there converted into sulphuric acid, which, in turn, is converted into ammonium sulphate in the saturator. As the liquor in the saturator is a strong solution of ammonium sulphate, it is easily electrolyzed, and any ammonia evolved at the cathode is absorbed in the saturator or in the anode compartment of the electrolytic bath. For this purpose, the cathode compartment may have a cover from which springs a pipe for leading the evolved gases into the saturator or into the anode compartment.

Concluding his specification, the patentee says: "In modern practice, the ammonium sulphate is removed from the saturator in the solid state. The drainings from the solid may conveniently constitute the electrolytic bath for my purpose. Or the sulphur dioxide may be absorbed in these drainings or mother liquor before or after the drainings have been passed through the anode compartment of the electrolytic bath and before they have been returned to the saturator. When operating with gases containing sulphur dioxide as well as ammonia, or when sulphur dioxide has been added to such gases, the whole gas may be passed through the electrolytic bath."

Automatically Regulating the Flow of Liquids.

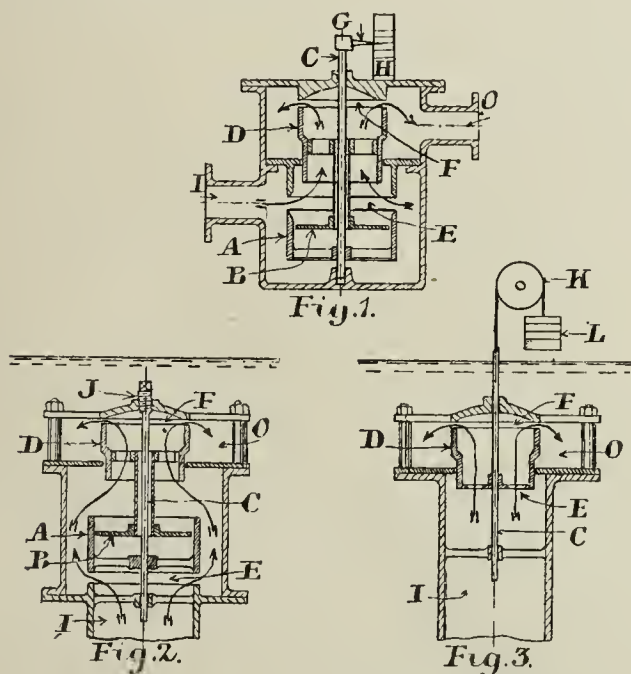
KENT, W. G., and HODGSON, J. L., of High Holborn, W.C.

No. 22,184; Sept. 24, 1910.

This apparatus is intended primarily for controlling the rate of discharge from filter-beds, so as to ensure a constant rate of filtration. It is for the same purpose as that described in patents No. 832 of 1876, No. 23,429 of 1898, No. 13,595 of 1903, and No. 9213 of 1908. It consists essentially of valve apparatus having a measuring orifice across which a difference of pressure is obtained according to the rate of flow, and a balance throttle valve—*i.e.*, a valve that will close down the flow without appreciable force having to be exerted—which is operated by the difference of pressure across the measuring orifice.

It is so arranged that the difference of pressure across the measuring orifice acting on a piston attached to the throttle valve balances the weight of the valve and its attachments at the flow at which the apparatus is set to regulate. Any increase of flow increases the difference

of pressure and causes the valve to lift and close down the flow; while any decrease of the flow in the same manner causes the valve to open up. The flow is therefore maintained constant. The amount passing depends on the size of the measuring orifice and the weight of the throttle valve and its attachments.



Kent and Hodgson's Fluid-Flow Regulator.

In the illustrations, I is the inlet; O, the outlet; E, the measuring orifice; C, the balance-valve; and F, the point at which the flow is throttled.

In figs. 1 and 2, the difference of pressure acts on the two sides of the piston B, which fits loosely in the cylinder A. The rate of flow is controlled by altering the width of the measuring orifice E by raising or lowering the central shaft C, to which the cylinder A (whose edge forms part of the measuring orifice) is attached. In fig. 1, a pointer is shown attached to C so that the rate of flow passing may be directly read. In fig. 2, the shaft C, carrying the cylinder A, is raised and lowered by means of the screw J. Fig. 1 shows an "enclosed" type of regulating valve, which may form part of a pressure pipe-line; while figs. 2 and 3 show an "open" type, which is placed on the filter outlet and is usually "drowned."

The balanced throttle valve D is made of two diameters (as shown), so that the high pressure against which the valve is regulating is balanced at the two ends of the smaller diameter cylinder, and the low pressure into which it discharges is balanced at the two ends by the larger diameter cylinder.

This throttle valve D thus differs very essentially from that shown in patent No. 13,595 of 1903, where it is made of one diameter only, so that the high pressure acts on the bottom of the valve and the lower pressure acts on the top, and the valve is not balanced.

Careful experiments have, it is said, been made on this point, which show that the valve does not work satisfactorily unless this balancing is carried out as described.

In patents No. 832 of 1876, No. 23,429 of 1898, and No. 9213 of 1908, the throttling is done by two discs or pistons opening or closing two openings, which, although it gives a balanced throttle valve, is not a suitable way of mechanically carrying out the throttling. In fig. 3, the measuring orifice E is attached to the balanced throttle valve. The rate of flow may in this case be controlled by balancing part of the weight of the moving parts by means of weights L passing over a pulley K.

Mixing Fluids in Given Proportions.

COMPAGNIE POUR LA FABRICATION DES COMPTEURS ET MATERIEL D'USINES A GAZ, of Paris.

No. 27,703; Nov. 28, 1910. Date claimed under International Convention, Dec. 1, 1909.

This invention relates to a regulator adapted for mixing (say) lighting gas and acetylene, or gas and air in determined proportion, whatever be their respective pressures and densities—the proportion in question being varied at will by closing to a greater or less extent an orifice admitting one of the two fluids. It can also be used for measuring the respective volumes or the total volume of the two fluids mixed. The regulator can, moreover, be placed on a shunt of a main conduit so as to serve for the regulation of the volume supplied by the shunt, in proportion to that passing through the main conduit, which allows of a proportional meter to be inserted in the shunt.

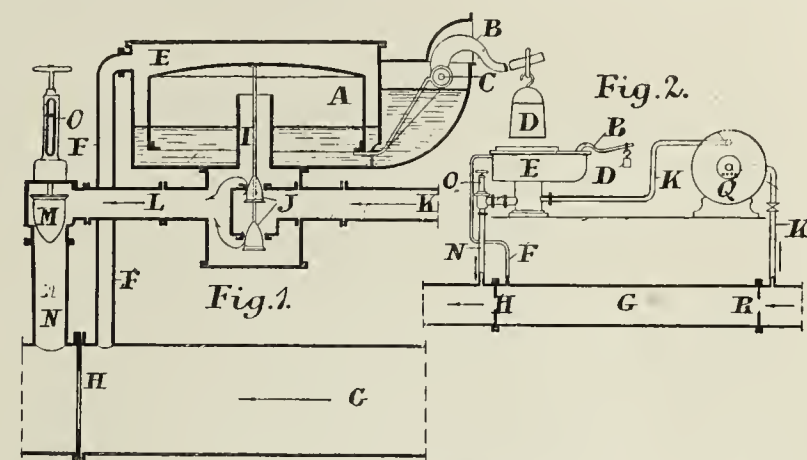
Fig. 1 shows a vertical section of the regulator. Fig. 2 shows diagrammatically the application of the apparatus in combination with a proportional counting device arranged in the shunt.

In the following description, it is assumed that the regulator is used for causing a certain quantity of acetylene to be distributed in a conduit for coal gas; but the arrangement of the parts, as well as the operation, would remain the same whatever be the nature of the constituents of the final mixture.

The regulator comprises an oscillating bell A, the immersed lower edge of which rests on the arm of a lever B, pivoted about the spindle C or resting on knife edges similar to those of the beam of a weighing machine. The bell is balanced exactly by means of an outer weight D secured to the second arm of the lever; and it works in a closed vat E, which is in communication, by the pipe F, with the conduit G, for the coal gas. The joint of the pipe F, with the conduit G, is in front of a diaphragm H in the conduit, and which has an orifice producing a

loss of head which varies approximately in proportion to the square of the output.

The bell is provided in the centre with a spindle I, carrying at the lower end an obturator or double cone J (or any other kind of balanced valve arrangement), by means of which it is possible to cancel, by equal and reverse reactions, the effect of the inlet pressure of the acetylene circulating in the conduit K, in case the pressure is variable. The



A French Gas Mixing Plant.

fixed or variable pressure acting in the conduit K must, of course, always remain greater than that in the conduit G.

The escape of the acetylene takes place through a branch L, communicating with the bottom face of the bell A, and terminating in a valve with a parabolic closing member or valve M. The latter is, in its turn, connected to the conduit G behind the diaphragm by a pipe N. The valve M is provided with an opening indicator O, and acts on the acetylene as a diaphragm having a cross-section adjustable at will, for the purpose of modifying the proportion of the mixture.

The operation is as follows: Any modification of the pressure in G, or of the admission pressure of the acetylene in K, brings about a movement of the bell. The latter, which is balanced exactly, takes up its position of equilibrium when the pressure acting on its bottom face is equal to that acting on its upper face—that is to say, whatever be the variation in the conduit G or in the acetylene conduit K, the regulator always gives, above the parabolic valve M, a pressure equal to that in the main conduit G in front of the diaphragm H.

The regulator for ensuring the mixing of the two fluids in a given and constant proportion can also be arranged in the shunt on a main conduit G (fig. 2) and used for regulating the volume supplied by the branch K, so that the volume in question should be always in proportion to that passing through the main conduit G. The apparatus working in these conditions and having a counting device Q arranged in front or behind it, enables the volume supplied by a conduit G to be determined by measuring only a small fraction of the volume, and therefore using a measuring apparatus of only small capacity.

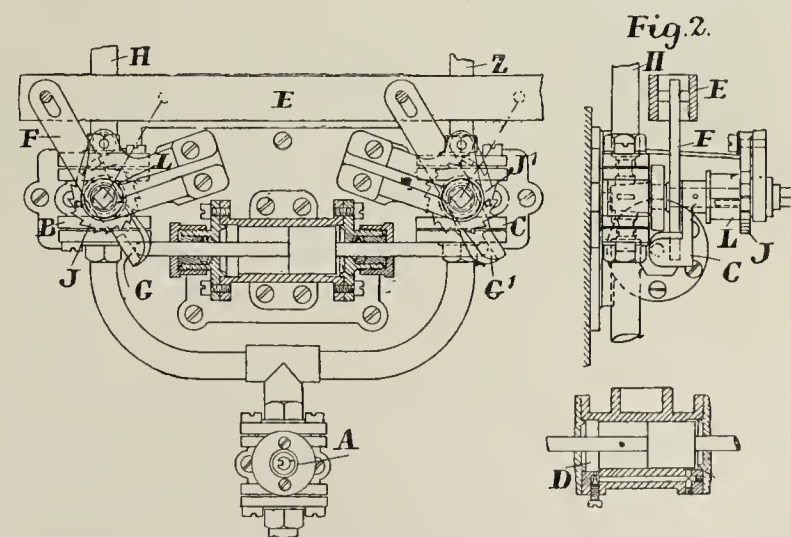
In the arrangement in fig. 2, the diaphragms H and R have for their object to bring about in the main conduit G the loss of head required for producing a current of fluid in the shunt conduit K and ensuring the working of the regulator and of the counting device Q. The regulator, instead of being provided with an oscillating bell A, could be constituted with a flexible diaphragm or a vertically adjustable bell, like those of emission regulators used in gas-works. The oscillating bell has, however, the patentees observe, the advantages of being very sensitive and easy to balance by means of a balance weight.

Alternately Igniting and Extinguishing Pilot Lights and Main Burners of Gas-Lamps.

JULIUS PINTSCH AKTIENGESELLSCHAFT, of Berlin.

No. 30,136; Dec. 28, 1910. Date claimed under International Convention, Dec. 27, 1909.

According to this invention, two separate cocks are provided—one for the supply pipe of the pilot lights, and the other for the supply pipe to the main burners—one of which is fully opened by hand by shifting



Pintsch's Pilot Light Regulator.

the device from one operative position to the other in order to establish the flow of gas from the source to the desired branch pipe. By this movement of the one cock, the tap of the other cock is released so as to enable it to be gradually closed automatically under control of a retarding device common to both cocks.

The illustration shows a plan (partly in section) of the whole device;

a side elevation and a longitudinal section of the retarding device. The mechanism consists essentially of a main cock A; a cock B for the main burner pipe H; a cock C for the pilot lights pipe Z; a retarding cylinder D; and an actuating bar E. The latter is positively connected with two levers F F' mounted freely on the spindles of the plug taps of the cocks B C. When the bar is moved in one direction, the levers abut against projections of the levers G G', which are fixed on the spindles of the cocks B C and are urged by springs L, which are arranged to be set by means of ratchet wheels J J' and co-operating pawls. The springs L are designed to close the cocks B C, which are so arranged that their closed positions are in different phases. For instance, both cocks are opened when the taps are turned towards the retarding cylinder D, which is provided with a duct communicating with both ends of the cylinder, the cross section of which duct may be varied by a screw.

The operation of the device is as follows: The actuating bar E is shown in the position which puts the device to "off." In this position, the gas enters from the main cock A through the supply pipe and cock C to the pilot lights pipe Z. The cock B controlling the main burner supply pipe H is closed, so that only the pilot lights connected with the pipe Z are burning. If, now, the bar E is put to the position corresponding to "on," the cock B is at once opened by means of the levers F G, whereas the lever F' merely releases the projection of the lever G', so that for the time being the cock C remains in the open position. The gas is now flowing through the cock B to the main burner supply pipe H; and, consequently, the air in this pipe is expelled, so that the burners connected with it are gradually ignited by the burning pilot lights.

Under the force of the spring L, the lever G' presses against the end of the rod of the piston of the retarding cylinder D in the effort to close the cock C. The latter, however, cannot be closed suddenly owing to the resistance of the air pressure in front of the piston; and consequently the complete closing of the cock C, and with it the extinguishing of the pilot lights, is delayed until the piston has expelled the air from the space in front of it to the space behind the piston. The cross section of the duct being variable by means of the screw shown, it is possible to retard the closing of the cock C so as to ensure that the burners on the main burner supply pipe H are ignited independently of their number or the distance of the lamps from each other.

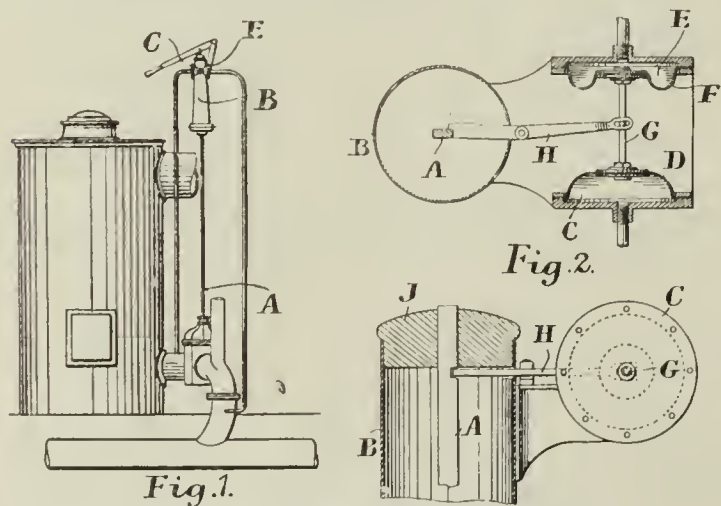
On the other hand, if it is desired that the pilot lights should be ignited at the main burners and the latter should be extinguished, the bar E is again put to the position corresponding to "off." In this case, the cock C is immediately opened to the full extent by means of the levers F' G', while the lever F merely releases the lever G. Sudden closure of the cock B, which, as well as the cock C, is subject to the action of the spring L, is prevented by the piston of the retarding cylinder D abutting against the projection of the lever G. On reversal of the bar E, both cocks B C are open, and the complete closure of the cock B takes place only when the piston has reached such a position that the projection of the lever G again abuts against the tail of the lever F.

Water-Gas Apparatus.

STELFOX, J. C., of Victoria Street, Westminster.

No. 29,709; Dec. 21, 1910.

The object of this invention is to prevent the opening of the blast-valves of water-gas apparatus if the pressure of the air in the blast-main be below that of the gas in the generating apparatus or below some fixed relation to the latter, and thus to prevent the passage of gas into the blast-main, and the consequent formation of an explosive mixture in this main or in the machinery room.



Stelfox's Water-Gas Blast-Valve Operator.

The blast-valves of the apparatus are controlled by a locking device actuated by differences in the pressures in the generating apparatus and the blast-main. In one arrangement, the blast-main at the inlet of the blast-valve and the gas-generating apparatus at the outlet of the blast-valve are connected respectively to two chambers separated by a flexible diaphragm, so that any excess pressure in either chamber over the other causes the diaphragm to move (or preferably to two separate chambers each having its own diaphragm, the two diaphragms being connected as by a bar). The diaphragms may be proportioned so as to move with any desired difference between the blast and gas pressures. This movement causes the bar or some connected lever to move in a slot in the blast-valve spindle (or its operating rod) in such manner that the latter cannot be raised when the diaphragms are at one end of the stroke, but is free when the diaphragms are at the other end.

Fig. 1 is a view of part of a water-gas generating plant fitted with a blast-valve the opening of which is so controlled. Fig. 2 shows a sectional plan and an elevation of one form of the valve-locking device.

A is the spindle or operating rod of a blast-valve; and B its guide or standard, of the usual type. C is the chamber connected to the gas-generating apparatus, with its diaphragm D. E is the second chamber connected to the blast-main, with its diaphragm F. The movement of these diaphragms, and the connecting bar G, actuates the lever H and causes it to enter a slot in the operating rod, when the pressure in the chamber C is higher than that in the chamber E or bears some fixed relation to it (according to the relative areas of the two diaphragms). The lever H lies close underneath some stop (as indicated by J), which prevents the rod A being raised when the lever H is in the slot. The movement of the diaphragms from the chamber E towards the chamber C, when the pressure in the chamber C falls to the required extent, carries the lever H clear of the rod A so that the latter is free to rise.

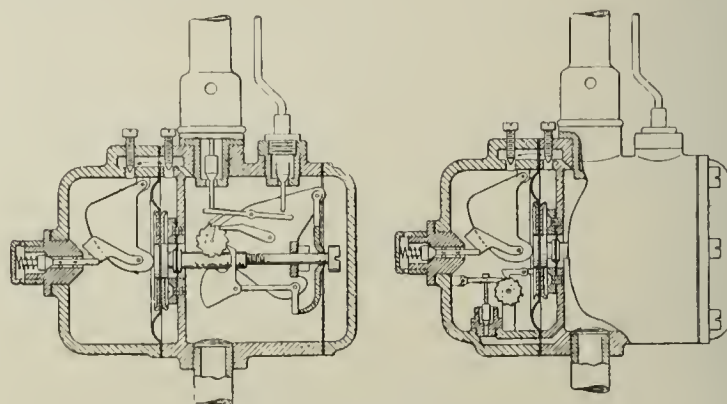
Controlling from a Distance the Valves of Gas-Burners.

ROSSBACH-ROUSSET, F., of Berlin.

No. 4936; Feb. 27, 1911. Date claimed under International Convention, March 19, 1910.

This apparatus for controlling from a distance the valves of gas-burners is of the type wherein, on a temporary and intentional increase in the gas pressure taking place, a diaphragm or yielding pressure member is moved so that mechanism is actuated to open or close the valve supplying gas to the burner. As is pointed out by the patentee, if such apparatus is to work efficiently it must be independent of any definite initial pressure, and not sensitive to gradual variations in gas pressure or rapid fluctuations in the pipes due to sudden gusts of wind. On the other hand, when a temporary intentional increase of pressure takes place, the apparatus must be certain to work.

Here one of two gas-chambers, separated from each other by a yielding pressure member—a diaphragm, piston, or the like—and connected to the gas supply pipe, is temporarily placed (as shown) in communication with the atmosphere through an outlet valve, opened by the movement of the yielding pressure member, when the burner-valve is to be operated; the outlet valve being closed as soon as the burner-valve has been actuated.



Rossbach-Rousset's Gas-Burner Valve-Controller.

As the diaphragm is generally exposed to gas pressure on both sides, and since the gas enters the two chambers through openings of different sizes, the ratchet mechanism is operated only when the pressure on one side of the diaphragm is rapidly and intentionally increased; and the initial pressure in the mains acting on the diaphragm is immaterial. As, moreover, the chambers on either side of the diaphragm are in free communication with the gas supply pipe, gradual changes of pressure are uniformly transmitted to both chambers, and, consequently, the diaphragm remains at rest.

Unintentional operation of the burner-valve when the gas pressure is momentarily increased and then quickly reduced—say, by a gust of wind—is almost entirely avoided, since the outlet valve does not immediately open to its full extent, and thus the pressure in the mains has time to sink before the gas pressure in one chamber has been sufficiently reduced to enable the diaphragm to operate the burner valve-actuating mechanism.

The operation of the valve-actuating mechanism, when a rapid and intentional increase of pressure takes place, is ensured by the diaphragm being relieved of pressure on one side when it is desired to actuate the burner-valve, so that practically the full gas pressure operates on the other side of the diaphragm to move the valve-actuating mechanism.

To avoid unintentional operation of the burner-valve when the pressure in the mains is momentarily increased, the chamber which has no outlet valve is connected to the gas supply pipe by a valve-controlled opening. If the valve is partially closed, the pressure is then only gradually transmitted to the chamber; so that a momentary increase of pressure does not influence the diaphragm which controls the valve-actuating mechanism.

When free movement is provided between the valve-operating gear and its actuating member, carried by the yielding pressure member, only a comparatively small but rapid increase of pressure is necessary to ensure its proper movement, since the excess of pressure on one side of the yielding pressure member, produced by the inlet openings to the two chambers being disposed on either side of the yielding pressure member and throttled to an unequal extent, only starts the movement of the diaphragm, while the operation of the valve is effected by the difference of pressure, which is increased as soon as the yielding pressure member is placed in communication with the atmosphere on the opening of the air valve.

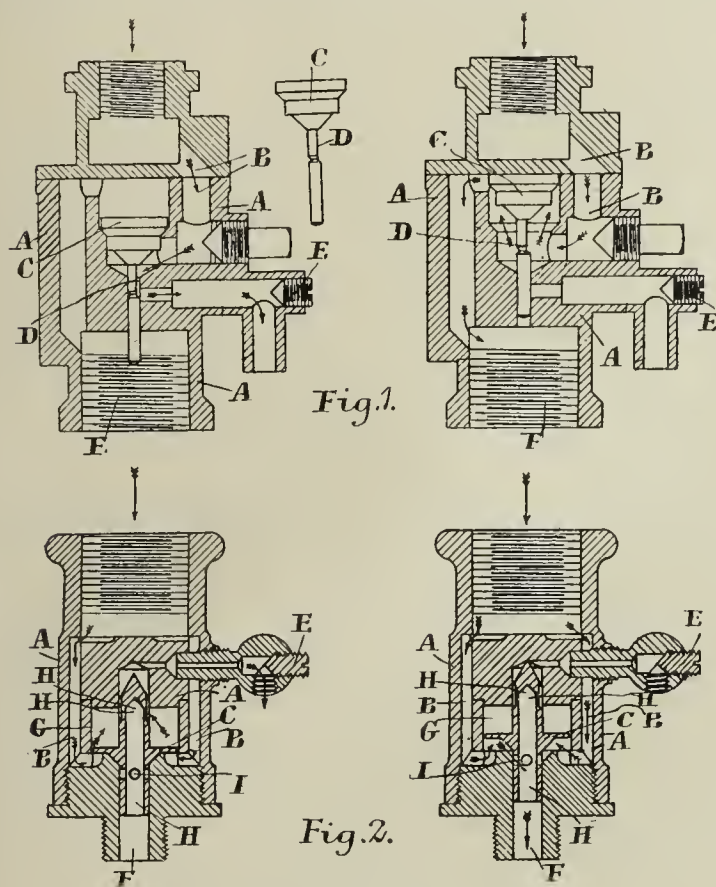
Two constructions of apparatus according to this invention are shown in longitudinal section.

Inverted Gas-Burners.

PERRY, W. F., of Tipton.

No. 28,523; Dec. 8, 1910.

This invention relates to inverted gas-burners with a controlling device of the mushroom type, to the underside of which gas is fed and which is so arranged that when the gas is at full pressure the valve is lifted off its seating, cutting off the pilot light supply and passing gas to the main burner; while when the pressure is reduced, the valve returns to its seating and cuts off the main burner supply, then only passing gas to the pilot light or bye-pass burner.



Perry's Inverted Gas-Burner Controller.

Fig. 1 is a longitudinal section of one form of lighter with the valve in the position for supplying the pilot light, and in position for supplying the main burners. Fig. 2 shows another form.

In fig. 1, the main chamber A is between the controlling valve and burner; the supply pipe being connected to the upper end, from which the gas passes, by the passage B, to the valve chamber beneath the mushroom valve C. When the quantity of gas is insufficient to lift the valve, the gas escapes from the chamber by the port D, which is formed by cutting away the valve stem for a portion of its depth. From this port the gas passes to the pilot light of the burner, a regulating plug E being provided in this passage. When more gas is admitted than the pilot pipe will pass, it lifts the valve C off its seating and allows the gas to escape to the outlet F to supply the main burners. The port D only extending over a short part of the valve stem. Immediately the valve is lifted, the reduced portion is raised and thereby automatically cuts off the bye-pass, or reduces the gas supply to it when the main burner is supplied.

In the modified form of lighter shown in fig. 2, the gas is similarly admitted to a valve chamber, which in this case is merely an annular groove beneath the valve C. This valve (a loose fit) allows sufficient gas to supply the pilot lighter to escape around its periphery to an upper chamber G having a passage to the pilot light. At full pressure the valve is lifted; the upper or coned end of the tubular stem H then entering a recess and reducing the pressure of gas to the pilot light. When the valve is lifted, openings I in the lower portion of the tubular stem are raised above the valve-seating; and through these openings and tubular stem the gas reaches the main burners.

The lighter is said to be particularly useful in churches or public buildings, railway stations, or in works, as for controlling burners above moving cranes, or where a large number of burners are supplied from a single main pipe in which it is desirable to light the main burners from a distance, "for by manipulation of a single master tap or controlling valve fitted with a bye-pass a large number of burners may be lighted."

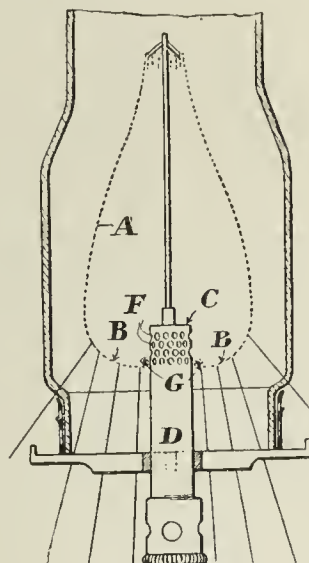
Incandescent Lamps and Mantles.

SKRIWAN, E., of Vienna.

No. 3026; Feb. 6, 1911. Date claimed under International Convention, Feb. 17, 1910.

Upright incandescent lamps, the patentee points out, suffer from the disadvantage that "the rays of light projected downwards by the mantle have either no effect or else very little effect, so that beneath the burner a small or large shadow is formed." A further disadvantage is that "the lower portion of the mantle which surrounds the burner-head fairly closely (apart from the fact that it is wholly useless for lighting purposes), on the lacquer being heated, adheres very firmly to the end of the burner-head, and the changes in dilation produced by the heating and cooling cannot take place. In consequence, the mantle becomes broken. If such adhesion, however, does not take place, then the disadvantage appears that, on variations in the length of the mantle produced by heating and cooling, the mantle becomes worn at the point of contact with the burner-head, and is thus quickly destroyed."

The object of this invention is to produce an upright incandescent lamp, which, like an inverted lamp, will "project downwards a large number of rays," by making a particular form of mantle which at its lower end, when in operative position surrounding the burner, is contracted in such wise that it forms an annular end, which in operation can also be contacted by the flame, and is thereby rendered incandescent and throws its rays of light downwards.



An Upright Incandescent Mantle Lamp of Novel Form.

The mantle A at the lower end encloses the burner, and is made as wide as possible, but is contracted at the lower edge in such wise that it forms an annular end B bearing on the burner-head C or on the burner-pipe D. By this means the mantle receives an addition B to its surface. In other respects it may be of any form; the additional surface connecting the space between the burner-pipe or burner-head, and the portion of the mantle projecting from this and assuming "a more or less flat or downwardly bulging form."

If this part of the mantle is subjected to the action of a heating flame, it becomes incandescent; and in consequence of its position relatively to the burner axis, all the rays emanating from it are directed downwards, so that the surface directly beneath the burner, in spite of the upright arrangement of the mantle, is "intensely and uniformly brightly illuminated as in inverted lamps."

In the form illustrated, the burner-pipe is closed at the upper end, and has in its cover one or more rows of outlet orifices, through which the gas and air mixture passes in the form of radial streams. Gas may also pass in an upward direction from the burner. In particular, the mixture, or the flame from it, passing from the lower openings F, strikes the contracted portion B of the mantle from the inside or outside or from both directions, and "produces intense incandescence of the mantle."

Direct Recovery of Ammonium Sulphate from Coke-Oven or Retort Gas.

FABRY, R., of Sheffield.

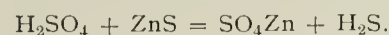
No. 5667; March 7, 1911.

This invention relates to the process described in patent No. 4473 of 1910—see "JOURNAL," Vol. CXII., p. 52.

The patentee says he has found it difficult to oxidize zinc sulphide into zinc sulphate by the method there described without losing appreciable quantities of sulphur escaping in the form of sulphurous acid. Furthermore, the oxidation of the zinc sulphide is never complete, so that the final product of the oxidation always consists of a mixture of zinc sulphate, zinc sulphite, and zinc oxide—a mixture unsuitable to recover simultaneously from the coal gas under treatment the whole of the ammonia contained in it together with so much sulphur as is capable of forming enough sulphuric acid to completely neutralize the recovered ammonia.

The object of the present invention is, therefore, a process or combination of known means for the purpose of converting quantitatively the zinc sulphide resulting from the washing of the coal gas with a solution of neutral zinc sulphate, into an equivalent quantity of zinc sulphate, which is then available for further washing the coal gas. This object is obtained in the following manner.

From the neutral or slightly acid solution of ammonium sulphate, obtained by washing the coal gas with a solution of zinc sulphate, the zinc sulphide is separated (by settling, filtration, or any other suitable method) and run regularly, and preferably in the form of mud, into a lead-lined closed vessel in which a regulated quantity of sulphuric acid is also flowing. The following reaction takes place:—



The zinc sulphate so formed is led back into the gas-washer for further use, while the sulphuretted hydrogen evolved is burnt with a suitable quantity of air, and the resulting products of combustion converted into sulphuric acid, preferably by the well-known contact process.

The chamber process may also be used; but owing to the purity of the sulphuretted hydrogen and its products of combustion, and the possibility of working the contact process on a small scale, the latter will, it is said, in most cases, be the more advantageous.

The sulphuric acid produced is utilized to form further quantities of zinc sulphate and sulphuretted hydrogen. The zinc sulphate may be conveyed to the gas-washer either as a solution or as a salt, according to whether or not sufficient water is added to the sulphuric acid to prevent crystallization of the zinc sulphate resulting from the combination of the zinc sulphide and the sulphuric acid.

CORRESPONDENCE.

[We are not responsible for opinions expressed by Correspondents.]

Uses of High-Pressure Gas for Industrial Purposes.

SIR,—I quite agree with you that much of the utility of the discussion on the Institution papers will be lost if the authors neglect to reply except through the "Transactions." The only difficulty I see is that the discussion might be endless. More time should be allowed for discussion at the annual meeting. This could be obtained either by sectionalizing (as you suggest) or by authors of papers reading a short *résumé* of what they have compiled. The interest taken in my hurriedly-written paper more than justifies an immediate reply through the Press.

Mr. Jacques Abady concludes his letter with a note of regret that the tone I adopted seemed to suggest an unfortunate consciousness of superior knowledge. I most strongly protest that a gentleman of Mr. Abady's standing should feel it necessary to make such a statement, especially after he has read the opening paragraph of the paper. The least he can do from that point of view is to pass the same judgment on my paper as he would expect to receive on his own, and allow much for one's style of expression. I am happy to think the large majority of those who were good enough to comment personally on the paper have received it in the spirit in which it was written.

The criticisms may be divided into two classes—those in which misunderstanding has occurred, due, in the main, to an insufficiency of explanation as to the object of the experiment, and those in which the critics have come to different conclusions to myself on various points, as a result of their own experiments.

My object in publishing the results of a certain number of comparative experiments in the paper was by no means to show what a high-pressure appliance could do, compared with the best types of other appliances, but to show what a high-pressure appliance could do compared with the appliances and methods most generally employed in the application under consideration for the time being. That is what one has to contend with when advocating the use of any system.

As an example, brass can be melted by means of coke in a certain special kind of furnace at a cost which prohibits all competition from gas, on fuel costs alone. But compared with the general type of coke-furnace, gas at 1s. 3d. compares quite favourably, taking everything into account, with coke; and gas-furnaces are gradually being adopted for certain kinds of brass casting.

The gold melting experiment is another example of what I mean. In Birmingham, by far the majority of small jewellers use small crucible furnaces, fitted with air-blast burners, for melting up their gold scrap and lemmel. They consider that they do not do sufficient melting to justify their putting in an air-compressor, and, consequently, they, almost universally, use foot-bellows. A boy does the "bellowing," and a man attends to the melting; their wages usually being 4d. and 9d. per hour respectively. The large consumption of gas in the air-blast experiment compared with the high-pressure gas will be easily understood by anyone who has endeavoured to heat-up a crucible by this means (low-pressure gas and air bellows). A low-pressure gas-furnace would prove more efficient for the purpose. The figures for melting by means of coke and air-blast are from actual jewellers' practice, and have been most carefully obtained.

It has been pointed out that the efficiency of the furnaces employed for gold melting was very low. I quite agree—the fuel efficiency is low. The jeweller or the brass caster (or the annealer or the aluminium melter) does not take up gas as a fuel solely because its efficiency is high. It is a much more important concern for him that the time of operation shall be reduced. Time is money; and it is no consolation to him to learn that by means of gas he is going to obtain a high fuel efficiency, if labour costs and everything else are going to be correspondingly increased. The time factor is a much more important one than the fuel factor, from the consumer's point of view. It is almost unnecessary to say that if the fuel efficiency can be increased, and other conditions remain the same, it is to the advantage of the consumer.

Mr. Mansfield raised the point, in his first letter, concerning the method I employed for measuring gas at varying pressures. I quite agree that coal gas is not a perfect gas; and for this reason the method of standardizing jets, as described in my paper, was adopted. The gas was measured at 20-10ths, by means of an accurate low-pressure meter, compressed by means of a compressor, and passed through standard jets at varying pressures, taken before the jets. All critics will agree that however much the gas varied from a perfect gas, the same weight of gas that passed through the meter per hour would pass through the jet, unless condensation of some of its constituents occurred. At these pressures, no appreciable condensation has been observed, and the calorific value has not varied more than within the experimental error.

I cannot gather, in comparing Mr. Mansfield's two letters, what point exactly he raises. I believe he raises two points—(a) that contained in his first letter, in which he asks whether, in the water-boiling experiment, I had reduced both gas volumes to 20-10ths, and then goes on to say that if I had not done so the high-pressure gas would contain 50 per cent. more B.Th.U. per unit volume than the low-pressure gas—813 B.Th.U., compared with 542. I replied that both volumes were reduced to the same standard; a cubic foot of either containing 542 B.Th.U.

In his second letter, Mr. Mansfield says that I have not replied to his original question, and suggests that, coal gas not being a perfect gas (with which I quite agree), it will have a different volume at low pressure after having been subjected to pressure than it had before compression. Taking his first letter again, does he suggest that the simple act of compressing to 15 inches mercury and expansion to the original pressure will make a difference of 50 per cent. in its volume? Surely the first point is the one he originally raised.

This point was also raised by Mr. Grafton; and Mr. Hartley asks how the gas was measured. I hope it is now clear.

The consumption pressure curve in the appendix should read "Consumption (Measured at 20-10ths Water) Cubic Feet per Hour."

I am asked by Mr. Abady whether I have ever seen two jets exactly alike. Under a microscope, certainly not. I have seen them so much alike that when water has been run through them from a constant head over a long period, and measured, there has been an error of less than 1 per cent. These jets are drilled with Morse drills, accurate to 1-1000th of an inch. As they are 1-20th inch thick, there is a sufficient bearing-surface to prevent side-play when in the lathe.

The jets used experimentally are polished on their inner surface by turning them at a high speed on slow tapered needles. For subsequent measurements of the jets, a blackened needle is used, and measured from the mark by means of a micrometer. The needles are guaranteed round to five places. An infinitesimal unevenness in the size of the jet is very much less than other sources of experimental error, however carefully the work is carried out. The jets are constantly being checked against low-pressure meters, through which the gas is passed before compression.

Mr. Abady asks why I advocate the use of standardized jets in place of meters before the gas is compressed. For experimental purposes, I have found the jets to be the more accurate. For consumers' use, jets are not convenient, although I hear that in Calcutta the gas is measured by a jet.

The water-heating experiment was carried out at the request of one of our Birmingham consumers, who used a very large number of glue-pots heated by means of low-pressure gas. The ring-burner he used was similar in design and construction to the large number of ring-burners I have noticed in use here. Before and since, I have found that it was not the best type of burner; but my object at the time was to determine its efficiency, in conjunction with the outer shell of a glue-pot containing water. This outer shell was lagged in a simple manner; the same pot and lagging being used in both cases. The question of lagging does not affect the comparison.

It is quite superfluous for Mr. Abady to introduce the question of the increased radiation losses in the case of the low-pressure test, and ask why this was not included in the calculations. There must be a reason for the difference in efficiency between the two methods; and I venture to suggest that the difference in temperature between the two flames accounts for the much increased efficiency. The greater the head of heat (temperature), the larger will be the percentage of heat passing through the iron to the water. In a low-pressure ring-burner of the type used, although the flames were fairly sharp before the pot was placed over the burner, when the pot was put in position, in contact with the tip of the flames, the products of combustion interfered with the proper aëration of the flames, and instead of the flames burning in contact with the iron pot, they were separated from it by a thin film of products of combustion, and the pot was obtaining its heat by means of hot products and radiation from the flame—probably no more than 10 per cent. In the case of the high-pressure burner, the high velocity of the combusting gases helped to clear away the products from the base of the pot, and, owing to almost complete aëration, the high-pressure flames were steady, and not drawn out through lack of air.

I have never seen a commercial ring-burner for low-pressure gas which would not light-back when aërated to the same extent as the high-pressure flames.

The experiments on water-heating are frequently being repeated; and, under the same conditions, they give the same results.

Mr. Grafton's tests are, no doubt, absolutely correct for the conditions under which they were carried out; and they served his special purpose at the time. In the experiment I took, there was a rise of 87° C. in one case, and 85° C. in the other. The water in either case was just short of boiling.

Mr. Hartley finds the water-boiling tests valueless to him. They were not intended to be of academic utility, but to fulfil the purpose I have indicated.

Mr. Grafton asks what I consider to be a "correct flame" for use in gas-fires having columnar fuel. I believe that the flame should have a slightly hazy inner cone—such that if the aëration were increased very slightly, the flame would become noisy, and the inner cone distinct. I gave as my opinion that all burners should be capable, by adjustment, of being caused to light-back or give a luminous flame. While the working pressures and the quality of the gas in different areas vary, it will be absolutely necessary to arrange for a wide range of adjustment in gas-stove burners. I do not wish it to be thought that I advocate that when a fire is installed its adjustment should be such that it would light-back. Far from it. In what tests I made with gas-fire burners, I found that the chief defect in some burners was that they had an insufficient range of adjustment.

Mr. Mansfield asks whether I have measured gas, compressed it, let the gas escape into a holder, taken its calorific value, and also measured the resultant volume of gas in the holder. All this has been done; and so far as the experiments indicated to the contrary, at the pressure at which we were working, the coal gas behaved as a perfect gas.

Concerning the high-pressure furnace burner used in the laboratory here, Mr. Abady asks how I know the quantity of air injected in the various high-pressure burners. By the analysis of the mixture of air and gas, of course, after they have passed through the burner. It is hardly necessary, however, to make an analysis, as by varying the pressures while the mixture of air and gas is burning in a crucible furnace, flame can be caused to appear at the sight-hole of the furnace by increasing the pressure when using all the high-pressure burners having expansion tubes. I see Mr. Mansfield agrees with me on the point that the amount of air drawn in does not vary as the pressure, in most high-pressure burners. An important series of tests on this subject are nearing completion; and I propose to publish them later.

Mr. Mansfield states that he has collected a large mass of data, all of which leads him into a *cul-de-sac*. Now, although much of his work is inconclusive (and much valuable research work always is), I should consider it a privilege if Mr. Mansfield would consent to exchange views privately on a number of points of mutual interest. And if the work of either of us thereby becomes more conclusive, it can be published and become of general use. It is, perhaps, asking too much, however, as my experience of the subject dates back but a short time.

The term "initial temperature of combustion" is an ambiguous one,

as it might easily be taken as meaning the ignition-point of the gas. When gas and air are undergoing chemical action and combining, radiant energy is being evolved, and is immediately dissipated throughout the flame and to the surrounding atmosphere. The temperature of the combusting gases (the flame) will depend on the extent to which this energy is concentrated in the form of heat in the flame. Concentration is brought about by various means. Dr. Bone told us in Glasgow that Mr. D. L. Chapman, of Oxford, had calculated that the temperature in the explosion wave of a mixture of electrolytic gas fired by adiabatic compression is 4265°C . The better the mixture of gas and air before combustion takes place, the higher will the flame temperature be. The larger the flame (the aëration remaining relatively the same), the higher will the flame temperature be.

Mr. Hartley waxes severe in the last paragraph of his letter, apparently labouring under a misapprehension as to my attitude towards the subject of heating by means of high-pressure gas. I am of the opinion that, compared with air-blast, there is nothing wonderful in it, as such. Any advantages it has (and in its use, I believe, there are many) are due purely to the mechanical conveniences in its use.

When using air-blast and low-pressure gas, one is dependent on two variable pressures, each of which is independent of the other. If the consumer compresses his own gas in preference to compressing air, he requires a smaller compressor, and smaller mains for the gas, than he does for the air; and no second main is necessary where compressed gas is used. Temperatures are more even in high-pressure furnaces than in air-blast furnaces.

We in Birmingham, over any given experiment, are getting generally quite as good results by means of air-blast as with high-pressure gas, so far as temperature and fuel efficiencies are concerned. The chief advantage of high-pressure gas is that by its means a good mixture of gas and air can be injected into a furnace by the simplest means, and be under perfect control.

It is quite possible that there are still some minor points unexplained or unanswered. In the main, I believe I have dealt with all the useful points raised. Discussions in the Technical Press on such subjects as these are of enormous value, and not the least to those who are carrying on work intimately connected with them. They will increase in value the more the personal element is kept out of them. This should not be a difficult thing to accomplish. You might be given a free hand, Sir, to use your blue pencil on matters and allusions which are not relevant to the subject under discussion.

I must say that from what I have read of recent discussions, both in the Technical Press and meeting, I have not looked forward to joining in either. I know there are many really useful contributions lying on shelves now, simply because the authors dislike joining in discussions which they believe will inevitably develop into a wholesale "rag," or worse.

High-Pressure Gas Laboratory, Birmingham,
July 15, 1911.

E. W. SMITH.

We have received from Mr. Jacques Abady the following reply to the above letter.

SIR,—Mr. E. W. Smith, in his letter of July 12, has replied to some of the questions put to him, and has given some explanations. I do not think the explanations strengthen the points urged by him in his original communication; and if I may be permitted a small amount of space, I will endeavour to briefly state why.

Measurement of Gas.—I do not agree with Mr. Smith that the use of jets in the manner he advocates is an accurate method of measuring gas—firstly, because jets vary in size, even with care in manufacture; secondly, because they are liable to obstruction from various deposits; and, thirdly, because gas varies materially in gravity from hour to hour and day to day. The latter fact, of course, destroys the value of a test of a jet with water.

The experiments upon jets with which I have been concerned range over so many years, and the results have been so consistently unsatisfactory, that I feel I can state, not as an opinion but as a fact, that the measurement of gas by jets is absolutely inaccurate. You measure gravity by a jet, not volume. Mr. Smith's statement that Calcutta gas is measured by jet would be a rather neat debating society point if it were true. But it is not.

Iron-Pot Test.—What Mr. Smith states in his paragraph commencing "it is quite superfluous," seems to me to complete the destructiveness of the criticisms which have been levelled at this test. A consideration of the time element (which affects the radiation to a great extent), so far from being superfluous, is all-important. To show that this is so, I think it will be found that if, instead of such an amount of gas at low pressure being used as would take $8\frac{1}{2}$ minutes, the quantity were increased in order to halve the duration of the test, then the result would be vastly different.

I do not think the way in which Mr. Smith now states he used the low-pressure burners would meet with the approval of many burner makers.

I quite agree with Mr. Smith when he says: "There must be a reason for the difference in efficiency between the two methods." The reason is that Mr. Smith is comparing two sets of non-comparable conditions; and his tests are tests of methods, and not of the relative efficiency of gas used under high and low pressure respectively. To put it in another way, if I were a maker of high-pressure apparatus, and wished to give the buying public a glowing idea of the value of my apparatus, I should make a test like Mr. Smith made it. If I wanted to arrive at the truth, however, I should not.

Measurement of Air.—Mr. Smith says he arrived at this "by the analysis of the mixture of air and gas, of course." All I have to say to this is that I totally disagree with this method of measurement, because I do not think it possible to get accurate figures from it; and if Mr. Smith will carefully think over the matter, I believe he will see that the use of the method is by no means a matter "of course."

As to the general question of the relative efficiency of gas used under high and low pressure, it is my belief that greater efficiency follows increased pressure to a certain extent; and I have before expressed the opinion that pressure as well as volume should be a factor in fixing price. It will be obvious, however, that the lower the calorific

standard becomes generally, the less will be the increased efficiency due to increased pressure. In any case, the iron-pot figures do not represent, or even approach, the relative values. JACQUES ABADY.
Westminster Palace Gardens, S.W., July 15, 1911.

Corrosion of Service-Pipes.

SIR,—In his letter published in your last issue, Mr. Hole says "one cannot be altogether incorrect in speaking of an ash subsoil as 'acidiferous' in character."

Surely if such ash subsoils give an alkaline reaction, and as I have previously stated this has been my experience so far as these soils have been examined by me, it follows that the term "acidiferous" applied to an alkaline body is entirely misleading. The mere fact that the porosity of such ash subsoils permits access of air and moisture containing traces of carbonic acid does not render the subsoil acid or acidiferous in character.

In my notes I have recorded certain observations I have made which may be right only in the case of the samples examined by me. If so, Mr. Hole will be able, I have no doubt, to supply or instance cases opposite to my conclusions. For example, it is open to him to test whether ash subsoils do or do not give an alkaline reaction. I have only to add that in my previous letter to you I did not define acidiferous subsoil in the way stated by Mr. Hole.

Greenock, July 12, 1911.

JAMES M'LEOD.

Oxide Firing in Purifiers.

SIR,—The purpose of Mr. Townsend's interesting letter as to oxide firing in purifiers was to suggest a method whereby boxes might be changed and emptied with safety.

The desired end would appear at Wakefield to be obtained by making for (say) twenty-four hours the foul box take the last place in the series; and it is claimed that, following the regular admission of a small percentage of air into the purifiers while at work, further revivification *in situ* is effected during the period mentioned, to such an extent as to avoid danger and nuisance.

It is obvious that where a second set of boxes is not available for check purposes, the backward and forward rotation principle cannot be well applied. In cases, too, where purifiers are comparatively small, the Wakefield results are not obtainable.

I would suggest that the desired minimization of danger may be achieved by shutting off and allowing the foul purifier to remain unopened for (say) a day, in order to dissipate any heat which may have been generated during working. This is the plan adopted here, and, as a further precaution, steam is passed into the box for two or three hours prior to shutting off.

I am inclined to think that the Wakefield method of placing the foul box last for a short time is another way of allowing it a chance of cooling should this have been necessary, since chemical action virtually ceases with the passage of clean gas through the vessel.

It would be useful to have expressions of opinion from those who have had and overcome purifier troubles, since the subject has attained importance, and has, I understand, induced the Home Office to ask for suggestions in the matter generally.

Doncaster, July 13, 1911.

ROBT. WATSON.

SIR,—The letter of Mr. H. Townsend on the above subject is of very great interest and importance at the present time; and I hope that engineers who have been troubled with "firing" in the purifiers will publish full particulars. These particulars, if tabulated, will go a long way towards solving the cause of the trouble, and providing us with a preventive.

While I cannot agree with Mr. Townsend that the passing of purified gas through oxide containing 50 per cent. of sulphur has any tendency to prevent firing, yet the method is good, and worth following, from the fact that the purifier is found to be less objectionable to work in by the men who have the emptying to do. At the same time, I find that when oxide is worked up to 50 per cent. or over without changing, it is not so objectionable to work among as when it contains only 30 to 40 per cent.

Last October, I emptied a 20 ft. by 20 ft. box that was filled with new natural oxide (held in hurdle grids) in July, 1909. When emptied, it was found to contain 68 per cent. sulphur, dry basis, and was like a bed of concrete. This when taken out showed no sign of heating, and gave off very little odour. While the oxide was at work, I used varying percentages of oxygen, in experimenting to ascertain the maximum that could be used without affecting the calorific or candle power of the gas; but at no time was there the slightest sign of overheating.

It would be interesting if those who have had trouble would state whether the oxide was natural or artificial, as up to the present my inquiries and investigations on the behaviour of oxides of iron as purifying agents point to the fact that any oxide that is in a fine state of division, and which quickly absorbs sulphuretted hydrogen, has a tendency to quickly oxidize; and when this occurs, it may be exceedingly difficult to prevent overheating and firing on opening a box, if the contents are anywhere about 30 to 40 per cent. sulphur. I can quite understand that, with oxide in this condition, firing may take place in the purifier itself, if from any cause an excess of oxygen is admitted.

I trust that the letter of Mr. Townsend will open up a correspondence that may help to solve what is undoubtedly a serious problem.

Brierley Hill, July 15, 1911.

W. C. JONES.

Unfounded Allegation of Fish Poisoning by Tar.—A paragraph appeared in the "JOURNAL" for the 4th inst. (p. 43) to the effect that a considerable area of the main road in the Kirkby Stephen district had been recently tarred to settle the dust, but that subsequent drenching rain had washed the tar into the River Eden, where numbers of trout had been found poisoned; and concern was felt by the farmers on the banks of the Eden lest their cattle should also be poisoned. We are, however, now given to understand that there was no ground whatever for the statements as to fish having been found poisoned by tar.

PARLIAMENTARY INTELLIGENCE.

HOUSE OF LORDS.

The following further progress has been made with Bills:—

Bills read a second time and committed: Margam Urban District Council Bill, Rotherham Corporation Bill.

Bills read the third time and passed: Chasetown Gas Bill, Gas Orders Confirmation Bills (Nos. 1 and 3), Marple Urban District Council Gas Bill, Rhondda Urban District Council Bill.

HOUSE OF COMMONS.

The following further progress has been made with Bills:—

Lords Bills read the first time and referred to the Examiners: Gas Orders Confirmation Bills (Nos. 1 and 3), Rhondda Urban District Council Bill.

Lords Bill read a second time and committed: Merthyr Tydfil Corporation Water Bill.

Bills reported with amendments: Kingston-upon-Hull Corporation Bill [Lords], St. Helens Corporation Bill.

Lords Bills read the third time and passed: Chapel, Whaley, and District Gas Bill, Sidmouth Gas and Electricity Bill.

Petitions against the Merthyr Tydfil Corporation Water Bill have been presented by the Barry Urban District Council, the Llandaff and St. Mellon's Rural District Councils, the Glamorgan County Council, and the Pontypridd and Rhondda Joint Water Board.

UXBRIDGE GAS ORDER.

House of Lords Committee.

(Before Lord WELBY, Chairman, Marquis of EXETER, Lord SACKVILLE, Lord BARING, and Lord ROTHERHAM.)

The Bill for the confirmation of a Provisional Order issued by the Board of Trade for the extension of the limits of supply of the Uxbridge Gas Company came before the above Committee last Thursday and Friday.

Mr. C. C. HUTCHINSON, K.C., and Mr. A. M. PADDON appeared for the promoters; Mr. BALFOUR BROWNE, K.C., Mr. TYLDESLEY JONES, and Mr. C. HALSEY represented the Hertfordshire County Council, who petitioned against the Bill.

Mr. HUTCHINSON, in opening for the promoters, said the only petition against the Bill was that of the Hertfordshire County Council, who asked for a special clause for the protection of their roads and bridges. The Uxbridge Gas Company were constituted under an Act of 1861, and were authorized to supply certain populous places in the county of Middlesex, and also in the county of Buckingham. This was followed by the Act of 1873, which extended the limits of supply and authorized the raising of additional capital. The object of the present Order was to further extend the limits of supply by taking in a number of parishes, including Chenies, Amersham, Penn, Great and Little Missenden in the county of Buckingham, and the parishes of Flaunden and Sarratt in the county of Hertford. The Hertfordshire County Council had withheld their assent to the Bill owing to the refusal of the promoters to insert a special clause giving protection to the roads and bridges under the control of the Council. When a gas company were laying pipes and mains, it was necessary, under the Gas-Works Clauses Act of 1847, which was incorporated in the Order, to comply with certain conditions. These conditions would, of course, be complied with. The two parishes of Flaunden and Sarratt were quite rural districts, and required no protection beyond what was contained in the Gas-Works Clauses Act. The promoters agreed to put in the Bill the clause inserted for the protection of the County of Middlesex in 1906—to give them, in fact, the same protection as Middlesex had had for the last five years. The county of Buckingham accepted the clause as sufficient; but the county of Hertford wanted something more, and asked for the insertion of what was known as the steam-roller clause. They asked for something in addition to the existing law.

The CHAIRMAN: I understand the Bill contains a clause extending to the Hertfordshire County Council the same protection as is afforded to the Middlesex County Council; so that the Hertfordshire County Council stands in relation to the Bill in exactly the same position as the Middlesex County Council?

Mr. HUTCHINSON: That is so.

The CHAIRMAN: Do we understand that the Middlesex County Council have consented to the provisions of the Order?

Mr. HUTCHINSON: The Middlesex County Council are not affected by the Order; but in the county of Buckingham we have taken in a large area, and they are satisfied.

The CHAIRMAN: Does the county of Hertford stand in exactly the same position as the county of Buckingham?

Mr. HUTCHINSON: Not one word of difference, except that they are much less affected.

Mr. H. E. JONES was called and gave formal proof of the preamble.

In cross-examination by Mr. TYLDESLEY JONES, witness said, having regard to modern traffic, he should advocate the laying of mains 2 feet below the surface. On roads on which steam-rollers were used, he might go lower if the road had a bad foundation. He was quite willing to be put under the provisions of the General Act; but he objected to the steam-roller clause. He was willing that sub-section 5 of section 54 should not apply to the county of Hertford. So far as the gas-mains under roads were concerned, he was willing to remain under the General Act.

This was the case for the promoters.

Mr. BALFOUR BROWNE then called

Mr. E. H. STEVENSON, who said in the two parishes proposed to be taken into the Uxbridge limit of supply there was a considerable length of main road which was not now subject to any interference by a gas company. The County Council had a perfect right to send their steam-rollers over these roads without any restriction as to weight, so long as they did not break down the bridges.

Mr. BALFOUR BROWNE: The Uxbridge Gas Company seek to get powers to lay pipes along these roads. Do you think it is fair that they should prevent the Local Authority repairing the roads in the same way they have been in the habit of doing in the past?

Witness: It is perfectly fair for the petitioners to say you shall not prevent us using any roller suitable for our purpose.

In cross-examination by Mr. HUTCHINSON, witness admitted that in his experience the steam-roller clause had never been inserted in a Bill before Parliament, except by consent. He could not say that it had frequently been asked for and always refused.

Mr. Herbert Smith, the County Surveyor to the Hertfordshire County Council, said there were about 12 miles of main roads in the two parishes of Flaunden and Sarratt. The Council asked for the steam-roller clause in the interests of the ratepayers of Hertfordshire.

The Committee then adjourned. On the resumption of the proceedings the following day,

Mr. BALFOUR BROWNE proceeded to address the Committee on behalf of the Hertfordshire County Council. He said reference had been made to a clause which the County Council desired to have inserted. The clause began by saying that, notwithstanding anything contained in the Order, the following provisions for the protection of the County Council of Hertfordshire shall, unless otherwise agreed between the undertakers and the County Council, have effect. The only paragraph he proposed to read was the first one, because paragraphs 2 and 3 were practically accepted by the witness for the promoters yesterday. Paragraph 1 provided that: "The County Council shall not be liable to pay any compensation for any injury to any of the works of the undertakers, or any loss or damage which may be caused by, or arise out of, the reasonable exercise of any powers of usage for the time being vested in the County Council." The County Council had the control of the whole of the main roads in Hertfordshire vested in them. These roads were some 1200 miles in extent. The County Council had the duty put upon them by Parliament of maintaining, repairing, and renewing these roads. The clause went on to say that "if the County Council, as the road authority, use a steam-roller not exceeding 20 tons in weight, it shall not be deemed to be an unreasonable exercise of such power of usage." This alone was the part complained of. The roads now had been made up and maintained by means of steam-rollers. A witness told the Committee that his steam-roller, unloaded, weighed 12½ tons; but when they hired a steam-roller, it weighed not less than 15 tons. It was a matter of common knowledge that the weight of these steam-rollers was constantly increasing; and he asked their Lordships to say that it was not an unreasonable exercise of their power that they should be allowed to use steam-rollers if the weight did not exceed 20 tons. Here were the County Council in sole possession of the roads—there was nobody there except themselves. But now the Gas Company came into their district and became partners with the County Council in the roads. If the Council did them any injury, it was their own fault—they should lay their pipes in such a way that they would not be injured by the use of a steam-roller, even if it weighed 20 tons. Was it reasonable that the ratepayers of Hertfordshire should be called upon to pay for any injury done to the property of the Gas Company under these circumstances? They were not interested in the Company. The only people interested were the gas consumers and the Gas Company themselves. They were coming into the county now for the first time, and were trying to prevent the County Council making reasonable use of a steam-roller of from 15 to 20 tons in weight. The Council were only carrying out their duties to the ratepayers when they said, if any damage were done, the responsibility should not be cast upon them so long as they were only carrying out their functions in a reasonable way.

Mr. PADDON replied on behalf of the promoters, and asked their Lordships not to insert the clause. Under the General Law, the County Council had already complete and ample protection. When the Gas Company proposed to lay mains along these roads, they had to submit plans to the County Council; and if they were not satisfactory, they could go to the Justices and get the plans altered if it were found that the complaint was a reasonable one. This clause was the most absolute derogative and destructive of the Company's common law rights.

The room was then cleared; and on the parties being re-admitted,

The CHAIRMAN said the Committee passed the Order without the opposed portion of the clause asked for by the Hertfordshire County Council.

BUSBY AND DISTRICT GAS ORDER.

House of Lords Committee.

(Before Lord WELBY, Chairman, Marquis of EXETER, Lord SACKVILLE, Lord BARING, and Lord ROTHERHAM.)

The above Order, which is comprised in the Gas Orders Confirmation (No. 4) Bill, was before the above Committee last week. The Order empowered the Busby and District Gas Company, Limited, to maintain and continue on a statutory basis their existing gas-works in the parishes of Cathcart and Mearns, and to supply gas within part of the parish of Mearns and parts of the parishes of East Kilbride and Carmunnock, all adjacent to the boundaries of the City of Glasgow. The Corporation of Glasgow petitioned against the Bill, asking the Committee so to restrict the Company's area of supply as to allow the Corporation the opportunity of extending their mains into that part of the parish of Mearns to supply which the Company would require to carry their pipes about two miles. The Corporation pointed out in

their petition that they already had mains laid close to the disputed area.

Mr. JOHN WILSON, K.C., and Mr. KING appeared both for the Busby Gas Company and for Lanarkshire County Council (which supported the Order); Mr. BALFOUR BROWNE, K.C., Mr. HONORATUS LLOYD, K.C., and Mr. HAROLD BEVERIDGE represented the Glasgow Corporation; and Mr. CLODE appeared on behalf of the Renfrewshire County Council.

Mr. WILSON said he did not understand any real or legitimate interest that the Corporation of Glasgow had in opposing the Order, though they might suspect an ulterior motive. The Busby Company grew out of a small gas-works carried on many years ago by a Mr. Crumm. He contended that the petition disclosed no *locus standi*. The Corporation had no statutory or other authority to supply gas within any part of the limits of the Order, and as a matter of fact they were not supplying to any person within the area. The Order interfered with no property of the Corporation, and in no way altered their rights or privileges or injuriously affected their present position. The limits of the Order did not include any portion of the Corporation's limits for the supply of gas; and he submitted they were not entitled to be heard. He quoted the Draycott case as a precedent.

Mr. BALFOUR BROWNE argued that the Corporation were entitled to be heard. It was true that they had no statutory authority to supply gas in the area in question; neither had the Company. They were both exactly in the same position. Neither the Corporation nor the Company were supplying gas in the area. What he submitted was that the Order interfered with an understanding and arrangement which was made in an agreement relative to the purchase by the Corporation of the Company's works in Giffnock. Under this agreement, it was determined that the Corporation should continue to supply gas to the parish of Mearns; and he submitted that this agreement gave the Corporation *locus*. The price of the Corporation gas was 2s. 2d. per 1000 cubic feet in the city supply district, and 3s. in the supplemental area. In the district in question, there were people who, if they got gas from the Company, would have to pay 4s. 7d. per 1000 cubic feet. He had authority to pledge the Corporation that they would come in and supply the whole of this area with gas in the immediate future when they were authorized to do so.

The Committee expressed the opinion that the Corporation were entitled to be heard; and evidence was called.

Mr. Brown, the Manager of the Busby Gas Company, stated that an extension of the Company's system in the parish of Mearns would be to the public interest in the whole area supplied by the Company, as increased consumption would allow a reduction of price all round.

Mr. Alex. Yuill, the Gas Engineer to the Dundee Corporation, stated that the gasholders and plant generally belonging to the Company were in good condition. He believed the plant was capable of producing four times the present output.

Mr. Alex. Wilson, the Gas Engineer to the Glasgow Corporation, was called in support of the Corporation's petition, and stated that they were prepared to put in mains in the disputed area without any guarantee whatever.

At this stage, the Committee adjourned. When the proceedings were resumed on the following day,

The CHAIRMAN intimated that the Committee did not desire to hear any evidence on behalf of the Glasgow Corporation.

Mr. WILSON, addressing the Committee on behalf of the promoters, said there could be very little doubt that the Busby Gas Company had been subject to a considerable amount of oppression on the part of the Glasgow Corporation. They first of all made a good bargain with the Company for the sum of £9000; and since then the Company had had to fight for every inch of territory which remained to them. The Corporation, having made an agreement with his client, proceeded to do a rather extraordinary thing. They applied to Parliament for confirmation of a Provisional Order giving them the whole of the remaining territory within the radius of what is known as the "yellow triangle," which it was said the Busby Gas Company had agreed to hand over to them. As a matter of fact, the agreement was never concluded. This point was made quite clear before the Committee of the House of Commons. Through long and weary years, and at considerable expense, the Busby Gas Company, who were the pioneers in the district, had built up a nice little business; and now it was proposed that Glasgow should come and take it away from them. He submitted that the Company, who had done good service to the community, were entitled to have this service recognized. If their Lordships allowed Glasgow to come into their area, as they were claiming to do, they would charge 3s. per 1000 cubic feet within 1300 yards of the Busby Gas-Works. What was to become of the remainder of the area and of the gas-works, which were capable of producing millions of cubic feet of gas as soon as the resources of the locality were developed? If the Committee passed the Bill, Glasgow would be able to come into the Busby area and would supply gas at 3s. where the Company were now charging 4s. 7d. If this profitable area were taken out, it would not be possible to continue the charge at 4s. 7d.—it might probably go up to 5s. for the remainder of the area. If they agreed to the Glasgow proposal, they would hand over to the Corporation the most profitable portion of the Busby area. Glasgow already had a population of 800,000 people within its own area, and a large supplementary district of supply outside the city. Were all these people to be charged a higher price for gas in order that Glasgow might undersell the Busby Company and inflict injury on the remainder of the householders in the counties of Renfrew and Lanark who resided within the Busby area? So long as Glasgow got this "yellow triangle," which was going to be quickly developed, they did not care what became of the non-developing area. He submitted that the Glasgow proposal contained an injustice to Busby, and would be unfair to the rest of the community in Lanark and Renfrew.

Mr. CLODE, on behalf of the Renfrew County Council, called

Mr. G. Duncan, a member of the Council, who stated that he had been authorized by the Parliamentary Committee to give evidence against the suggestion to include the proposed triangular portion of the parish of Mearns in the Glasgow area of supply. The County Council were satisfied that it was in the interests of Mearns parish as a whole that it should remain in the area of the Busby Gas Company.

In cross-examination by Mr. HONORATUS LLOYD, witness said he desired to see a supply of gas in the parish of Mearns. He believed the Busby Company's mains were about two miles from the triangular portion. The Glasgow mains were within a few yards of the triangle; and the cost of extending them would be infinitesimal.

Mr. HONORATUS LLOYD: Do you think it is in the public interest that people should be supplied with gas at 3s. per 1000 cubic feet or at 4s. 7d.?

Witness: It would be in the interests of the people in this particular locality that they should be supplied at 3s.; but I am thinking of the interests of the community as a whole. It would be better that the Busby Company should be allowed to supply gas to the area which is likely to develop first, in order that they may be in a position to supply other parts of the district.

Mr. WILSON addressed the Committee on behalf of the Lanarkshire County Council, who petitioned against alterations.

The room was then cleared. When the parties were re-admitted, The CHAIRMAN said: The Committee consider that the Order may proceed provided a clause be inserted to the effect that the triangle shall not be within the Company's limits if the Glasgow Corporation, in the session of 1912, obtain powers to supply the district.

MILFORD HAVEN GAS ORDER.

The Bill embodying the Milford Haven District Council Order (*ante*, p. 112) was again before the Chairman of Ways and Means Committee on Unopposed Bills last Thursday. Mr. EMMOTT presided.

Consideration of the Order had been adjourned in relation to the provision in which the Council were given, subject to the sanction of the Local Government Board, unlimited borrowing powers for their gas undertaking. The Committee indicated on the former occasion that they were not prepared to assent to the provision, as it kept the Local Authority beyond the control of Parliament. They adjourned the proceedings in order that further information might be supplied by the Local Government Board relative to the insertion of the provision.

Mr. WOOD, of the Local Government Board, submitted a statement setting forth many precedents (both Bills and Provisional Orders) for the provision. He argued that, in the event of there being any complaints against the administration of the undertaking, these would be duly noted by the Inspector who conducted the local inquiry, and, if advisable, reported upon with the view of influencing the amount to be sanctioned.

Mr. MOONEY (a member of the Committee) pointed out that the tendency of the Local Government Board in recent years had been in the direction of deciding, upon their own responsibility, the extent of borrowing powers in cases such as this.

The CHAIRMAN observed that the Committee did not desire to do anything which would compel a local authority to come to Parliament every three or four years; neither did they wish to encourage a system which enabled a local authority to keep away from Parliament for a long period.

Mr. WOOD suggested that the Committee might let the Bill through, and consider the whole question next session.

The CHAIRMAN: Certainly not. Our attention has been called to it now, and we must deal with it.

The Committee finally inserted the figure of £12,000; this being based upon an estimated requirement of £4000 to £5000 for five years.

LEGAL INTELLIGENCE.

THE PIPE CONTRACT DISPUTE AT LINCOLN.

In the Nisi Prius Court at Lincoln Castle last week, the important action arising out of the new water-works scheme of the Lincoln Corporation [*ante*, p. 113] was continued before Mr. E. J. POLLOCK, one of the Official Referees of the Supreme Court. Plaintiffs, the Staveley Coal and Iron Company, Limited, claimed from the Corporation a sum of £15,778, under a contract, of which the total was £28,406, to supply cast-iron pipes for the main in connection with the new supply of water. The Corporation said the pipes which were the subject of the claim were some which had been rejected, but had been re-numbered and sent back having been passed; and they made a counterclaim of the same amount as the Company's claim.

Sir EDWARD CARSON, K.C., M.P., Mr. NORMAN CRAIG, K.C., M.P., and Mr. LYNDEN MACASSEY (instructed by Messrs. Davis, Sanders, and Swanwick, of Chesterfield, appeared for the Company; Mr. HUGO YOUNG, K.C., and Mr. J. B. MATTHEWS (instructed by Mr. W. T. Page, Town Clerk of Lincoln) represented the Corporation.

Fourth Day.

On the resumption of the proceedings on the 8th inst.—the fourth day of the case—Mr. Gandy's cross-examination was continued.

Witness was questioned by Mr. HUGO YOUNG with reference to certain entries in one of the plaintiffs' books in regard to a particular pipe. He admitted that an "R" (rejected) had been altered to a "W" (waste), and that there was a note at the side which read: "Spongy spigot-end." The entry in the books of the Corporation in respect of this pipe was "R," and there was a note: "Spigot faked." Counsel reminded witness that Mr. Westlake had stated that 455 of the rejected pipes were taken into stock; and he asked him if he could state the actual number. Witness replied that he could not give an estimate; but he understood 455 were paid for to the casters.

Mr. HUGO YOUNG: May I take it that the total payments to the casters include the 3862 pipes passed and the 455, and that is all?

Witness: No, Sir, that is not all. We make them allowances, and give a sort of "subs" in addition.

Then it is impossible to get from you the amount you have paid to the casters for this job, and specifically what it is for?—Certainly.

Witness was then taken through an arithmetical calculation with the object of showing what was the loss to the Company upon a "waster" pipe in comparison with the profit accruing to them if it passed the Inspector and went forward to the Corporation dépôt. *Witness* informed the Court that the cost of material and workmanship was 25s. per ton; and each pipe weighed, on an average, 1½ tons. According to the contract, they had from the Corporation £5 6s. 7d. per pipe, less 8s. 7d. for carriage, or £4 18s. If they broke the pipe up, all they got was the actual cost of the iron (£3 2s. 6d. per pipe) and the difference between that £3 2s. 6d. and £4 18s. was the loss to the Company—£1 15s. 6d. Counsel next reverted to the conversation which the witness had with Mr. Smith during the interview at the works on the 21st of March, when, as witness had stated in his examination-in-chief, Smith (who had gone to the works for the Corporation as a practical moulder) told him he laughed at the idea that these numbers could be burnt on the pipes. *Witness* said he had not made any memorandum of the conversation; but it was so strange that he was not likely to forget it. The peculiarities of terminal figures was the next matter to engage attention. It was pointed out by Counsel that the groups of figures ending with "8" and "6" came up for inspection before those ending with "3" and "5"; and witness said his attention had been called to this.

Mr. HUGO YOUNG: You agree that if I am right in the suggestion that there was a practice of altering the figures "8" and "6" into "3" and "5," this would be a necessary incident of that practice?

Witness: Yes, it would. But I cannot explain it.

Now have you found the same thing does not apply in dealing with other terminal numbers?—I have not looked into it.

Have you made observation that on a number of these pipes, where the terminal figure is "3" or "5," you find there has been some work done on the final figure; and that on the corresponding number of "8" and "6" you find very frequently something abnormal about all the figures on the pipe? Has your investigation drawn this to your attention?—No, Sir.

Irrespective of who has done it, I ask you whether you noticed that the "3" and "5" terminal figures have been abnormal, and that in the same numbers, except ending with "8" and "6," all the figures appear now somewhat abnormal?—I have not noticed that.

Have you noticed at the spigot end of some of the pipes there is a depression?—Yes.

What I want to ask you is, have you noticed that it is nearly always on a number ending with the terminal figure "3" or "5"?—I have not observed that.

In further cross-examination, witness said that he had not observed certain other peculiarities in the figures pointed out by Counsel. He had not particularly noticed that the figures which had been chiselled and filed were "3" and "5"; but it was quite possible that they should have more done to them at the fettling-bench. *Witness* was next questioned in regard to discrepancies in the weights marked on certain pipes and their actual weights. In one case a pipe bearing a particular number according to the pump-book was marked as weighing 1 ton 4 cwt. 2 qrs. 14 lbs.; but the pipe which actually went forward under the number was 1 cwt. 6 lbs. greater weight. Counsel wished to have this explained. *Witness* said he could not do it; he supposed it was due to carelessness. Asked if he could account for this—that the Inspector had passed a pipe with a particular number on it, and made a note of a special characteristic, but that the pipe delivered under the number had not this characteristic, witness replied in the negative. Two specific instances of this were quoted; and witness was unable to account for them.

Fifth Day.

On the re-assembling of the Court on Monday last week,

Sir EDWARD CARSON said that, under the order of the Official Referee, the defendants had furnished the plaintiffs with a list of cases in which they said rejected pipes had had the numbers fraudulently cut. This was one branch of the case. There was another, under which they said the terminal figures had been altered. Having regard to the number of pipes, their expert witnesses could not complete their evidence without a list of these cases, and they wished to have them investigated if defendants would give the numbers they relied on.

Mr. HUGO YOUNG said this appeared to be quite reasonable, and he did not see any difficulty in doing it. The only thing was that a great many of the pipes where the terminals of what they called the "father" had been altered, were now underground. To meet the exigencies of the pipe-laying contract, they were used; but a list of them was kept, and they knew exactly where they were. They could easily supply the list of those on the surface.

It was arranged that the list should be supplied.

Sir EDWARD CARSON then said he was told the pipes were being constantly moved about, and he wanted them to be left as they were. The plaintiffs' engineers had to go out and turn their attention to these various matters as they arose in evidence, and they found the pipes displaced and discoloured with mud.

Mr. HUGO YOUNG said the pipes had only been moved as a matter of convenience. They had been put into consecutive order, so that it might be known where to find them. If Sir Edward did not want them to be moved, they should not be. He added that Mr. Barron wished to go over to Staveley to see "the three pipes" after the rising of the Court. He supposed Sir Edward had no objection to him seeing any other pipes on the ground, if he wished.

Sir EDWARD CARSON: Not the least.

Mr. Gantry was then further cross-examined on a few points.

In re-examination by Sir EDWARD CARSON, witness said he had stated, with respect to the non-production of the three pipes required on the occasion of Mr. Barron's visit, that he himself saw them the next morning, and examined them. No question was subsequently asked by the Corporation authorities as to whether or not the pipes had been found. A number of questions had been put to him by Counsel for the defendants as to the passing of "8" pipes before "3" pipes, and he was

asked by Sir Edward whether any selection was made in this way. *Witness's* reply was: "None whatever." He added that he never gave any directions to have the pipes brought up in any particular order, and he never heard that they were. Counsel said he wished to give instances on the theory the defendants put forward of "8" being turned into "3" and the pipes delivered. He wanted to take cases where the former pipes were taken before the latter, so as to show that it was not an invariable practice. *Witness* was taken through a series of instances where the state of things quoted by Sir Edward was shown to exist.

Mr. HUGO YOUNG said he had not limited himself to stating that the only alterations were in the figures "8" and "3" and "5" and "6"; but he had laid special stress on these.

James Allright, the foreman in charge of the pipe dipping and forwarding department at the Staveley works, explained at some length what was done with the pipes after they had passed the Inspector. He said the pipes that had been rejected were sent to a different place altogether from that to which the good pipes went; the latter being put into trucks, and taken to the dipping-tank. When the pipes were actually sent away, the number of the truck into which they were put was taken from one of the books, and entered in the despatch-book, which was kept by the advice clerk, who entered the matter in the advice-book. *Witness* was questioned by Sir Edward Carson as to what took place on the day when Mr. Barron and Mr. Richardson appeared at the works and asked for three particular pipes. *Witness* said he went to look at his man's book. He saw the number of the pipes; but they were not ticked off. There were other numbers not ticked off. He and Smith then went on to the sidings and climbed into about a dozen waggons without finding the pipes. As it was dinner time, and there was another mile to walk, they stopped the search. On his return to the works, he saw Mr. Barron, who was very violent, and accused witness or knowing all about the job. He went about the search for the pipes as fast as he could, so as to find them and get the job done as soon as possible.

In cross-examination by Mr. HUGO YOUNG, witness said he did not consult the book in which he could have seen for himself where the several pipes could have been found, as it was kept by his assistant for private use.

James Taylor, assistant to the last witness, was next called. After giving evidence as to the procedure in the works, he said he did not find the three pipes Mr. Barron asked for on the 21st of March, but did so next morning. He spent about three hours in looking for them on the afternoon of the 21st; but he did not find them, because they were not ticked off in his book. They never ticked off pipes when they were going into stock. He found them in two waggons, and reported it to Mr. Allright, who went along with him in order to see them.

Sixth Day.

Mr. W. J. E. Binnie, of the firm of Sir Alexander Binnie, Son, and Deacon, examined by Mr. NORMAN CRAIG, said that for the purposes of the case he had examined in detail he believed every pipe which had been challenged by the defendants, and also those remaining at the plaintiffs' works. He had measured the thickness of the pipes at both the spigot and the socket end; and he gave in great detail a mass of figures relative to each pipe, of which the number was mentioned by Counsel. He showed the variations in the thickness of the metal of the pipes at each end, and gave the height of the relief of the number figures above the body of the pipe. He was furnishing these particulars when the Court rose for the midday adjournment.

On re-assembling after luncheon,

The OFFICIAL REFEREE commented upon the method which had been adopted of going through the long list of pipes and their measurements; and it was agreed that a list should be provided, including those which remained to be dealt with.

In answer to further questions, witness dealt generally with the results of his examination of the pipes. He said the plaintiffs' Solicitor (Mr. Sanders) had asked the other side what they had been doing with the pipes; and the reply was that a vaseline and blacking mixture had been applied to them. He added that the coating would have the effect of concealing evidence if anybody came to inspect the pipes. He had seen the particulars of the action, and knew that in regard to the pipes complained of as defective, the only particulars given were that each of them possessed one or more of 23 different defects which a pipe might present. A good many of the pipes had the appearance which suggested that work had been done on them over and above what he called legitimate fettling; but a large number did not look as if they had had the work of a fettler at all. They were very amateurish. The terminal numbers, if they happened to be "3" or "5," were mostly uncovered, having been covered and then worked up again with white paint on them. Dealing specifically with numbers, witness said a "5" was so different from a "6" that an alteration could not have been made; and this feature was preserved throughout the different blocks used. Some of the suggested alterations were more than could be accomplished by a fraudulent person. In the vast majority of cases, they could not say whether or not an "8" had been altered into a "3"; but there was evidence indicating why a particular "3" had not been altered from an "8." There were difficulties in the way of making the alterations suggested. With regard to the thickness of the pipes, witness said he did not expect to find it uniform, either right round or right through. The variations he had given earlier in the day were nothing out of the ordinary in measuring cast-iron pipes with great accuracy. Having given a good deal of detailed evidence as to the particular appearances of certain pipes which he had examined for marks, witness produced a chisel which he said he found inside one of the pipes at No. 5 dépôt on the 11th of June. He said it was a chisel which might have made the sort of marks he saw; but it was not the kind of tool which would be used to alter numbers, or anything of that kind. It was not a fettler's tool.

Mr. HUGO YOUNG pointed out that the chisel did not appear to have been used, judging from both the head and the point.

Witness agreed that it had not been used much, but said it might have been used a little.

Withdrawal of the Plaintiffs' Case.

On the resumption of the hearing on Wednesday morning,

Sir EDWARD CARSON intimated that he had a statement to make in reference to the case. He said certain knowledge came to hand on the previous day which had satisfied Mr. Westlake, the Managing-Director of the Staveley Company, that the Company ought not to further contest the right of the defendants to have the contract terminated. The moment Mr. Westlake ascertained that there were reasons for supposing that the pipes had been improperly dealt with, he did not hesitate for a moment to instruct him (Sir Edward) to this effect. So far as the Company were aware, and having regard to the satisfactory way in which all other contracts were being carried on at the same time, it was thought impossible that this could have happened. But Mr. Westlake was now satisfied that he was deceived, and that some persons—though it might be difficult to trace who they were—were tempted, by reason of the unprecedented number of rejections in the Lincoln case, being about 30 per cent., compared with 2½ per cent. in the other contracts, to try to dispose of rejected pipes by tampering with them. The arrangements they had come to were these: That plaintiffs were to take back, at their own expense, all pipes at present at the Corporation depôts, or any pipes that had not been used; that the defendants should pay for all pipes they had actually used, at the contract price; that the plaintiffs were to abandon any further claim under the contract; and that the defendants under the counterclaim should receive £3000, and upon this the plaintiffs were to be relieved from any further liabilities under the contract. Counsel added that, of course, it followed that the plaintiffs were to pay all the defendants' costs on the claim and counterclaim. The Referee would probably make an order that the sum paid into Court should be handed over to the defendants.

Mr. HUGO YOUNG said he was not at all surprised that the Staveley Company should have taken this course, which, he thought, was most creditable to them under the circumstances. He quite agreed that the Company was one that stood very high; and, in his cross-examination of the Managing-Director, he said he felt sure that if Mr. Westlake was once satisfied that fraud had been committed, he and his Company would be the first to try to put the Lincoln Corporation right. On behalf of the Corporation, he (Mr. Young) could only say it was very gratifying to them that their conduct had been so fully justified.

The OFFICIAL REFEREE also congratulated both parties and everybody concerned on the result. He said it was one which he considered very satisfactory to everybody, because the case involved an enormous amount of expense. Unfortunately, somebody or some persons—for whom, so far as he could see, the Staveley Company were in no way responsible morally, though they were legally, inasmuch as they were carrying out the contract—committed some gross fraud, which entitled the Lincoln Corporation to determine the contract. He could only say he thought Mr. Westlake had nothing whatever to do with the matter; and nobody, so far as he knew, connected with the Company, was aware of what was going on until somewhere about the 21st of March. He hoped there would be further investigation to arrive at the real facts; and he supposed some order or judgment would be required.

Mr. MATTHEWS suggested that the record be withdrawn upon these terms, with the Judge's order, if necessary.

The OFFICIAL REFEREE agreed.

The case, which had occupied the Court altogether eight days (including the day spent visiting the works), and had cost, according to a statement made by Sir EDWARD CARSON in the course of the proceedings, £3 10s. per minute, was then brought to a close.

Unlawfully Fixing a Gas-Pipe.

Charles Buckett, of No. 4, Hobart Place, Wokingham, was charged before the Magistrates of the town with unlawfully laying a pipe to convey gas to his house. According to the evidence given, defendant, in March, 1910, entered a cottage previously occupied by a tenant who was supplied with gas from the local Company. During three quarters of the year, no gas was registered by the meter; but 2s. was found in the slot-meter for two quarters of this year. As there appeared to be some irregularity, a fitter was sent to the house; and he discovered what had been done. When he disconnected the meter on the house side, he found a supply of gas coming back, which was altogether unusual. As he was leaving the place, defendant's wife called him back, and took him to the spot where the connection had been made. The gas went over the meter; and the work was done so cleverly that an ordinary person would not have discovered how it had been carried out. Later the defendant went to the Manager of the works, and asked him to hush the matter up. The full penalty of £5 was inflicted.

Position of the Newtown Gas Undertaking.—In the course of a lengthy report on the Newtown Gas-Works, Mr. William Belton, of Shrewsbury, who was called in by the Urban District Council to advise them as to putting the concern on a more profitable basis, said the works generally were in a fair condition, but the Council were not obtaining as much gas per ton as they ought to do. This appeared to him to be due, firstly, to want of adequate supervision in the retort-house; and, secondly, to stopped pipes. Under the present arrangement, it was impossible for the Gas Manager to devote sufficient time to the retort-house work and to the supervision of mains, services, meters, and lamps, which were all possible sources of leakage. Too much of his time was taken up in collecting rates, which necessitated his absence from the works to an undesirable extent, during which the retort work was not properly carried out. He advised that the collecting be removed from his duties; that the hydraulic mains be altered; and that the coal used be changed. The gas unaccounted for, equal to 11.5 per cent., was too high; and the Manager's time would be more profitably employed in detecting leakages than in collecting rates. The Gas Committee agreed to appoint a collector, to make the alterations to the hydraulic mains, and to reset two beds of retorts.

MISCELLANEOUS NEWS.**EUROPEAN GAS COMPANY, LIMITED.****Recent Labour Difficulties in France.**

The Annual General Meeting of the Company was held on Tuesday last, at the London Offices, Finsbury House, Blomfield Street, E.C.—Mr. R. HESKETH JONES in the chair.

The SECRETARY (Mr. W. B. Brady) read the notice convening the meeting, and then the following report of the Directors:

The Directors have pleasure in reporting an increase of 4½ per cent. in the total gas-rental received during the year. With the exception of Bolbec, all the stations show a satisfactory improvement.

The cost of coals has been slightly higher than during the previous year, but under new contracts, which will shortly come into force, the price will be reduced. The average price realized for coke is a trifle below that obtained last year. Both tar and sulphate have given a higher return.

The Directors have succeeded in renewing the Company's concession at Bolbec, which has been extended 25 years, until 1949. The average length of the Company's concessions is now 27 years.

In view of the increasing demand for gas at Rouen, we have recently purchased additional land adjoining the Company's works in the Ile Lacroix. We have also acquired an additional slip of land at Sotteville, which is an adjunct to our Rouen works, and where there has recently been a considerable increase in the sale of gas, due no doubt largely to the reduction in the sale price agreed to on the extension of the concession last year.

The rearrangement of capital decided upon by the shareholders at the extraordinary general meeting held on Feb. 21, 1911, has been successfully carried through; and the Directors now recommend the payment of a dividend of 12s. 6d. per share, free of income-tax, on the augmented capital, which will be a total of 10 per cent. for the year, as foreshadowed by the Directors in their circular of Feb. 4 last. The payment of the above dividend of 12s. 6d. per share is, as usual, subject to a deduction for French stamp and transfer duty of 1s. 1d. per share in respect of all shares held in France.

The Directors purpose in future to equalize the half-yearly dividends by distributing 10s. per share each half year, instead of as heretofore paying a larger part of the year's dividend on Aug. 1.

Notice has been given that two Directors (H. C. Smith, Esq., and R. Hesketh Jones, Esq.), and both Auditors (J. Reeson, Esq., and H. J. Luff, Esq.) retire from office at this meeting, but, all being eligible, they offer themselves for re-election.

The CHAIRMAN, in moving the adoption of the report and accounts, said that since the last annual general meeting an unusual number of events had occurred in connection with the Company. They had had two extraordinary general meetings for the purpose of readjusting the share capital in relation to capital outlay, taking advantage of these meetings also to modernize the Articles of Association. All this had been carried out with much labour, careful study, and attention by their officials and staff in London, whose labours the Directors had recently acknowledged by suitable gratuities. He could not allow this opportunity to pass without, in the presence of the shareholders, very heartily thanking each member of the staff for the care, devotion, and attention to the work in which he had been engaged, and which had brought it to a successful completion. He (the Chairman) might mention that, during the past four months, the staff had not for many nights left the office until nine and ten o'clock at night; and he felt sure the shareholders would agree with him in conveying to them very hearty appreciation of their services. [Hear, hear.] Turning to less favourable events. For some months past, the Company had experienced labour troubles at some of the stations. The shareholders would no doubt from time to time have seen allusions in the public Press to strikes and threatened strikes in France. Commencing with the railways, the discontent spread, fostered by Labour Bureaux, with headquarters in Paris, and culminating, in their own case, in the stokers at Rouen striking, in conjunction with those at the French Gas Company's works in the town. The strike lasted for several days. Their Manager (M. Huon) obtained stokers from other gas-works; and with the assistance of the general staff, who remained loyal to the Company, he was enabled to maintain the supply of gas at Rouen, and not only so, but to assist, to a certain extent, the other Company as well. His actions were appreciated by the Mayor and local authorities; and the Directors had since acknowledged, by the grant of gratuities, his tactful services and those of the men and staff who remained faithful, and rendered him their services during the several anxious days preceding and during the strike. Several of the men who went out on strike had not been taken back into the Company's employ. These labour troubles had not been confined to Rouen. They created much anxiety for the Directors and Managers, who endeavoured to treat the men with all possible consideration and liberality. But, in consequence of outside pressure, the men were often forced to act contrary to their own interests. He was, however, pleased to say that the several mayors and local authorities with which the Company were connected, and with whom they endeavoured to co-operate, had, during these labour troubles, recognized the Company's actions; and it behoved him, as Chairman, on this occasion to tender to them their best thanks. He was sure the shareholders would agree with this. [Hear, hear.] In the Directors' report, they recommended the payment of a dividend of 12s. 6d. per share, which, with the interim dividends paid on Feb. 1, amounted to 10 per cent. per annum on the present share capital. This might perhaps require slight explanation. The old £7 10s. paid-up shares received 7s. 6d. per share last February. They would now receive 12s. 6d.—that was to say, 20s. for the year; being 10 per cent. on the now fully-paid shares of £10. Every three of the old fully-paid up shares of £10 that received in February 10s. per share—i.e., 30s.—would now be paid 12s. 6d. per share on four shares—i.e., 50s.—being a total of 80s. for the year, or 10 per cent. on a holding of four shares (£40). Before moving the adoption of the report, he might allude to the progress of the Company's business during the past ten years that he had had the honour of occupying the chair. In 1900-1, the consumption of gas was 1250 million cubic feet; in 1910-11 it had been 1587 million cubic feet. The

towns the Company supplied did not increase by leaps and bounds; but the business progressed steadily and satisfactorily.

The DEPUTY-CHAIRMAN (Mr. H. E. Jones), in seconding, remarked that, as the Chairman had fully explained, they had been passing through a period of considerable anxiety; but when they looked at their Chairman's bronzed and healthy face, they would see that it had not altogether worn him out.

The motion was unanimously carried.

The CHAIRMAN moved, and Mr. R. S. GARDINER seconded, the declaration of a dividend in the terms stated in the report.

Mr. H. D. ELLIS: Will you, instead of paying 12s. 6d. and 7s. 6d. per share, pay 10s. and 10s. on the same dates?

The CHAIRMAN replied in the affirmative.

The DEPUTY-CHAIRMAN proposed the re-election of the Chairman and Mr. H. C. Smith as Directors of the Company. Referring to the veteran Chairman, he said the shareholders had seen, from the terse and exhaustive account supplied to them of the transactions of the past twelve months—it was *multum in parvo*, the whole history of the Company at a very critical time had been given in brief compass—that they had a gentleman at the head of the Board who had a powerful grasp of all the Company's affairs, even under circumstances of great difficulty. Their Chairman had had a varied and ripe experience as a gas administrator, coupled with which he had a happy, genial, and fraternal manner with his colleagues, which rendered service by the Directors very pleasant, and harmonized and united them all. The history of any successful company must be written in the harmony and consistency of its Board. Mr. Smith was also a Director of several years' standing; and he had a complete acquaintance with all the circumstances of the Company. He gave very valuable help in the matter of the securities in which they invested their reserves, which were happily not unimportant in amount.

Mr. R. S. GARDINER seconded the motion, which was unanimously carried.

Moved by Mr. ELLIS, and seconded by Mr. L. R. WILKINSON, the Auditors (Mr. J. Reeson and Mr. H. J. Luff) were re-appointed.

SPECIAL ACKNOWLEDGMENT TO THE STAFF—AGITATION AND LOYALTY.

The CHAIRMAN remarked that he had already, in his address, practically proposed a vote of thanks to the Secretary (Mr. Brady) and the staff in London. Therefore it was not necessary for him to say more about them. But he should make special allusion to their friend the Managing-Director (Mr. W. Williams), upon whose shoulders had devolved, and from whose head had been evolved, the details as to the rearrangement of the capital, and the various duties which had been carried out by the staff during the last four or five months. Without the head, the tail could not very well move. [Laughter.] Therefore, he (the Chairman) had very much pleasure in specially referring to Mr. Williams. During the ten years that he (Mr. Jones) had had the pleasure of occupying the chair, he had worked harmoniously with Mr. Williams. Then as to the staff abroad, unfortunately, owing to his (the Chairman's) accident twelve months ago, he had not since been able to go abroad. Therefore he could not speak of the staff abroad so well as he could otherwise have done had he been in personal contact with them. But he had watched their movements. He had their correspondence before him pretty well every week; and he felt that he might say they had a most efficient staff. The accounts and reports from them were always carefully scrutinized; and when there was anything to which their attention should be called, it was always efficiently dealt with and carried out by them, and with the greatest satisfaction to the Board.

The DEPUTY-CHAIRMAN, in seconding, also spoke of the work of Mr. Williams, the Secretary (Mr. Brady), and those who worked under him. With respect to the officers and staffs abroad, he said he had always been impressed with the extreme care and anxious pains taken by their local Directors and engineers. They were all men of good education and standing, and most of them carried diplomas of some of the scientific and educational societies of France. One thing that one found was their particular anxiety in the interests of the shareholders, and their loyalty and devotion to the Company. They had especial exemplification of this in the conduct of their Managers who had lately been submitted to strikes and partial strikes. They had exercised great patience, forbearance, and conciliation. Fortunately, all their Managers stood so well with the Mayors and Corporations of the towns in which they worked, that when misunderstandings arose they were able to explain the position, and obtain the assistance of the municipal corporations. This was of great importance to the Company. Their workmen, too, had for the most part been exceptionally loyal, and not less so because the Company happened to be an alien one. It was very gratifying to see the allegiance these men had to their duty; and it was fair of him to say that the endeavour of the Board was always to treat the employees of every rank—from the highest to the lowest—in a just and generous spirit. The men appreciated this; and when they were upset—it was only part of them, he was very glad to say—by the agitators whose work it was to disseminate violence and discontent, the men, except a comparatively small portion of them, stood by the Company. During the recent trouble, though it was a time of anxiety, it was a satisfaction to the Board to find how many of the men were loyal. In connection with these times, the Board commended the attitude in which, and the manly courage with which, their Manager at Rouen (M. Huon) faced the difficulties. He bore himself like a man from first to last; and he conquered in the end, and in the end, too, was kind and merciful to those who returned to the Company. It was obvious, however, that all could not be taken back. The history of the strike in Rouen was one which would always be creditable to the Manager and staff of that station.

Mr. W. B. PRATT, from the shareholders' side of the table, supported the encomiums passed upon the staff by both Chairman and Deputy-Chairman.

The motion was heartily passed.

The MANAGING-DIRECTOR (Mr. W. Williams), in acknowledging the vote on behalf of himself, the Secretary, and his staff, and the Managers and their staffs abroad, said the words that had fallen from the Chair-

man and the Deputy-Chairman and the endorsement of the shareholders, showed that they had a due appreciation of the extra work that had devolved upon the officers and the staff for some time past. But it had all gone through satisfactorily; and the kind remarks that had been made on this occasion would be an encouragement in the future, and especially to those who had had to face difficulties of no common order in dealing with a situation set up and fomented in Paris, and not entirely dependent upon the will of their own men. The Directors treated their men liberally, and that so many of these men stood loyally by the Company, showed that the good treatment was not thrown away. The vote would be an encouragement to the officers and the men, and it would be highly appreciated by them.

Mr. ELLIS remarked that a vote of thanks was due to the Chairman and Directors, and most emphatically the shareholders should add a word of sympathy with them on account of the difficulties they had had to encounter during the past year. Nothing was more unsettling to a Board of Directors than labour troubles, because they did not know how far they might extend. He hoped that, in the immediate future, the Directors might be spared any recurrence of the recent experience. They could not, however, shut their eyes to the fact that labour disturbances on the Continent were becoming more frequent, and that European countries were in a serious condition in this respect; and France, he supposed, would have its share. They had these disputes forced upon employers and upon the men, who, in the case of this Company, were treated in a generous manner. This should persuade the men that it was against their interests to strike. He was sure the Board were magnanimous enough to meet the men with the utmost possible concessions, without showing weakness, which was always fatal.

Mr. J. REESON seconded the motion, which was very cordially agreed to.

The CHAIRMAN, in the course of his acknowledgment on behalf of himself and his colleagues, said, so long as he was spared, he should do his utmost in the interests of the Company. He was working with gentlemen who desired to spare him as much as possible the anxious duties which usually fell upon a Chairman, although he must confess that he did not like to shirk his duties at all. It was true the Board had had an anxious time the last few months; and he dare say they would have anxious times in the future. If any one had read the Paris notes in "The Times" that day, they would have seen that matters were by no means quiet in the House there. They must expect further agitation; but while the Board desired to be conciliatory to their men, they should endeavour to be firm, and not yield too much to pressure.

This concluded the proceedings.

EAST GREENWICH GAS-WORKS INSTITUTE.

Opening Ceremony.

The workmen employed at most of the stations of the South Metropolitan Gas Company have had the advantages of an institute in which to meet for recreation and social intercourse; those engaged at the East Greenwich works being until last Wednesday an exception to the rule. On the day named, however, a new building which has been erected for their use was formally opened and handed over by Mr. Charles Carpenter, Chairman of the Company. Its main feature is the hall, in which the ceremony was held. It will seat about 800; and nearly this number were present. It is well lighted, for both day and night use, and amply provided with exits. The floor, specially laid for dancing, is covered by a drugget. There is an ample stage, the opening of which is surmounted by a bust, in high relief, of the late Sir George Livesey; while at the rear are spacious rooms which may be used for purposes connected with entertainments or as committee-rooms. There is a billiard-room, affording space for two tables at least; also a miniature rifle range and a recreation-room in connection with a refreshment department; and the kitchen and lavatory arrangements are excellent. The employees themselves, working through a Committee already actively engaged, will take steps to provide the furnishing; but even in this matter help has been given by the Company in the shape of chairs and the drugget which preserves the smoothness of the floor of the large hall.

As mentioned, Mr. Carpenter presided at the opening ceremony; and upon the platform with him were Messrs. Frank Bush (the Vice-Chairman of the Company), J. Mews, J. Ewart, T. B. Hawksley, Frank H. Jones, and J. Newbold (Workmen-Director), Mr. H. Austin (a former Director), Mr. F. M'Leod (Secretary), Mr. W. Doig Gibb (Chief Engineer), Mr. J. F. Braidwood (Engineer at the West Greenwich works), and Mr. S. S. Field. The Chairman explained that, of the Company's different works, those at East Greenwich had been left so long in the matter of an institute, as it was felt that it was the most important, and experience had been gained by what had been done at the other works. He said the Directors' duty began and ended with providing the buildings. No pains had been spared with them; and it remained with the men to make the institute a success. That it would be done the Directors were confident. He declared the building open. Mr. Bush then gave some interesting reminiscences of the starting of the works at East Greenwich. Mr. J. Newbold, Mr. J. D. C. Hunter, Mr. W. H. Cupit (Workmen-Director) and Mr. Austin followed. Mr. Gibb informed the company that the building was really the Chairman's own design; and he read a letter from Mr. Joseph Tysoe (the Engineer-in-Charge of the station, who is on holiday) in which this credit was given. The institute was gratefully taken over by the staff, on the motion of Mr. W. S. Lawes, seconded by Mr. Sturt.

The terms submitted to the Weston-super-Mare Urban District Council by the Gas Company, for the lighting of the whole district as now lighted by gas, were £2045 per annum; whereas the amount paid by the Council under the last contract was £2175. The seal of the Council has been affixed to a new three years' contract with the Company.

GAS PROFITS AT CARLISLE.

The Carlisle Town Council, at their meeting last Tuesday, had placed before them the accounts of the gas undertaking for the twelve months ending March 31.

Mr. J. P. Buck, the Chairman of the Gas Committee, pointed out that the total amount of outstanding loans on the whole of the works, plant, mains, and meters was £24,201, to which they might add the balance of the suspense account, amounting to £2923, making a total liability of £27,124. The balance of the suspense account would, at the present rate of reduction, be extinct in three years; while the loans account, at the present rate of reduction, would be wiped out in nine years, leaving the whole of this valuable property—unless further loans were needed—entirely free from liability. This state of affairs was largely due to the policy adopted a year ago (whether wisely or justly, he would make no pronouncement) of increasing or renewing the property to a considerable extent out of revenue by building up a reserve fund. Of a total amount expended on works, plant, mains, and meters of £147,821, no less a sum than £78,763 had been provided out of revenue—thus demonstrating that the gas consumers of the city, besides paying large sums yearly to the relief of the city fund, had practically built up this huge undertaking. The position was sound, and the citizens of Carlisle were to be congratulated to-day on having such a property. They were not quite following this policy now, except in a small way. Last year, they asked the Council to place £500 to reserve. This year they were proposing that the amount should be increased to £1500, by placing £1000 to the fund. The results of the year's working, before capital charges, interest, and income-tax were deducted, amounted to the handsome sum of £14,020, which, he believed, was a record for the gas undertaking. It was a result which had not been obtained by sitting down and waiting for something to turn up. It was largely due, as he thought all would admit, to the energy, foresight, and intense interest in the success of the business manifested by their Engineer (Mr. Harold Bloor). Among the matters to which he drew attention on the expenditure side, was the repair and renewal of meters. No serious overhauling had been done for many years; and the Committee were as anxious that no one should pay too much as they were that no one should pay too little. Hence when they knew things were well with them, the Engineer decided to overhaul a section, and had it repaired and renewed, which had meant an increased expense under this head of £700. No work was more important, both from the Committee's and the consumers' point of view. He was given to understand that the amount of £33,917 on the revenue side of the balance-sheet was a record sum for gas-rental in any one year. He sincerely hoped that, with the increased facilities for using gas by cookers, &c., the quantity sold might be even larger still. The sales of coke and sulphate of ammonia were little different in amount from those of the previous year; but they obtained £450 more for tar. The two sides of the account balanced with the large sum to the credit of the gas-works of £14,020, which, after payment of instalments of loans and suspense account, together with interest and income-tax, left a net sum of £8695. The income-tax amounted to £700, or equal to very nearly 1d. per 1000 cubic feet. The Committee asked the Council to confirm their decision to place £1000 to reserve and £693 to pay the deficiency on the baths account, and to hand over the sum of £7000 to the city fund account. The past year had not been altogether a bed of roses; but he believed when they realized the honest aspiration of their Engineer and his Committee to safeguard the interests of the Council, while moving steadily in the path of progress, they might know each other better and sympathize with each other's difficulties.

Mr. KING, alluding to the sum which was paid in income-tax, suggested that the question of reducing the price of gas might be taken into consideration.

Other members congratulated the Chairman of the Committee and the Engineer on the results achieved.

Mr. Buck, replying to the remarks made, said that, with regard to the price of gas, he considered they had better wait and see for a time.

OLDHAM CORPORATION GAS DEPARTMENT.

Annual Report of the General Manager.

The General Manager of the Gas Department of the Oldham Corporation (Mr. Arthur Andrew) has presented his annual report, which furnishes the following particulars.

The gross revenue for the past financial year amounts to £180,443, and the gross expenditure to £133,018; the balance carried to the profit and loss account being £47,425. The annuities amounted to £3348, the interest on loans and stock to £13,949, and the sums payable to the respective sinking funds, &c., to £6655—making £23,952; the net profit on the year's working being £23,473. Adding the balance brought forward (£19,158), and deducting the amounts transferred to the borough and reserve funds (£7500 and £6000), the cost of renewing the Higginshaw gasholder (£3342), and the amount written off for depreciation on gas cooking-stoves (£1650), making in all £18,492, there is left a credit balance of £24,139 to be carried forward. The prices realized for residual products were considerably higher last year than during the preceding twelve months—coke and breeze to the extent of 11½d. per ton, tar of 6s. 1½d. per ton, and ammoniacal liquor of 8d. per 100 gallons of 10-oz. strength. The cost of production, apart from the increased value of residuals, decreased by 2d. per 1000 cubic feet, due principally to lessened expenditure for the repair and maintenance of works, and partly to a decrease in the cost of fuel and in carbonizing wages; the latter owing to there having been an increased make of gas per ton of coal carbonized. The cost of fixing cookers free during the year amounted to £1701.

The quantity of gas consumed by the street-lamps within the borough and in the various municipal buildings, formerly supplied gratuitously, was charged for last year, and included in the revenue, in accordance with the provisions of the Corporation Act of 1909.

The quantity of gas manufactured at the different stations during

the year ended March 25 was: Oldham, 55,998,000 cubic feet; Higginshaw, 698,465,000 cubic feet; Hollinwood, 557,632,000 cubic feet; do. (water-gas plant), 142,408,000 cubic feet—total, 1,454,503,000 cubic feet, against 1,390,303,000 cubic feet in the preceding year; being an increase of 64,200,000 cubic feet, or 4·62 per cent. The following quantities of coal, oil, and benzol were used in its production: Coal, 109,829 tons 2½ cwt.; gas oil, 403,639 gallons; benzol, 87,909 gallons. The average quantity of coal gas made per ton of coal carbonized was 11,946 cubic feet, compared with 11,666 cubic feet in the year 1909-10. The quantity of gas unaccounted for was 78,138,000 cubic feet, or 5·37 per cent. of the quantity made, compared with 73,837,000 cubic feet, or 5·31 per cent., before. The maximum quantity of gas delivered in 24 hours was 7,718,000 cubic feet, on Dec. 15 last, compared with 7,609,000 cubic feet the previous year; being an increase of 109,000 cubic feet. The record maximum delivery was on Dec. 23, 1904—viz., 8,634,000 cubic feet. The minimum quantity delivered was 1,703,000 cubic feet on June 26, 1910, compared with 1,572,000 cubic feet before; being an increase of 131,000 cubic feet. The average illuminating power of the gas, No. 2 "Metropolitan" burner, was 19·89 candles.

The total number of meters fixed on the 25th of March last was 53,722, of which 4026 are of the prepayment type; 951 meters were fixed in new premises and others in which gas had not previously been used; and 115 meters were permanently disconnected. The actual number of consumers at the close of the financial year was 48,455. The number of meters fixed but not in use was 2264—a reduction of 137 during the year. The net increase in the number of additional cooking-stoves and grills fixed free of charge to consumers was 1798. The total number in use on the 25th of March last was 18,876, exclusive of stoves owned by consumers. The number of gas-fires sold during the year was 52. There was an increase of 18,107,000 cubic feet in the quantity of gas used in houses and shops, and of 45,240,000 cubic feet in that consumed in mills and workshops; the latter increase being due to less short time having been worked in the mills than during the preceding year. The number of prepayment meters in use increased last year from 2662 to 4026; and the quantity of gas consumed through them from 18,299,000 to 35,702,400 cubic feet.

As recorded in the "JOURNAL" at the time, the first sod of the new gasholder tank at Hollinwood was cut on Aug. 8, 1910, by the then Chairman of the Gas Committee, Alderman Jason Thompson, J.P. The holder will be of the spiral-guided type, in four lifts, with a capacity of about 5¼ million cubic feet. One of the two-lift gasholders erected in 1872 at Higginshaw has been replaced by one having four lifts, on the spiral-guided principle. The new holder was brought into use on Nov. 7 last. [See "JOURNAL" for Nov. 8, 1910, p. 392.]

There were 95 additional gas-lamps erected within the municipal borough and 55 in the out-townships during the year. The total number of lamps fixed in the whole of the supply area on March 25 was 6024. The total number of lamps of the incandescent type at that date was 4094 within the borough and 1607 in the out-townships; being an increase of 203 during the year. The high-pressure plant for lighting the lamps in front of the Town Hall has been replaced by another of a more modern and efficient type. The number of lamps supplied by the plant is six, each of 1500-candle power, and five of 500-candle power each—making a total of 11,500-candle power.

Appended to the report is an analysis of the expenditure per 1000 cubic feet of gas sold in the years ended March 25, 1909, 1910, and 1911.

HAMILTON CORPORATION GAS UNDERTAKING.

Annual Report.

The annual report by the Gas Engineer—Mr. J. Ballantyne—to the Corporation of Hamilton states that the quantity of gas made in the year ending May 15 was 161,779,700 cubic feet—a decrease of 1,352,500 feet. Gas sold through consumers' meters amounted to 136,686,750 cubic feet—a decrease of 1,090,650 cubic feet. For public lighting, 8,769,500 cubic feet was used—an increase of 993,800 cubic feet. The decrease in the consumption through consumers' meters occurred almost entirely during the early winter months, and was due to mild weather and an absence of fog. The total quantity of gas accounted for, including that used on the works, was 146,870,250 cubic feet, which left 14,909,450 cubic feet unaccounted for, equal to 9·22 per cent.—a decrease of 1 per cent. on the previous year. The gas unaccounted for, although very much less than it used to be, is regarded as being about double what it should be; but it is recognized that, so long as underground disturbances continue, it will probably be difficult to get it much below the present figure. The coal used was 15,486 tons—a decrease of 624 tons; and the yield of gas was 10,449 cubic feet per ton—an increase of 321 cubic feet. Since the introduction of coal-handling plant, the increase in the yield of gas per ton of coal has been 562 cubic feet, which, on the quantity of coal carbonized during the year, amounted to £780 at the present selling price of gas, and is fully £300 more than would have been necessary to pay interest and sinking fund charges on the total of £9023 which was expended on the new plant and the railway siding. Apart from the new plant, there has been no change in the systems of working, and, if anything, of late the quality of the coal had not been so good as formerly; so that the increased yield was entirely due to the introduction of the new plant. At May 15, the number of consumers through ordinary meters was 5003, and through prepayment meters, 2802—a total of 7805, as compared with 7661 last year, an increase of 144. The number of cookers on hire was 2292, as against 2117—an increase of 175. The total revenue was £22,119, and the expenditure £15,991, which included the cost of a new saturator. There was left to be carried to net revenue account £6128, which was £1833 more than last year. The amount carried to net revenue account, notwithstanding the reduction in the price of gas when the coal-handling plant was introduced—which was equal to £1515 on the year's consumption of gas—was the largest in the history of the gas-works.

At the meeting of the Town Council on Tuesday, the Gas Committee reported a net profit of £1942, which, with the balance brought forward of £1766, made a total of £3708. Before arriving at the balance, a

sum of £1000 had been applied as a third instalment towards liquidating the cost of the new plant. The Committee recommended that £2000 be transferred to the revenue of the common good, that £442 be placed to the contingency fund, and that the balance of £1266 be carried forward. The Engineer and Manager estimated for the current year a gross profit of £6786; and the Committee recommended the Council to reduce the price of gas by 2½d.—making the rates to ordinary consumers, 1s. 8d.; for street lighting and power purposes, 1s. 5½d.; and for prepayment meter consumers, 2s. and 2s. 4d. per 1000 cubic feet. The reductions, it was recommended, should take effect after the next survey; and instead of altering the prepayment meter indices, the recommendation was that the difference should be refunded to the gas consumers.

Baillie Anderson, the Convener of the Gas Committee, said the Council, he was sure, would be pleased to see such good results. These said much for the Gas Manager and his assistants. Ex-Provost Keith concurred in the congratulations which had been uttered; but he questioned whether, in the face of their results, they were justified in reducing the gas in the form proposed. He moved that they keep the price at the flat-rate of 1s. 8d.

The report was adopted by eight votes to seven.

TIPTON DISTRICT COUNCIL GAS DEPARTMENT.

The Annual Accounts.

The accounts of the Gas Department of the Tipton Urban District Council for the year ended the 31st of March last, as certified by the Auditor (Mr. James E. Rowley), have been issued. They are accompanied by a manufacturing statement for the past and the preceding years by the Engineer and Manager, Mr. Sidney O. Stephenson.

The accounts show that the gross sales of gas last year amounted to £14,575, compared with £14,267 for the year to March 31, 1910, or an increase of £308. After allowing for discounts and adjustments of stock, the net sales were £13,801, against £13,545, or an increase of £256. This increase is stated by Mr. Rowley, in his report on the accounts, to be entirely due to the increase in the receipts from the prepayment meters, the totals for which amount to £3991, against £3595 for the previous year, or an increase of nearly £400; and as these consumers are allowed a larger discount than the ordinary ones, a rise of some £30 in the discounts is due to this source. With regard to the residual products, all show a considerable increase—coke of £325, tar of £67, and ammoniacal liquor of £61. After allowing for discounts, there is a net increase of £445 on these items. The total sums to the credit of the revenue account amount to £19,539, against £18,789 for the year to March 31, 1910, or an increase of £750. On the debit side of the revenue account, the charge for coal amounts to £7259, against £7069 for the year to March 31, 1910, or an increase of £190, compared with the net increase of £256 in the sales of gas. This is wholly due to the larger quantity of coal used, and has been occasioned by the decrease in the make of gas per ton, as shown by the manufacturing statement of the Engineer and Manager. The cost per ton of coal carbonized was practically the same as in the preceding year—being 12s. 11½d. against 13s. 0½d.

The net result of the year's trading is a gross profit of £5927, compared with £6067 in the year 1909-10, or a decrease of £140. From the gross profit, £2107 has to be deducted for interest on loans, and a further sum of £2401 for their repayment. These charges amount to £4508, which is £320 less than the corresponding charges for the year 1909-10. The net surplus to be carried to the accumulated profits account is £1419, or £181 more than for the year 1909-10. The amount standing to the credit of this account is now £6677. With regard to any disposition of the net profit of £1419, Mr. Rowley says it should be borne in mind that a sum of £945 was expended during the year on capital account, and that, in the absence of any loan, this expenditure had to be defrayed out of the profits; so that in that case there is a balance of some £450 only over the capital expenditure.

Mr. Stephenson's statement contains the following particulars:

	Year Ended March 31, 1911.	Year Ended March 31, 1910.
Coal carbonized . . .	11,638 tons	10,831 tons
Gas made (total) . . .	130,968,000 cub. ft.	126,368,000 cub. ft.
Make of gas per ton . .	11,253 "	11,667 "
Water gas added . . .	2,406,000 "	1,273,000 "
Water gas, proportion of total make . . .	1'83 per cent.	1 per cent.
Net coal gas made (de- ducting water gas) . .	128,562,000 cub. ft.	125,095,000 cub. ft.
Net coal gas made per ton . . .	11,047 "	11,550 "
Gas sent from the works	131,262,000 "	126,445,000 "
Gas sold and used in works . . .	114,121,875 "	110,083,475 "
Leakage, condensation, &c.	17,140,125 " (13½ per cent.)	16,361,525 " (13 per cent.)

Sidmouth District Council and Gas and Electricity Supply.—Last Wednesday evening, a meeting of ratepayers was held in the Drill Hall, Sidmouth, with reference to the action of the Urban District Council in opposing the Sidmouth Gas and Electricity Bill. Mr. C. E. Roberts presided, and said the ratepayers had met by the invitation of the Council in order to have laid before them what had been done in the matter. The Council had opposed the Bill because they were of opinion that the Sidmouth Gas Company should not have a monopoly of the lighting of the town. By opposing, they had obtained a reduction of 10d. per 1000 cubic feet in the price of gas, and also had a clause inserted in the Bill which gave them the option of purchasing the Company's undertaking. Mr. Halse said the Council thought all present would agree with what had been done. He moved that the Council purchase the undertaking; and the motion was carried with nine dissentients. The Council will now take steps to promote a Bill to authorize the purchase.

GOOLE GAS AND WATER SUPPLY.

At the Meeting of the Goole Urban District Council last Wednesday, the accounts of the Gas and Water Departments were submitted and approved. In his report, the Engineer and Manager (Mr. J. Fazakerley) stated that the increased sale of gas compared with the year 1909-10 was 3,061,430 cubic feet, or 4 per cent. on the make. The increased yield of gas sold was 338 cubic feet per ton of coal carbonized. Coal cost 10d. per ton less than in the previous year; and residuals realized 1s. 8d. per ton more—being equivalent to 8s. 4d. per ton of coal carbonized. There was an increased revenue of £1315, and an increased expenditure of £501—the latter being on the general upkeep of the works and the renewing of old mains, &c. There was an increased transfer of £814; and the net profit was £1159. With regard to the Water Department, an increased revenue of £522 was reported, compared with the year 1909-10. The quantity of water pumped was 194 million gallons—an increase of 7,250,000 gallons. There was a decrease in wages of 1s. per million gallons, and a decrease of 1s. 6d. per million gallons in the cost of coal. The net profit was £782—an increase of £300.

THE LIGHTING OF BIDDULPH.

A meeting of ratepayers, convened by the Urban District Council for the purpose of discussing an electric lighting scheme, was held in the Public Hall, Biddulph, on Wednesday evening last—Councillor JOHN COPELAND presiding.

The CHAIRMAN said he thought the time had come when the streets should be lighted either with electricity or gas, and that Biddulph should have some light, both from a moral and a business standpoint. The question of purchasing the Gas Company's undertaking had frequently been discussed by the Council; but the price was considered excessive, and they must now consider the advisability of resorting to electricity as a means of lighting the parish.

Mr. ROBERT HEATH, J.P., remarked that his Manager (Mr. Allott) had helped to formulate a scheme as a means of getting over the difficulty and giving private consumers the opportunity of having electric light. It had been suggested to him that, as the firm were bringing electric power from Kildgrove to Black Bull, perhaps they could convey it to Biddulph. He had gone carefully into the matter, and had got a scheme out, which he had submitted to the Council. On this plan, the Council could be supplied at 1½d. per unit; and without excessive charges, they could supply private consumers at 3½d. per unit. This was a reasonable price, as compared with other towns. One strong point in favour of the scheme was that if the Council obtained a number of consumers, they would not only make a profit, but the lighting of the town would cost nothing. They must, of course, be guaranteed sufficient private consumers. It would be no advantage to him; but it would be a good thing for the parish, for which he wanted to do all he could.

Councillor WHALLEY said 1d. per unit was equal to gas at 1s. per 1000 cubic feet.

Mr. J. R. L. ALLOTT, the General Manager to Messrs. R. Heath and Sons, then briefly outlined the scheme, which, he said, originated from Birchenwood, the source of supply. Some doubt had been cast on the continuity of supply; but there were two generating stations of 900 kilowatts, and if one broke down the other would be going on. Electricity had been brought to Black Bull for colliery purposes, and was used for pumping purposes night and day. The current was always on; and there was no fear of the supply discontinuing. The scheme combined safety and reliability; and compared with gas, electricity gave a better light, and was far more economical. The cost of gas in Biddulph was 4s. 3d. per 1000 cubic feet; electricity would cost 3½d. per unit, which was equivalent to 3s. 6d. for gas, a saving of 25 per cent. A splendid opportunity was given Biddulph to get cheaper light, which was very desirable. The price offered was such that the firm would make nothing out of it.

Councillor WALLEY asked how the Council were going to recoup themselves for the initial cost of £2270. He thought they should own and control their means of supply, and said now was the time to make an offer to purchase the Gas Company.

The CHAIRMAN replied that in 1908 the Gas Company were willing to supply gas at 3s. 10d. per 1000 cubic feet for street lighting, erect and maintain the lamps, and extinguish the lights. If 60 lamps were erected and burned four hours per day, it would cost £101. An additional expense of £60 or £70 per year would also be incurred until the loan was repaid. Lighting the streets would thus cost about £170 per year. On the other hand, if Messrs. Heath's offer were accepted and electricity purchased at 1½d. per unit, and sold at 3d. or 4d., the Council should make a profit to pay for lighting the streets. If the consumption grew, the profits would increase, and would go in aid of the rates.

Mr. HEATH said he was one of the foremost opponents of the purchase of the gas-works, which he always considered would be a most unbusinesslike proceeding. If the Council took that on, they would do so at a big loss. The gas-works had been in existence something like forty years; and during all this time, as a shareholder, he had never received any dividend. He was quite sure gas could not be produced to pay; and it was already at an excessive price. The principal reason was a business one. The works were old and defective; and it was monstrous to think of buying them. Even if they were bought, the site would have to be changed, as it was very unfavourably situated for the supply of coal, &c. It would be a foolish and impossible scheme. Gas at 3s. 10d. was going to cost £101 per annum; and electricity £32.

Councillor SHAW said there was no intention of having the scheme unless the Council could get a sufficient number of private consumers. A lot of shopowners would not pay the cost of the fittings.

Mr. HEATH remarked that it was certainly not worth while to light the streets alone.

Mr. HARDING thought it advisable to know the cost of lamps per year to working men in comparison with the cost of paraffin lamps.

Mr. ALLOTT stated that the cost would be 25 per cent. more, including the fitting of one light.

Mr. ENOCHS expressed the opinion that the initial cost would debar many from going in for the light. The upkeep, breakages, &c., would be too much.

Councillor WALLEY proposed that the Council make an offer to purchase the Gas Company at a reasonable figure. He said the present Council had never dealt with the matter.

The CHAIRMAN ruled this out of order; saying the meeting was called to discuss electric light, not gas.

Councillor COTTRELL proposed that the Council get more information as to the cost per unit, including fittings, &c.

Mr. OAKES said he should like to add to the motion that the Council also consider the lighting by gas.

Mr. ENOCHS moved, as an amendment, that the Council ascertain the probable cost per unit and the cost of two lamps fitted free into the houses.

On a show of hands, the amendment was declared carried; and it was announced that another meeting would be called when the Council had again discussed the question.

THORIUM SYNDICATE SUSPENDED.

The "Financial Times" last Friday published the following communication from a special correspondent on the subject of the suspension of the Thorium Syndicate.

For a considerable time past, negotiations have been proceeding among the principal European manufacturers of thorium, with the view of coming to an arrangement by which production and prices could be regulated; but these have at length been abandoned, as unanimity was found to be unattainable under existing circumstances. The supply of thorium was at one time a virtual monopoly, under the control of a powerful Continental Syndicate; but the "corner" has at length been broken, and the industry has fallen on evil days from the producer's point of view. Prices have steadily declined for two or three years, and are not unlikely to go considerably lower. This declining tendency is directly attributable to the glutting of the market with monazite sand—the principal raw material from which thorium is produced. The supplies of this sand were entirely controlled by the Thorium Syndicate. Inordinate greed proved the Syndicate's undoing, however; for the exorbitant prices charged forced the leading makers of incandescent mantles, including the Welsbach Incandescent Light Company and the German Incandescent Gas Company, to exert themselves to obtain independent supplies at all costs. In this they were successful; and prices fell rapidly. Practically the whole of the supply of monazite sands comes from Brazil; and thorium nitrate is manufactured only in the United States and on the Continent of Europe. The yearly consumption of monazite sand for the manufacture of thorium is placed at between 2000 and 2500 tons; but for some years the supplies have been equal to double the consumption. The contract between the Brazilian Government and the Thorium Syndicate has now expired; and a new lease of the fields is about to be arranged. There are numerous offerers; and as the Brazilian Government are not likely to allow any monopoly to acquire control of the supplies, a further flooding of the market, and consequent decline in prices, is feared.

"PAPER-BAG" COOKERY.

In view of the great publicity which has lately been given in the daily papers to the subject of paper-bag cookery, the supplier of gas is not likely to lose the opportunity of bringing to the notice of the public the peculiar adaptability of gas-cookers for this method of preparing viands for the table. To reap the full benefit of the curiosity which has been aroused, however, oral lectures and practical demonstrations are necessary, when the advantages of the new over the old method of cookery, and (incidentally) of gas over any other fuel, can be shown in a convincing manner. Bearing this in mind, Messrs. R. & A. Main, Limited, inaugurated a series of lectures at their show-rooms at No. 83, Old Market Street, Bristol, on the 3rd inst.; and the success achieved was instantaneous. This is evinced by the fact that more than 500 applications for tickets were made in less than two days; and that instead of holding one demonstration each night, as was originally intended, Messrs. Main had to adopt the modern music-hall method of "two houses nightly," and lengthen indefinitely the one week which was at first to have been the duration of the demonstrations.

The subject is referred to as follows by Miss Helen Edden in the current number of the Gaslight and Coke Company's "Co-Partners' Magazine": "This method of cooking has been in use for many years, as reference to any good book will show. French cooking *en papillotes* it is called; the only difference now being that the process is simplified by using paper bags, instead of oiled or buttered paper, to form a case. This method of cooking is essentially good for fish, such as cod cutlets, salmon steaks, and small filleted fish, as the whole of the flavour is retained, and there is no smell arising during the process of cooking—which odour so often prevails, and is very penetrating. I should advise always oiling or buttering the bags. Dried fish, such as bloaters, kippers, and haddocks, can be successfully cooked; but the economical user of gas must bear in mind that by this paper-bag process the oven gas must be alight for 10 to 15 minutes, then lowered to half, and the fish will take another 10 to 12 minutes, making 25 minutes for the fish, instead of 7 minutes with the grill. It is better to remove the browning-shelf while heating-up the oven, and to slip it in when the paper bags are put in the oven. The two grid shelves should be spaced at the top of the oven, and the solid shelf below, about a foot from the flames, to prevent smothering. Lower the gas one-half or rather less when cooking. . . . Paper-bag cookery should be used only for small things, such as kidneys, tomatoes, cutlets, pigeons, small savoury dishes, and fish."

REDUCTION IN PRICE AT READING.

In view of the provisions of the Bill for Extending the County Borough of Reading, the Directors of the Reading Gas Company have given notice that the price of gas to ordinary consumers within the limits of the borough as extended will be at the rate of 2s. 5d. per 1000 cubic feet as and from the 1st inst., and that the annual charge for the public lamps in Tilehurst and Caversham will be based upon the schedule of prices in force under the terms of the present contract with the Reading Corporation. The prices for the standard patterns of lamps (extinguished at eleven o'clock) in the two districts will be: Tilehurst, £1 12s. 5d. per annum; Caversham, £1 12s. 2d. per annum. The prices for the small number of other types of lamps in use will also be reduced in accordance with the schedule referred to. Immediate steps will be taken to give prepayment consumers in the added districts the full benefit of the revision. The prices in the areas outside the extended borough will, for the present, remain as before.

The public lighting of Caversham—one of the districts affected by the change in the price—having recently been the subject of some comments in the "JOURNAL" in connection with the electric lighting contract entered into by the Urban District Council, it may be mentioned that the price of gas there previous to the 31st of March last was 2s. 10d. per 1000 cubic feet; and the Reading Company's charge for the public lamps fitted with No. 3 Kern burners, extinguished at eleven o'clock, was £2 1s. 4d. per annum. Under the altered conditions, it is only £1 12s. 2d. The Reading Electric Supply Company are substituting for the No. 3 Kern burners lamps fitted with two 55-watt burners alight until eleven o'clock; and for these they are charging £1 17s. 3d. per lamp per annum. The Gas Company's reduced charge therefore compares very favourably with that of the Electric Light Company, and deprives the Chairman of the District Council of one of the principal arguments of which he made use when accepting the Electric Light Company's contract—viz., that they would effect a saving of £88 per annum. Instead of doing this, they will incur considerable loss.

FYLDE WATER BOARD'S JUBILEE.

In Search of a New Supply Area.

In celebration of the jubilee of the Fylde water undertaking, members of the four constituent authorities, at the invitation of the Board, made an inspection last Thursday of the water-works at the base of the hills east of Garstang, and saw for themselves the steps being taken to cope with the increasing demand by consumers in Blackpool, Fleetwood, Lytham, and St. Annes districts. The party, which numbered 67 in all, included Alderman J. Bickerstaffe, J.P., of Blackpool (the Chairman of the Board), Mr. C. Arthur (the Secretary), Mr. J. Cook (the Engineer), and Mr. A. V. Riley (the Manager).

Much attention was paid to the new Grizedale Lea reservoir works, on which about 250 men are now engaged—a number that will shortly be increased to some 400. This reservoir will be 34 acres in extent, and 50 feet deep, with a holding capacity of 330,000,000 gallons. The geological faults encountered, and how they were dealt with, were explained by Mr. Cook, who acted as guide. It was stated, in the course of the general inspection, that the North Barnacre reservoir is 28 acres in extent, and has a holding capacity of 96,000,000 gallons; while the South Barnacre reservoir is 16 acres in extent, and holds 60,000,000 gallons. The Grizedale reservoir covers 13 acres, and has a holding capacity of 80,000,000 gallons. It was also explained that one of the improvements the Board propose to carry out as soon as matters are settled by arbitration with Mr. Garnett, the owner of land on which are numerous springs, is to catch the water of these springs in pipes, and carry it direct to the Calder conduit. The advantage of this was obvious, said Mr. Cook. Instead of running into the blackened River Calder, when there is a storm, the pure spring water will be conveyed direct to the reservoirs; and this water will therefore be saved from running to waste, as frequently happens now. It is also proposed to construct a channel through the silt bed, and thus prevent much of the discoloration, which no practicable filtration will remedy.

Following a dinner served at the Kenlis Arms, Garstang, at the close of the inspection, a short toast list was gone through. Replying to the toast of "Success to the Fylde water undertaking," Alderman Bickerstaffe referred to the difficulties they had had to contend with in the construction of the new reservoir. There was not a water undertaking in the kingdom, he said, that had not some such troubles, and probably greater ones than had faced the Fylde Water Board. Some delay and additional expense had been caused in consequence; but it was not anything more than all other such concerns had had to contend with. As to the future, this was a serious matter. When he told them that their consumption had doubled within the last ten years, they might judge that it was quite necessary to be looking further ahead. They had three sites in view for a new water area, but had not finally selected one.

London County Council and Improved Gas Lighting.—The London County Council have accepted an offer from the Gaslight and Coke Company, at £85 2s. 4d., for improving the lighting of the north pontoon of the Woolwich Ferry, by substituting better lanterns fitted with inverted burners. It is stated that by carrying out this improvement an average annual saving of about £70 will be made, while at the same time a greater amount of light will be obtained. The Council are in negotiation with the South Metropolitan Gas Company with a view to effecting similar economy in the lighting of the south pontoon. As a result of negotiations with the Wandsworth and Putney Gas Company, an offer by them has been accepted for the conversion of the lamps on Putney Bridge to the inverted type, at the cost of the Company. The result of this will be that the illuminating power will be increased from 2000 to 8500 candles, while the annual cost of gas is estimated to be increased from £95 to £98 12s. only.

NOTES FROM SCOTLAND.

From Our Own Correspondent.

Saturday.

In the annual report which was submitted to the Perth Town Council on Tuesday, it was stated that the past year has been one of the most prosperous in the history of the gas department. There is a balance at the credit of the revenue account of £13,692; and there is a net balance of £426 to carry forward. Gas sold during the year amounted to 224,092,000 cubic feet—an increase of over 3½ million cubic feet. It is proposed to reduce the price of gas by 1d. per 1000 cubic feet—making it 2s. 9d. to ordinary consumers, and 3s. to prepayment meter consumers—and to reduce the charge for public lighting from 2s. 6d. to 2s. 4d. per 1000 cubic feet. The scheme of charges for gas for commercial, industrial, and power purposes—ranging, according to consumption, from 1s. 4½d. to 2s. 6d.—it is proposed to leave undisturbed.

The Corporation of Glasgow and the Busby and District Gas Company have been in conflict for some years over the supply of gas to the districts contiguous to the area served by both parties. I daresay the quantity of gas which might be sold in the district is not of so much moment to the Corporation as is the preventing of anybody of gas suppliers from obtaining statutory powers over the area, which would have to be paid for at a heavy rate in the event of the area being brought into the city. The subject was considered worth fighting for at Westminster, where it was before a Select Committee of the House of Lords on two separate days this week. Both parties sought rights in the area which they do not at present possess; and the decision of the Committee, given on Thursday, was that the Busby Company get what they sought, less the portion which the Corporation were desirous of having, subject to the condition that in 1912 the Corporation shall obtain power to include this area within the limits of their gas supply. That is to say, the Corporation have won the point they made—that the Company should not obtain statutory power over a district which the Corporation have a desire to serve.

The annual meeting of shareholders of the Stirling Gas Company was held in the Company's office on Tuesday, under the chairmanship of ex-Provost Kinross. The report of the Directors stated that the net revenue from the sale of gas during the year was £15,997; from meter-rents, £721; from rents of stoves, £281; and from the sale of residual products, £5142. The balance at the credit of the ordinary account, after providing for ordinary maintenance and repairs and renewals, amounted to £4846, to which fell to be added the sum of £3735 brought forward from the previous year. After payment of all charges, there remained a balance of profit on the year's working amounting to £7474. The Directors recommended payment of dividends, on the original capital, at the rate of 9s. 5½d. upon each share of £5 7s. 6d., and on the new ordinary shares at the rate of 11s. upon each £10 share—amounting together to £4537; that £412 be added to the reserve fund, raising it to £734; and that a balance of £2790 be carried forward.

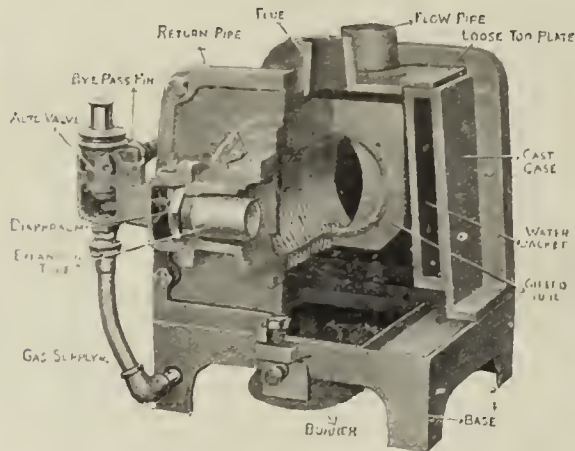
The dividends were at the same rate as last year. The report also mentioned that since their last annual meeting Mr. David Chrystal, one of the Directors of the Company, had been removed by death. The Directors regretted to find that no securities existed for the sum of £500 belonging to the reserve fund, which, since the last annual meeting, had been entrusted to Mr. Chrystal, as Law Agent of the Company, for investment in heritable securities which had been submitted to, and approved of by, the Directors. As advised, the Directors proposed to write off this loss; but a claim had been made against Mr. Chrystal's estate, and any sums received would be credited to the reserve fund. There had been an increased consumption of gas during the year. The report was adopted. The Manager—Mr. J. M. Smith—reported that the works were being maintained in a satisfactory condition.

The Directors of the Selkirk Gaslight Company reported to the shareholders at their annual meeting on Tuesday that the past year's working showed a very satisfactory result. The quantity of gas made was 40,780,200 cubic feet—an increase of 284,700 cubic feet over the preceding year. Gas sold amounted to 38,088,200 cubic feet. Coal carbonized amounted to 4113 tons; and the yield of gas was 9915 cubic feet per ton. It was recommended that the price of gas remain at the same figure; and that the profit for the year—£1431—be applied in payment of a dividend at the rate of 4 per cent., and in placing £250 to depreciation account and £455 to surplus account. These recommendations were adopted.

The gas made in the Dunfermline Corporation gas-works during the past year amounted to 140,113,000 cubic feet—an increase of 5,290,000 cubic feet over the previous year. The gas sold amounted to 132,040,600 cubic feet—an increase of 6,081,600 cubic feet. At the monthly meeting of the Town Council on Monday, Mr. T. Stewart, the Convener of the Gas Committee, stated that the matter of supplying gas to Culross had taken a turn which necessitated the Committee holding their hands, so far as they could do so, in the meantime. The Committee had entered into a contract for the laying of pipes between Dunfermline and Culross, and the Fife Coal Company, Limited, had intimated their intention to establish at Newmills works for the supply of gas to their own workpeople there. He was hopeful that the Committee would be able to come to an amicable and satisfactory arrangement with the Company. The agreement with Culross had not yet been signed.

The Cardenden Gas Company, Limited, earned net profit last year to the amount of £572. A dividend of 5 per cent. has been declared; and it has been resolved to give prepayment meter consumers a rebate of 2½d. per 1000 cubic feet of gas consumed.

In the Kirkcaldy Town Council on Monday, the Finance Committee recommended that Mr. Maxwell, the Burgh Chamberlain, be granted an increase of his salary, raising it from £350 to £400, and that the question of an honorarium for work done in connection with the taking over of the gas undertaking be considered at a later date, when the whole work is finished. The proposed increase was agreed to by 16 votes to 8.



The actual section of which this is a photograph may be seen at our London Show-Rooms.

IF you have not yet verified all we have said in these pages regarding the unique claims of the GILLED CIRCULATOR, it is easy to do so. Pay a visit to our London Show-Rooms, where the Circulator may be inspected in operation. We desire merely to remind you *now* that every claim put forward for the "Gilled" is a proof of its triumph in the matter of

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On Monday, the Town Council of Burntisland met as Gas Commissioners to consider their annual work. The report of the Gas Manager—Mr. Alex. Ross—was to the effect that there had been an increase in the quantity of gas made, which last year amounted to nearly 24 million cubic feet. In 1897, the output was only 10½ million cubic feet. The increase was attributed to the large expansion which there has been in the demand for gas for cooking and heating as well as for lighting. The estimate for the current year is that there will be a further increase in the demand for gas of from 1½ to 2 million cubic feet. In anticipation of this, the Council agreed to reduce the price of gas to consumers within the burgh to 2s. 11d. per 1000 cubic feet, after the August reading of the meters; the usual discounts and abatements for gas used for power being continued.

The Coupar Angus Gaslight Company have paid a dividend of 6 per cent., and reduced the price of gas from 5s. 7½d. to 5s. 5d. per 1000 cubic feet.

The Kelty Gas Company, Limited, have just paid a dividend of 6 per cent.

The Cupar Gas Company, Limited, have paid a dividend at the rate of 5 per cent. on the preference stock of the Company, and of 40s. per share upon the ordinary stock.

In the Broughty Ferry Town Council on Monday, Mr. C. T. Godfrey, the Convener of the Gas Committee, said they had had a phenomenally good year, for which he complimented the Manager. The result, financially, had been a decrease of £95 in revenue; but they reduced the price of gas last year by 1d. per 1000 cubic feet. A feature of the accounts was the yield from residual products, which showed an increase of £320. From all sources, their revenue showed an increase of £111. The Committee proposed to take 1d. off the price of gas; making the charge 2s. 8d. per 1000 cubic feet. The estimate was for a credit balance of £100 at the end of the year. The accounts and estimates were agreed to.

In the Brechin Town Council on Monday, Treasurer Archibald reported that the Committee which was appointed to inquire into the question of the purchase of the gas undertaking had been making inquiries, and had acquired considerable information.

It is reported that the Lighting Committee in Tulliallan have agreed to the terms offered by the Kincardine-on-Forth Gaslight Company, Limited, for a supply of gas. The agreement is to last for ten lighting seasons. The price of gas is to be 4s. 2d. per 1000 cubic feet, which, it is stated, is 2d. per 1000 cubic feet more than the former rate.

The Vale of Leven Gas Company (Alexandria) had a profit last year of £3106, out of which a dividend at the rate of 5 per cent. has been paid, and £1000 has been placed to reserve and depreciation fund.

Reduction in Price.—The Ackworth, Featherstone, Purston, and Sharlston Gas Company have, as from the 1st inst., reduced the price of gas 2d. per 1000 cubic feet for public lighting and 1d. for ordinary purposes.

CURRENT SALES OF GAS PRODUCTS.

[For Table of "Tar Products Prices," see p. 195.]

LIVERPOOL, July 15.

Sulphate of Ammonia.

Although the demand has hardly been so vigorous as that recently experienced, the requirements during the past week have been sufficient to absorb current production, and the prices realized have again been in favour of sellers. At the close, the nearest values are £13 11s. 3d. to £13 12s. 6d. per ton f.o.b. Hull, £13 12s. 6d. to £13 13s. 9d. per ton f.o.b. Liverpool, and £13 13s. 9d. to £13 15s. per ton f.o.b. Leith. The volume of business that has transpired in the forward position has not been large; but it is reported that £13 17s. 6d. per ton f.o.b. Leith has been obtained for January-April shipment next year, while manufacturers are now holding for this figure for delivery October-December this year or the first half of 1912.

Nitrate of Soda.

The market for this article has become rather firmer, and holders have advanced their quotations to 10s. per cwt. for 95 per cent. and 10s. 3d. for 96 per cent. quality, on spot.

LONDON, July 17.

Tar Products.

The markets for tar products remain very steady. The value of pitch has improved during the week, and there has been a decided advance in the price. Benzols continue steady, although there is no material alteration in the value. In solvent naphtha, there has been a little inquiry; but contracts are reported to have been taken at low figures. Creosote maintains its price; and the outlook seems good. In crude carbolic, improved prices are stated to have been offered for forward business, no doubt on account of the number of inquiries for crystals.

The average values during the week were: Tar, 19s. 3d. to 22s. 3d., *ex* works. Pitch, London, 38s. 6d. to 39s.; east coast, 38s. to 38s. 6d.; west coast, Manchester, 37s. 6d. to 38s., Liverpool, 38s. to 38s. 6d., Clyde, 38s. to 38s. 3d. Benzol, 90 per cent., casks included, London, 9d. to 9½d.; North, 9d.; 50-90 per cent., casks included, London, 8½d. to 9½d.; North, 8½d. to 9d. Toluol, casks included, London, 9½d. to 10d.; North, 9½d. to 9½d. Crude naphtha, in bulk, London, 4d. to 4½d.; North, 3½d. to 3½d.; solvent naphtha, casks included, London, 11d. to 11½d.; North, 10d. to 10½d.; heavy naphtha, casks included, London, 11½d. to 1s. 0½d.; North, 10d. to 10½d. Creosote, in bulk, London, 2½d. to 2½d.; North, 1½d. to 2d. Heavy oils, in bulk, 2½d. Carbolic acid, 60 per cent., casks included, east coast, 1s. 10½d. to 1s. 11d.; west coast, 1s. 9½d. to 1s. 10d. Naphthalene, £4 10s. to £8 10s.; salts, 40s. to 42s. 6d., bags included. Anthracene, "A" quality, 1½d. per unit, packages included and delivered.

Sulphate of Ammonia.

This market is very firm, and there has been a further rise in the value. Actual Beckton is quoted at £13 5s.; outside London makes,

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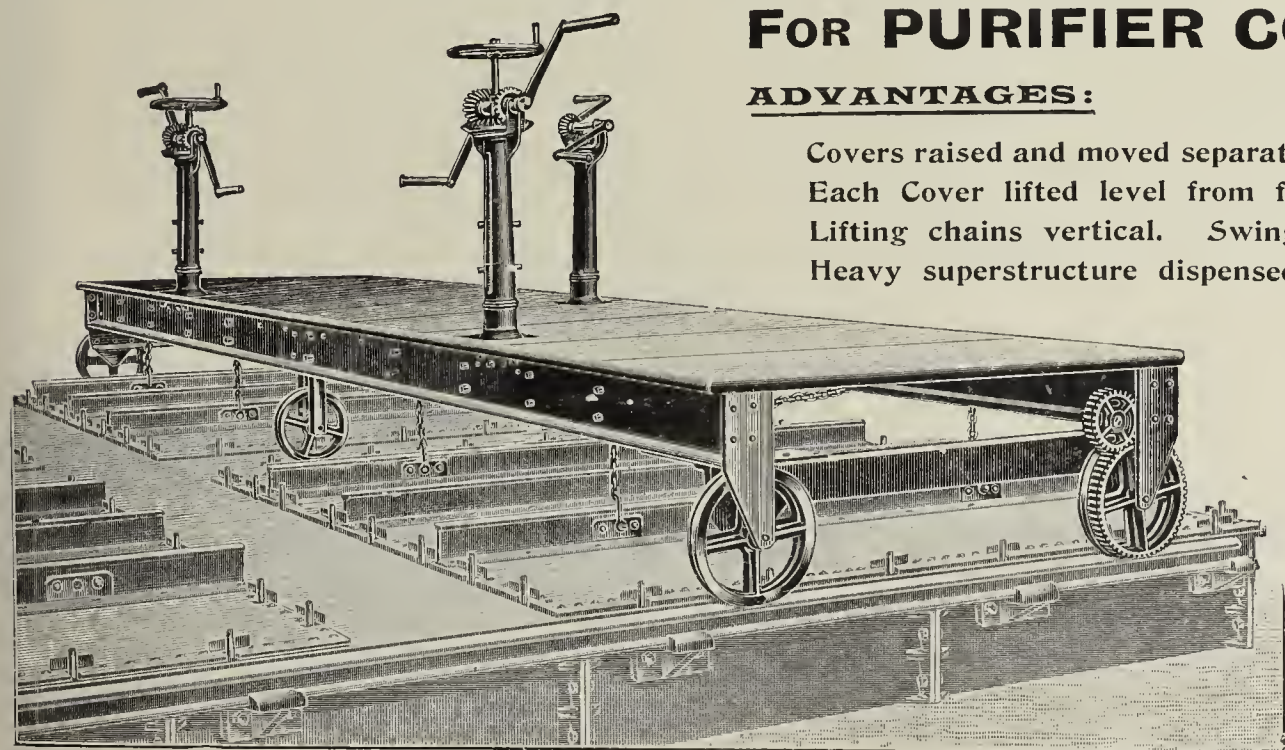
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£12 17s. 6d.; Hull, £13 10s.; Liverpool, £13 12s. 6d.; Leith, £13 15s.; and Middlesbrough £13 10s. For the forward position, a premium of 2s. 6d. to 5s. per ton is asked.

COAL TRADE REPORTS.

Northern Coal Trade.

There is a fuller demand for coal; and the possibility of some stoppage in a part of the northern coalfield is causing users to stock supplies. In the steam coal trade, the inquiry is good, and prices are steady. Best Northumbrians are from 11s. 3d. per ton f.o.b., second-class steams are 9s. 3d. to 9s. 6d., and steam smalls are 5s. to 6s. The production at the pits is full; and the output is well taken up. In the gas coal trade, the demand is now beginning to increase, though only slowly at first, for home needs; but the exports are very full. Durham gas coals are about 9s. 3d. per ton f.o.b. for second-class coals; best Durhams are 10s. 3d.; and "Wear" specials from 10s. 9d. to 11s.—the latter class being in brisk inquiry. Some sales of cargoes for Genoa are reported, at prices that are thought to be a little below those now current; but they include the freight on the coal, which fluctuates a good deal. One or two other contracts are in close treaty; but coalowners do not like at present to bargain too far forward till they can better estimate the cost of some legislative changes. Coke is steady. Gas coke, being now in slow output, is rather firmer, and good makes are from 14s. to 14s. 6d. per ton f.o.b. in the Tyne.

Scotch Coal Trade.

There has been a little more activity in coal circles, which, however, may not mean much more than that the cessation of trouble with seamen and dockers has brought a material improvement in the export department. Also, in the west, the miners' holidays are on; and there is always a slight spurt immediately before them, due to the laying in of stocks to tide over the time when the pits are idle. The prices now quoted are: Ell, 8s. 9d. to 9s. 9d. per ton f.o.b. Glasgow; splint, 9s. 3d. to 9s. 6d.; and steam, 8s. 9d. to 9s. The shipments for the week amounted to 322,025 tons—a decrease of 1196 tons upon the previous week, but an increase of 2175 tons upon the corresponding week last year. For the year to date, the total shipments have been 8,253,411 tons—a decrease upon the corresponding period of 22,891 tons.

Bursting of a Water-Main in Edgware Road.—A water-main in Edgware Road, W., burst last Friday afternoon, and in a few minutes the roadway was flooded for about 200 yards. The flood subsided in about an hour, leaving the roadway like a petrified sea; the water having forced the surface up in a succession of "waves," some of them 2 feet high. Little damage was done in the flooded basements, most of which were coal-cellars.

Hoylake and West Kirby Gas and Water Company.

The report of the Directors and the accounts for the year ending June 30 (which will be submitted at the thirty-fourth ordinary general meeting of the Company) show that the balance at the credit of profit and loss, after payment of the dividends in respect of the year to June, 1910, is £2056, to which has to be added the net revenue for the past twelve months, £7952—making a total of £10,008. Deducting the interim dividend paid in January (£2600), there is available a sum of £7408. From this, the Board recommend the payment of the following dividends: 6 per cent. on the "A" gas original capital; 4½ per cent. on the "B" gas additional capital; 6 per cent. on the "A" water original capital; and 4½ per cent. on the "B" water additional capital. These will absorb £3899, and leave a balance of £3509. After transferring £111 to the water back-dividend reserve, £342 to the gas, and £150 to the water contingency and plant renewal fund, and adding £433 to the gas reserve fund, there is left a sum of £2473 to carry forward. The dividend scheme, together with the interim dividend paid in January, represents a total distribution, less income-tax, for the year of 10 and 7 per cent. on the "A" and "B" capitals respectively. The gas reserve fund will then stand at £2164. The quantity of gas supplied last year to private consumers and the public lamps was 59,066,022 cubic feet. The price of gas during the period under review was 3s. 6d. per 1000 cubic feet, less varying discounts; while the charge to users of prepayment meters was 4s. 2d.

Seville Water-Works Company.—After providing for administration expenses and debenture interest, the accounts for the year ended March 31 show a net profit, including £8556 brought forward, of £17,383. The Directors recommend a dividend of 3 per cent., and the transfer of £5000 to the reserve (making it £15,000); leaving £4249 to be carried forward.

Indian Water-Works.—The proposals of the Municipality of Cawnpore for the extension of the city water-works have been approved by the Government of the United Provinces. The scheme includes a large multiple filtration plant for dealing with the water of the Ganges. The filters will have a capacity of 7 million gallons per 24 hours. The Consulting Engineers are Mr. H. Chabal, C.E., of Paris, and Mr. Walter Clemence, of London.

Kenilworth Gas Company.—At the 58th annual meeting of the Kenilworth Gas Company, the Chairman (Mr. Thomas Kemp, J.P.) stated that they had raised further capital during the past year, and had reduced the price of gas to the ordinary consumers; but they were still able to pay a dividend of 7½ per cent. on the ordinary shares. The accounts showed receipts (including a balance of £1029 brought forward) amounting to £5255, as compared with £5102 for the previous year; while the expenditure on revenue account totalled £3372. Mr. Thomas Berridge, J.P., of Leamington, the Engineer to the Company, was elected to the Board as Managing-Director.

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Sales of Stocks and Shares.

There was an extremely good demand for the new capital issues and other stocks and shares which Messrs. A. & W. Richards offered for sale at the Mart, Tokenhouse Yard, E.C., last Tuesday. Under instructions from Directors, additional capital in the Gravesend and Milton Water Company, the Sutton Gas Company, and the Southend Water Company was placed. The new issue of the first-named Company consisted of £10,000 nominal capital in $4\frac{1}{2}$ per cent. preference shares of £20 each; and they were all sold at £22 10s. apiece. The Sutton Gas Company had for disposal £6500 of $4\frac{1}{2}$ per cent. mortgage debentures; and they were purchased at from par to £100 10s. per £100. The new issue of the Southend Water Company comprised £5000 of 4 per cent. perpetual debenture stock and 500 new £10 ordinary 5 per cent. maximum shares. The stock was placed at from par to £101 per £100; and the shares, which will carry $4\frac{1}{2}$ per cent. dividend, were sold at par. By order of executors and another owner, some £10 fully-paid "A" shares and some "A" stock of the East Grinstead Gas and Water Company were offered for sale. Both rank for a maximum dividend of 10 per cent.; and they received dividends at the rate of $9\frac{1}{2}$ per cent. for the year ended Dec. 31 last. The shares fetched from £18 to £19 5s. each; and the stock was sold at £182 per £100. Some £10 "B" and "C" shares (7 per cent., but last dividend £6 13s. per cent.) in the same Company fetched £12 10s. in the former case, and £12 10s. to £12 12s. 6d. in the latter. By order of executors, a few fully-paid £5 ordinary shares in the Redhill Gas Company, carrying 10 per cent. dividend as from Jan. 1 last, fetched £10 2s. 6d. each; and £100 of ordinary "B" stock (carrying 5 per cent.) was purchased for £102 10s. At the Castle Hotel, Windsor, next day, Messrs. Buckland and Sons offered a number of shares in the Windsor Gas Company. Eight original shares of £20 fetched £44 5s. apiece; seventeen preference shares of £8 realized £10 10s. each; three new £20 shares, £32 5s. each; and eleven similar shares, on which £8 had been paid, were sold for £11 15s. each. At a recent sale at Ramsgate, £3500 of new ordinary "D" stock of the Broadstairs Gas Company was offered in £20 lots, which fetched, on an average, £26 15s. each. Some 4 per cent. perpetual debenture stock of the Company was sold at par.

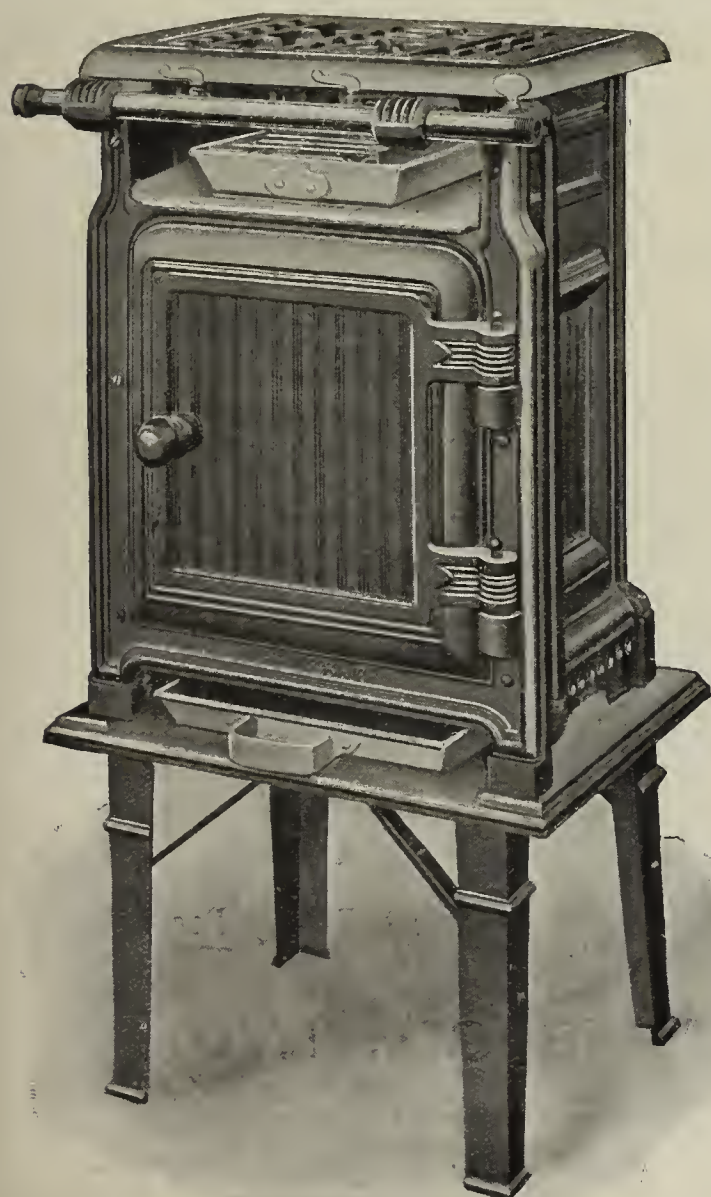
Inspection of London Water-Works by Japanese Delegates.—An important party of the delegates from Japan were received by the Chairman of the Metropolitan Water Board (Mr. E. B. Barnard) and the Clerk (Mr. A. B. Pilling) at the offices of the Board last Tuesday morning, and were subsequently conducted by the Chairman and Engineer on a visit of inspection to some of the works of the Board—including the large pumping-stations and filter-beds at Lea Bridge, the storage reservoirs at Walthamstow, the new reservoir at Chingford (approaching completion), the Hampton and Kempton Park works, the reservoirs at Walton, and the engine-house there recently opened by the President of the Local Government Board.

Boston Gas Company.—The net profits of the Boston Gas Company for the past year were £5866, which enabled the Directors at the annual meeting to recommend the payment of full parliamentary dividends, and to reduce the price of gas 3d. per 1000 cubic feet.

New Joint-Stock Companies.—The Counties Gas Company, Limited, has been registered, with a capital of £40,000 in £10 shares, to take over the works of the Mid-Oxfordshire Gaslight and Coke Company, Limited, and the business of the Bucks and Oxon District Gas and Coke Company, Limited, and to adopt an agreement made with Mr. W. A. Schultz. The first Directors include Messrs. W. C. Parkinson and W. A. Schultz. The Company is a private one; and the registered office is at No. 50, Cannon Street, E.C.—The Switch-On Gas Lighting Syndicate, Limited, has been registered with a capital of £1100, in 1000 ordinary £1 shares, and 2000 deferred shares of 1s. each.—The Aberlady and Gullane Gas Company was registered in Edinburgh last week, with a capital of £6000, in shares of £5 each.

Allowance of Electricity to London County Council Caretakers.—About eighteen months ago, the London County Council decided that as from Jan. 1, 1910, and until further order, caretakers of secondary schools and training colleges living in quarters provided by the Council should be allowed 40,000 cubic feet of gas annually, and that they should be required to pay for any gas consumed in excess of this quantity. The Education Committee of the Council consider it is desirable that a similar limit should be fixed in cases in which the quarters are lighted by electricity. The average price of gas is 2s. 6d. per 1000 cubic feet, and of electricity $3\frac{1}{2}$ d. per unit. An annual allowance of 350 units, which the Committee regard as approximately equivalent to 40,000 cubic feet of gas, would, they think, be reasonable. Where gas is used as well as electricity, the combined cost should not exceed £5 annually. They brought up a recommendation to this effect at the meeting of the Council last Tuesday; and it was adopted.

Gisborne (N.Z.) Gas Company, Limited.—In the report presented by the Directors of this Company at the last annual meeting, it was stated that the sale of gas in the twelve months ended the 31st of March showed an increase of nearly $2\frac{1}{2}$ million cubic feet, or about $8\frac{1}{2}$ per cent., compared with the preceding year; and that the price had been reduced equal to 6 per cent. The revenue from the sale of gas, residuals, &c., was £12,769; and the total receipts were £16,071. The balance on the profit and loss account was £5820. On Sept. 30 last, an interim dividend amounting to £1842 was paid; and the Directors recommended the payment of a further dividend of 1s. 6d. per share on all shares issued to the date named, and of 9d. per share on those dating from Jan. 1, 1911, amounting to £1845, the placing of £2000 to the general reserve, and the carrying forward of £1975. The Chairman (Mr. J. T. Evans), in moving the adoption of the report, said the Company were in possession of works of which the shareholders might be justly proud; and their management did not need comment, as it spoke for itself. The report was adopted; and a vote of thanks was accorded to the Engineer and Manager (Mr. Henry Hoare) and the staff for their services during the year.



WITHIN THE RADIUS

of most Gas Undertakings there is usually a large number of flats and small dwellings.

The ordinary Gas Cooker may be too large for these, and the circumstances demand the use of small Cookers such as "MAIN'S"

KENT

or

SUSSEX

which are just large enough to meet ordinary purposes and just small enough to fit into a corner or recess.

These Cookers embody all the features which make the "MAIN" Lines pre-eminent for efficiency and economy.

R. & A. MAIN, LTD.,

WORKS:

Gothic Works, EDMONTON, N.; and Gothic Iron-Works, FALKIRK.

SHOW-ROOMS:

25, Princes St., Oxford Circus, W.; 136, Renfield St., GLASGOW;
56, Broad St., BIRMINGHAM; 83, Old Market St., BRISTOL;
13, Whitworth St. West, MANCHESTER; 333, Queen St., MELBOURNE;
and 12, Cunningham Lane, Pitt Street, SYDNEY.

Bankruptcy of a Gas-Stove Manufacturer.—The public examination took place at Warwick last Friday, before Mr. Registrar Campbell, of Mr. Charles Edwin Ryder Terry, of Leamington. The main facts of the case were recorded in the "JOURNAL" for the 4th inst. (p. 50). The debtor—who does not admit his insolvency—was questioned at length; and the matter was adjourned until the 2nd prox.

The Recent Explosion at Stalybridge.—At a meeting of the Stalybridge Gas Committee, it was resolved that the offer of the Insurance Company to pay the sum of £557 in settlement of the claim for damage caused by the recent explosion at the gas-works be accepted. It was also resolved that the tender of Messrs. W. C. Holmes and Co., of Huddersfield, for a new Livesey washer and a new rotary naphthalene washer be accepted.

Mr. Justice Warrington, sitting in the King's Bench Division of the High Court of Justice, had before him last Wednesday the case of *Morgan v. Water-Works, Lighting, &c., Corporation, Limited*, and others. When the case was called, Mr. Montagu Shearman, K.C., who appeared for the plaintiff, said terms (which were not stated) had been arranged; but he asked his Lordship to let the matter stand over with regard to some of the defendants, who would be communicated with. His Lordship agreed.

We have received from Messrs. C. & W. Walker, Limited, of Donnington, their latest illustrated booklet on Milbourne's patent luteless purifiers and purifier valves, of which they are sole makers. The various types are preceded by an enumeration of the advantages claimed for these appliances, and a list of the gas-works in which they have been erected. Particulars are also furnished of Milbourne's cover fasteners, and rubber jointing, as well as of lifting apparatus. The illustrations are very effective; and the booklet altogether is an artistic production.

By the generosity of the Directors of the Littleborough Gas Company, the employees had their first excursion last Wednesday to Northwich, where they were met by Mr. S. S. Mellor, the Engineer and Manager of the Northwich Gas Company, and members of his staff, who accompanied the party throughout the day. They received a hearty welcome at Vale Royal Abbey, from Mr. and Mrs. Robert Dempster, by whom they were personally conducted over the house and through the extensive and beautiful grounds and gardens, conservatories, &c. The visit was one of much interest; and Mr. S. E. Halliwell, the Manager and Secretary of the Littleborough Gas Company, and Mr. G. P. Smith, the Cashier, expressed the sincere appreciation of the party of the generous hospitality and the kindly welcome extended to them. Later in the day, thanks were expressed to the Directors of the Company for granting facilities for arranging the excursion. Mr. Halliwell assured the men that the Directors hoped the innovation would further strengthen the good feeling and pleasant relationship existing among the employees.

At the meeting of the Council of the Royal Society of Arts on Monday last week, Lord Sanderson, G.C.B., who has been a member of the Society for upwards of thirty years, was elected Chairman.

It will doubtless interest our readers to learn, in connection with the investiture of the Prince of Wales at Carnarvon last Thursday, that the whole of the special cooking apparatus used in the preparation of the banquet was manufactured and supplied by the firm of Messrs. Fletcher, Russell, and Co., Limited, of Warrington. We may add that complete satisfaction was given by the cooking apparatus to both the caterers and the large number of guests on this historic occasion.

The many friends of Mr. W. B. Randall (Secretary, Engineer, and Manager of the Waltham Abbey and Cheshunt Gas and Coke Company) will be sorry to hear that he has sustained a sad loss by the death, on the 6th inst., of his wife, who had been in failing health for a considerable period. The interment took place in Cheshunt Cemetery on Monday of last week, amid tokens of the deepest sympathy and respect; those attending the funeral including numerous employees of the Gas Company.

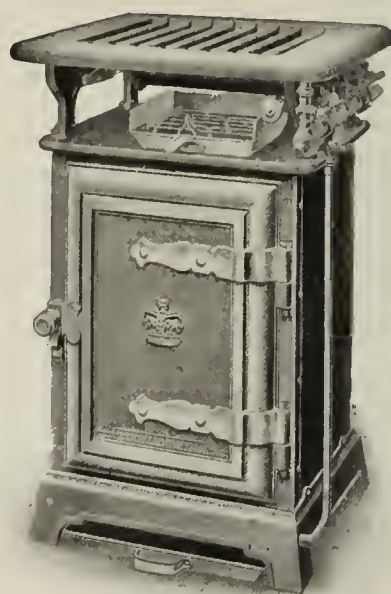
APPLICATIONS FOR LETTERS PATENT.

- 15,388.—UNRUH, M. VON, and WEIGEL, A., "Mantles." July 1.
- 15,393.—RESTLER, J. D. K., "Gas-producers." July 1.
- 15,396.—WILSON, C. E., "Fuel for gas-fires." July 3.
- 15,425.—OWEN, J., "Clearing jets of burners." July 3.
- 15,451.—LENTSCHAT, G., "Incandescent burners." July 3.
- 15,463.—KITSON, A., "Lighting and heating apparatus." July 3.
- 15,497.—HODKINSON, C., "Gas smoke shield." July 4.
- 15,520.—BURDON, J. W. M., & M. M., "Production of oil-gas." July 4.
- 15,532.—SCHULTZE, G. A., "Device for measuring the quantity and the current velocity of fluids and gases flowing through pipes." July 4.
- 15,553.—GAMMENTHALER, V. W., and SCHUEPBACH, C., "Igniting device." July 4.
- 15,580.—GOODMAN, J., Executor of W. J. JENKINS deceased, and W. J. JENKINS AND CO., LTD., "Apparatus for charging retorts." July 4.
- 15,605.—TERRY, G., "Smoke shades." July 5.
- 15,639.—LAMKIN, A. E., "Gas-heating appliances." July 5.
- 15,712.—MACKAY, J. F., and LEESON, G. W. T., "Gas-burners." July 6.
- 15,765.—CONTRERAS, G., "Gas-stove for baking." July 6.
- 15,795.—JACOBS, F., "Mantles and burners." July 7.
- 15,799.—MAGEE, F. W., and BAKER, T. W., "Gas-regulator." July 7.
- 15,837.—CLARKE, H., and CAMPBELL, J. A., "Fuel." July 7.
- 15,856.—DEMPSTER, R. & J., LTD., and BEARD, G. F. H., "Scrubber-washers." July 8.
- 15,861.—LISMEY, W. H., "Regenerator furnace." July 8.

Parkinson's Pointed Paragraphs.

SCRAP YOUR OLD COOKER.

**Parkinson's
Cookers
Never
Grow
Old.**



**See the
Point?**



Standardized Parts.

Perfect Fitting Renewals.

THE PARKINSON STOVE CO., LTD.

(Incorporating Maughan's Patent Geyser Co.),

BIRMINGHAM AND LONDON.

TAR PRODUCTS PRICES.

Representative manufacturers give the following as fair current values for the week ending July 15. Prices are net, and they include the usual packages and delivery f.o.b., f.a.s., or f.o.r., as customary.

Article.	Basis.	London.	North-East Coast.	st Coast, Yorks.	West Coast.		Glasgow.
					Liverpool.	Manchester.	
Tar, crude	per ton	—	20/- 23/-	23/6	19/- 22/-	19/- 22/-	—
Pitch	"	39/- 40/-	37/-	37/6	36/6	36/-	38/-
Benzol, 90%	per gallon	-/10½	-/9½	-/9	-/9½	-/9½	-/10
Benzol, 50-90%	"	—	-/9½	-/9½	-/8 -/8½	-/8½	—
Toluol, 90%	"	-/10½	-/9½	-/10	-/10	-/10	-/10
Crude naphtha, 30%	"	—	-/3½	-/4	-/3½	-/3½	—
Light oil, 50%	"	—	-/3½	-/3½ -/4	-/3½	-/3½	—
Solvent naphtha, 90-160	"	—	-/10	-/10	-/10	-/10½	-/11
Heavy naphtha, 90-190	"	—	-/11	-/11½	-/11½	-/11½	-/11
Creosote in bulk	"	-/2½ -/2½	-/2	-/2	-/2½ -/2½	-/2½ -/2½	-/1½
Heavy oils.	"	—	-/2½ -/2½	-/2½	-/2½	-/2½	-/2½
Carbolic Acid, 60's.	"	—	1/10	1/11	1/8½	1/8½	1/10½
Naphthalene, crude drained salts	per ton	—	43/9	41/3	47/6	47/6 50/-	—
" pressed	"	—	60/-	63/-	60/-	60/- 72/6	—
" whizzed.	"	—	—	—	70/- 72/6	60/- 75/-	60/-
Anthracene	per unit	-/2	-/1½	-/1½	-/1½	-/1½	—

WANTED, FOR SALE, CONTRACTS, &c., ADVERTISEMENTS IN THIS WEEK'S "JOURNAL."

Appointments Vacant.

GAS MANAGER. Slough Gas Company. Applications by July 21.
METER REPAIRER. Derby Gas Company.
GAS-FITTER. Shotley Bridge Gas-Works.
STOKER. Ynysybairn Urban District Council. Applications by Aug. 1.

Appointments Wanted.

CLERK. No. 5420.
MANAGER. No. 5425.

Plant, &c. (Second-Hand), For Sale.

CONDENSER. Sutton Gas Company.
METERS. No. 5424.

Plant, &c. (Second-Hand), Wanted.

CAST-IRON TANK. Bishop's Stortford Gas-Works.

Meetings.

BRENTFORD GAS COMPANY. St. Ermin's Hotel. Aug. 2. Twelve o'clock.
SOUTH METROPOLITAN GAS COMPANY. De Keyser's Hotel. Aug. 9. Two o'clock.

Stocks and Shares.

HORNCASTLE WATER COMPANY (Mortgage Debentures).

TENDERS FOR

Coal.

DEVON GAS ASSOCIATION. Tenders by July 22.
HAWORTH URBAN DISTRICT COUNCIL. Tenders by July 24.
LYMM URBAN DISTRICT COUNCIL. Tenders by July 20.
MOSSLEY GAS DEPARTMENT. Tenders by July 21.
SHEFFIELD UNITED GASLIGHT COMPANY. Tenders by Aug. 1.

Condensers.

GUILDFORD GAS COMPANY. Tenders by July 28.

General Stores.

SALFORD GAS DEPARTMENT.

Pipes, &c., and Pipe-Laying.

CHAPEL, WHALEY AND DISTRICT GAS COMPANY. Tenders by July 7.
DOCKING RURAL DISTRICT COUNCIL. Tenders by July 25.
NEW HUNSTANTON URBAN DISTRICT COUNCIL. Tenders by July 25.

Steelwork for Coal Store.

GUILDFORD GAS COMPANY. Tenders by July 28.

Tar and Liquor.

LYMM URBAN DISTRICT COUNCIL. Tenders by July 20.

Telpher and Coal Grab.

GUILDFORD GAS COMPANY. Tenders by July 28.

Water Tower and Tank, &c.

DOCKING RURAL DISTRICT COUNCIL. Tenders by July 25.

GAS COMPANIES' STOCK AND SHARE LIST.

Referred to on p. 158.

Issue.	Share.	When ex- Dividend.	Dividend or Dividend & Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Invest- ment.	Issue.	Share.	When ex- Dividend.	Dividend or Dividend & Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Invest- ment.
£			p.c.				£ s. d.	£			p.c.				£ s. d.
1,551,868	Stk.	Apl. 12	5	Alliance & Dublin Ord.	82-85	..	5 17 8	4,940,000	Stk.	May 12	9	Imperial Continental .	183½-185½	..	4 17 0
374,000	Stk.	July 14	4	Do. 4 p.c. Deb.	93-95*	..	4 4 3	1,235,000	Stk.	Feb. 10	3½	Do. 3½ p.c. Deb. Red.	92-94	..	3 14 6
200,000	5	May 12	7	Bombay, Ltd.	64-6½	..	5 3 8	200,242	Stk.	Mar. 10	6	Lea Bridge Ord. 5 p.c..	120-122	..	4 18 4
40,000	5	"	7	Do. New, £4 paid.	54-5½	..	4 17 5	561,000	Stk.	Feb. 24	10	Liverpool United A. .	215-217	..	4 12 2
50,000	10	Feb. 24	15	Bourne-) 10 p.c. . .	28½-29½	..	5 1 8	718,100	"	"	7	Do. B. .	163-165	..	4 4 10
311,810	10	"	7	mouth Gas } B 7 p.c. .	16½-16½	..	4 3 0	"	June 30	4	Do. Deb. Stk.	102-104	..	3 16 11	
75,000	10	"	6	and Water } Pref. 6 p.c.	14½-15	..	1 0 0	5	June 15	6	Malta & Mediterranean	42-4½	..	6 3 1	
380,000	Stk.	"	12½	Brentford Consolidated	257-262	..	4 15 5	560,000	100	Apl. 1	5	Met. of } 5 p.c. Deb.	100-102	..	4 18 0
330,000	"	"	9½	Do. New	200-210	-½	4 10 6	250,000	100	"	4½	Melbourne } 4½ p.c. Deb.	100-102	..	4 8 3
50,000	"	"	5	Do. 5 p.c. Pref. .	122-124	..	4 0 8	541,920	20	May 31	3½	Monte Video, Ltd. . .	12½-13½	..	5 5 8
206,250	"	June 15	4	Do. 4 p.c. Deb. .	97-99	..	4 0 10	1,775,892	Stk.	Feb. 24	4½	Newcastle & Gt. Sheld. Con.	103½-104½	..	4 3 9
220,000	Stk.	Mar. 10	11	Brighton & Hove Orig.	217-220	..	5 0 0	529,705	Stk.	June 30	3½	Do. 3½ p.c. Deb.	87-89	..	3 18 8
246,320	"	"	8	Do. A Ord. Stk. .	157-160	..	5 0 0	55,940	10	Mar. 10	7	North Middlesex 7 p.c.	15-16	..	4 7 6
490,000	20	Apl. 12	11½	British	44½-45½	+½	5 3 5	300,000	Stk.	Apl. 27	8	Oriental, Ltd. . . .	137-139	..	5 15 1
120,000	Stk.	June 30	4	Do. 4 p.c. Deb. Stk.	94-96	..	4 3 4	60,000	5	Apl. 12	8	Ottoman, Ltd. . . .	6½-7½	..	5 10 4
109,000	"	Feb. 10	6	Bromley, A 5 p.c. .	116-118	..	5 1 8	31,800	53	Feb. 24	13	Portsea Island A . .	135-140	..	4 18 4
165,700	"	"	4½	Do. B 3½ p.c. . .	87-89	..	5 1 2	60,000	50	"	13	Do. B	—	..	—
82,278	"	"	5½	Do. C 5 p.c. . . .	106-108	..	5 1 10	100,000	50	"	12	Do. C	120-125	..	4 16 0
55,000	"	June 30	3½	Do. 3½ p.c. Deb. .	82-84	..	4 3 4	114,800	50	"	10	Do. D and E. . . .	—	..	—
250,000	Stk.	"	4	Buenos Ayres 4 p.c. Deb.	95-97	..	4 2 6	398,490	5	May 31	8	Primitiva Ord. . . .	7½-7½	..	5 3 3
100,000	10	"	—	Cape Town & Dis., Ltd.	2-3	..	—	796,980	5	June 30	5	Do. 5 p.c. Pref. . .	5½-5½	..	4 10 11
100,000	10	"	—	Do. 4½ p.c. Pref. .	4-5	..	—	488,900	100	June 1	4	Do. 4 p.c. Deb. . .	97-99	..	4 0 10
50,000	50	Nov. 2	6	Do. 6 p.c. 1st Mort.	—	..	—	312,650	Stk.	June 30	4	River Plate 4 p.c. Deb.	95-97	..	4 2 6
100,000	Stk.	June 30	4½	Do. 4½ p.c. Deb. Stk.	80-83	-5½	5 8 5	250,000	10	Mar. 24	9	San Paulo, Ltd. . . .	21½-22½	..	4 0 0
157,150	Stk.	Feb. 24	5	Chester 5 p.c. Ord. .	109-111	..	4 10 1	115,000	10	"	6	Do. 6 p.c. Pref. . .	12-12½	..	4 16 0
1,513,280	Stk.	"	5/9/4	Commercial 4 p.c. Stk.	114-116	..	4 14 3	125,000	50	July 1	5	Do. 5 p.c. Deb. . .	49-50	..	5 0 0
560,000	"	"	5½	Do. 3½ p.c. do. . .	103-110	..	4 16 11	135,000	Stk.	Mar. 24	10	Sheffield A	236-238	+1	4 4 0
475,000	"	June 15	3	Do. 3 p.c. Deb. Stk.	75½-77½	..	3 17 5	209,984	"	"	10	Do. B	236-238	+1	4 4 0
800,000	Stk.	May 31	4	Continental Union, Ltd.	92-95	..	4 4 3	523,500	"	"	10	Do. C	236-238	+2	4 4 0
200,000	"	"	7	Do. 7 p.c. Pref. .	135-137	..	5 2 2	70,000	10	June 15	7	South African . . .	8½-9½	..	7 7 4
492,270	Stk.	"	5½	Derby Con. Stk. . .	122-124	..	4 8 9	6,429,895	Stk.	Feb. 10	5/9/4	South Met., 4 p.c. Ord.	119-121	..	4 10 3
55,000	"	"	4	Do. Deb. Stk. . . .	104-105	..	3 16 2	1,895,445	"	July 14	3	Do. 3 p.c. Deb. . .	78½-80½	..	3 14 6
148,995	"	Apl. 12	5	East Hull 5 p.c. Ord. .	—	..	—	209,829	Stk.	Mar. 10	8	South Shields Con. Stk.	154-156	..	5 2 7
840,150	10	Jan. 27	10	European, Ltd. . . .	19-20	..	5 0 0	605,000	Stk.	Feb. 24	5½	S'th Suburb'n Ord. 5 p.c.	119-121	..	4 13 6
16,179,445	Stk.	Feb. 24	4½	Gas-) 4 p.c. Ord. . .	106½-107½	..	4 6 9	60,000	"	"	5	Do. 5 p.c. Pref. . .	118-120	..	4 3 4
2,600,000	"	"	3½	light) 3½ p.c. max. .	85-87	..	4 0 6	117,058	"	July 14	5	Do. 5 p.c. Deb. Stk.	121-123*	..	4 1 4
4,062,235	"	"	4	and) 4 p.c. Con. Pref.	103-105	..	3 16 2	502,310	Stk.	May 12	5	Southampton Ord. .	109-111	..	4 6 11
4,531,705	"	June 15	3	Coke) 3 p.c. Con. Deb.	78½-80½	..	3 14 6	120,000	Stk.	Feb. 10	7	Tottenham, A 5 p.c. .	147-150	..	4 13 4
258,740	Stk.	Mar. 10	5	Hastings & St. L. 3½ p.c.	95-97	..	5 3 1	483,940	"	"	5½	and) B 3½ p.c. . .	116½-118½	..	4 12 10
82,500	"	"	6½	Do. do. 5 p.c. . .	—	..	—	149,470	"	June 15	4	Edmonton } 4 p.c. Deb.	96-98	..	4 1 8
70,000	10	Apl. 27	11	Hongkong & China, Ltd.	17½-18	+¼	6 2 2	182,380	10	June 15	8	Tuscan, Ltd.	8½-9½	..	8 13 0
131,000	Stk.	Mar. 10	7½	Ilford A and C . . .	147-150	..	4 18 4	149,900	10	July 1	5	Do. 5 p.c. Deb. Red.	96-98	..	5 2 0
65,780	"	"	5½	Do. B	119-122	+1	4 16 3	236,476	Stk.	Feb. 24	5	Tynemouth, 5 p.c. max.	115-117	..	4 5 6
65,500	"	June 30	4	Do. 4 p.c. Deb. . . .	94-96	..	4 3 4	255,636	Stk.	Feb. 24	6½	Wands-) B 3½ p.c. .	141-143	..	4 14 5
								85,766	"	June 30	3	worth } 3 p.c. Deb. Stk.	71-73	..	4 2 2

Prices marked * are "Ex. div."

NOTICES TO CORRESPONDENTS, ADVERTISERS, AND SUBSCRIBERS.

No notice can be taken of anonymous communications. Whatever is intended for insertion in the "JOURNAL" must be authenticated by the name and address of the writer; not necessarily for publication, but as a proof of good faith.

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O'NEILL'S OXIDE

For GAS PURIFICATION.

LARGEST SALE OF ANY OXIDE.

SPENT OXIDE PURCHASED IN ANY DISTRICT.

GAS PURIFICATION & CHEMICAL CO., LD.,
PALMERSTON HOUSE,
OLD BROAD STREET, LONDON, E.C.

WINKELMANN'S

"VOLCANIC" FIRE CEMENT.

Resists 4500° Fahr. Best for GAS-WORKS.

ANDREW STEPHENSON, 182, Palmerston House, Old Broad Street, LONDON, E.C. "Volcanism, London."

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THOMAS HORROCKS & SONS, LTD.,

Albert Chemical Works, BRADFORD,
MANCHESTER.

Pitch, Creosote, Brick and Fuel Oils, Benzol, Solvent Naphtha, Carbolic, Sulphate of Ammonia.

SULPHURIC ACID.

SPECIALLY prepared for Sulphate of AMMONIA Makers by**CHANCE AND HUNT, LIMITED,**

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Telegrams: "CHEMICALS, OLDBURY."

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GAS LIGHTING ENGINEERS AND CONTRACTORS,

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Telephone:

"DACLIGHT LONDON."

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SPENCER'S PATENT HURDLE GRIDS.**THE very best Patent Grids for Holding**

Oxide Lightly.

See Illustrated Advertisement, June 20, p. 801.

HYDRATED OXIDE OF IRON.

PREPARED from Pure Iron.

Twice as rich as Bog Ore.

Gives no back Pressure.

The Cheapest in the Market.

READ HOLLIDAY AND SONS, LTD., HUDDERSFIELD.

ENQUIRIES SOLICITED.

FOR Gas-Works Plant of Every Description; also SULPHATE OF AMMONIA and SULPHUR RECOVERY PLANTS,

C. & W. WALKER, LIMITED,

DONNINGTON, NEWPORT, SALOP.

JOHN RILEY & SONS, Chemical Manufacturers, Hapton, near Accrington, are MAKERS of Special SULPHURIC ACID, for Sulphate of Ammonia Making. Highest percentage of Sulphate of Ammonia obtained from the use of this Vitriol, which has now been used for upwards of 50 years. References given to Gas Companies.

J. & J. BRADDOCK (Branch of Meters Limited), Globe Meter Works, OLDHAM, and 45 & 47, Westminster Bridge Road, LONDON, S.E.
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REPAIRS RECEIVE PROMPT ATTENTION.

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SPENT OXIDE PURCHASED IN ANY DISTRICT.

THE First Dutch Bogore Co., Ltd.,

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Consumers in any form are invited to correspond with CHANCE AND HUNT, LTD., Chemical Manufacturers, OLDBURY, WORCS.

GAS-WORKS requiring Extensions should Communicate with FIRTH BLAKELEY, SONS, AND CO., LIMITED, Dewsbury, who make a Speciality of Catering for the Smaller Gas Concerns. Prices Reasonable; quality and results, the best. Satisfaction Guaranteed.

GAS PLANT for Sale—We can always offer NEW and SECOND-HAND GAS APPARATUS, including Retorts and Fittings, Condensers, Exhausters, Scrubbers, Washers, Purifiers, Gas-holders, Tanks, Valves, Connections, &c. Also a few COMPLETE WORKS. Compare Prices and Particulars before ordering elsewhere.

FIRTH BLAKELEY, SONS, AND COMPANY, LIMITED, Church Fenton, near LEEDS.

GAS OILS.

MEADE-KING, ROBINSON, & CO.,

Represent the Strongest Independent Refineries in America; also Petroleum Spirit for Gas Enrichment. 18, EXCHANGE STREET, MANCHESTER, and TOWER BUILDING, 22, WATER STREET, LIVERPOOL.

"GUIDE to Patents, Trade Marks and DESIGNS," 1910. 4th Edition. Contains concise information on British, Colonial, and Foreign Patents, &c. All Inventors and those interested should send for free copy to J. S. WITHERS & SPOONER, Chartered Patent Agents, 323, High Holborn, LONDON. 'Phone. 480 HOLBORN. Telegrams: "Improvably, London."

AMMONIACAL Liquor wanted.

BROTHERTON AND CO., LTD., Ammonia Distillers. Works: BIRMINGHAM, GLASGOW, LEEDS, LIVERPOOL, SUNDERLAND, AND WAKEFIELD.

J. E. C. LORD, Ship Canal Tar-Works, Waste, Manchester. Pitch, Creosote, Benzols, Toluol, Naphtha, Pyridine, all kinds of Cresylic Acid, Carbolic Acid, Sulphate of Ammonia, &c.

AMMONIACAL Liquor wanted.

CHANCE AND HUNT, LTD., Chemical Manufacturers, OLDBURY, WORCS.
Telegrams: "CHEMICALS."

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PUBLICATIONS, "MERCHANDISE MARKS ACT, and Decisions thereunder," 1s.; "TRADE SECRETS v. PATENTS," 6d.; "DOCTRINE OF EQUIVALENTS, Mechanical and Chemical," 6d.

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MEWBURN, ELLIS, & PRYOR, Chartered Patent Agents, 70 & 72, Chancery Lane, London, W.C. Telegrams: "Patent London." Telephone: No. 243 Holborn.

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SULPHURIC ACID.

SPECIALLY prepared for the Manufacture of SULPHATE OF AMMONIA.

SPENCER CHAPMAN & MESSEL, LTD.,

with which is amalgamated WM. PEARCE & SONS, LTD., 36, Mark Lane, LONDON, E.C. Works: SILVERTOWN.

Telegrams: "HYDROCHLORIC, LONDON."

Telephone: 341 AVENUE.

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Results Guaranteed. No Working Costs.

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suitable for making Sulphate of Ammonia.

BROTHERTON AND CO., LTD., Chemical Manufacturers. Works: BIRMINGHAM, LEEDS, SUNDERLAND, and WAKEFIELD.

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BROTHERTON AND CO., LTD., Tar Distillers.

Works: BIRMINGHAM, GLASGOW, LEEDS, LIVERPOOL, SUNDERLAND, AND WAKEFIELD.

"GAZINE" (Registered in England and Abroad). A radical Solvent and Preventative of Naphthalene Deposits, and for the Automatic Cleaning of Mains and Services.

It is also used for the enrichment of Gas.

Manufactured and supplied by C. BOURNE, West Moor Chemical Works, KILLINGWORTH, or through his Agent, F. J. NICOL, Pilgrim House, NEWCASTLE-ON-TYNE.

Telegrams: "DORIO," Newcastle-on-Tyne. National Telephone No. 2497.

SULPHURIC ACID—Specially prepared for Sulphate of AMMONIA and BENZOL

Recovery Plants. JOHN NICHOLSON & SONS, LTD., Hunslet Chemical Works, LEEDS. Tele.: "NICHOLSON, LEEDS." Telephone: (Two lines), Nos. 2420 and 2421.

WANTED—Tar and Ammoniacal

Liquor. Any Quantity.

GRINDLEY AND COMPANY, LIMITED, Rawcliffe, near Goole, YORKSHIRE.

SULPHATE OF AMMONIA

SATURATORS and all LEAD and TIMBER WORK in Connection with Sulphate Plants.

We guarantee promptness with efficiency for Repairs.

JOSEPH TAYLOR AND CO., CENTRAL PLUMBING WORKS, BOLTON.

Telegrams: "SATURATORS, BOLTON." Telephone 0848.

FOR Instructions on Polishing and

Cleaning Gas-Cookers and Gas-Fittings, read Canning Handbook on Polishing, Electro-Plating, and Lacquering. Fully illustrated. Price 2s. 3d., post free; abroad, 2s. 6d.

W. CANNING AND CO., BIRMINGHAM, and 18 to 20, St. John's Square, Clerkenwell, LONDON, E.C.

CITY AND GUILDS EXAMINATIONS.

STUDENTS who are disappointed at their results at the recent Examinations should avail themselves of Mr. CRANFIELD'S CORRESPONDENCE CLASSES. Courses and results better than ever. Courses are starting now and in September.

11, AVONDALE PLACE, HALIFAX.

CLERK AND COLLECTOR BEXHILL WATER AND GAS COMPANY.

APPLICANTS for the above position are THANKED. The APPOINTMENT HAS BEEN MADE.

ROBERT DEMPSTER & SONS, Ltd.,
Contractors for Complete CARBONIZING
PLANTS and every description of GAS APPARATUS,
ELEVATING, CONVEYING, and TELPHERAGE
PLANTS, also STOKING MACHINERY, ROSE MOUNT
IRON-WORKS, ELLANN.

CLERK, with several years' experi-
ence in large Gas Company, desires CHANGE.
Expert Shorthand-Typist. Sound knowledge of Ac-
countancy and Book-keeping. Experience in Drafting
Reports, &c. Capable correspondent. Age 26. Highest
Credentials.
Address, No. 5420, care of Mr. King, 11, Bolt Court,
FLEET STREET, E.C.

ADVERTISER is open to Engagement
as MANAGER, having held present Position for
17 Years, the last Nine with Inclined Retorts, Re-
generators, &c.
Address, No. 5425, care of Mr. King, 11, Bolt Court,
FLEET STREET, E.C.

SLOUGH GAS AND COKE COMPANY.

APPLICATIONS are invited for the
position of GAS MANAGER. The Salary to com-
mence will be 50s. per Week. House, with Garden,
Rates, Coal, and Gas free. Make per Annum, 60 Million
Cubic Feet and increasing.
The Works are new, with Inclined Retorts, practical
Experience of which is desirable.
Applications, accompanied by recent Testimonials
(Three sufficient), stating Age and Experience, to be
sent to the undersigned on or before Friday, the 21st
inst.

Canvassing will disqualify.

ARTHUR THOMAS,
Secretary.

46A High Street, Slough.
July 13, 1911.

**YNYSCYNHAIARN URBAN DISTRICT
COUNCIL.**

GAS STOKER REQUIRED.

WANTED, a Good, Reliable Stoker
and SHOVEL CHARGER for a 10-Million
Works. One used to Regenerator Settings, Gas Engine,
and Exhauster. To commence duties on Aug. 21, 1911.
Wages 28s. a Week of Seven Days. Must take Night
Duties in turn and Assist in Yard Generally.

Applications, in candidates' own Handwriting, en-
dorsed "Gas Stoker," stating Age and experience, &c.,
and accompanied by not more than Two recent Testi-
monials to be sent to me not later than Aug. 1, 1911.

JNO. JONES,
Clerk.

Town Hall, Portmadoc,
July 11, 1911.

WANTED, a Gas-Fitter, accustomed
to Main and Service Laying.
Apply, stating Age, Experience, and Wages required,
to the SECRETARY, Gas Office, SHOTLEY BRIDGE.

WANTED, a Thoroughly Competent
METER REPAIRER, one used to Ordinary
Dry and Prepayment Meters.
Apply, stating Age, Experience, and Wages required,
to the MANAGER, Derby Gaslight and Coke Company,
Friar Gate, DERBY.

CAST Iron Tank of 5000 Gallons capa-
city required.
Full Particulars and Price Delivered Bishop's Stort-
ford to the MANAGER, Gas-Works, BISHOP'S STORTFORD.

FOR SALE—A One Million Cubic Feet
per diem WATER COOLED CONDENSER,
Marshall's Patent, by Kirkham, Hulett, and Chandler,
18-inch Inlet, Outlet, and Bye-Pass Valves and Con-
nections Complete.
Offers to the SECRETARY, Sutton Gas Company, Sutton,
SURREY.

FOR SALE—One set of Four 20 ft.
PURIFIERS, Lifting Apparatus, Valves and
Connections. Also Four 14 ft. square PURIFIERS
complete. Also two 10 ft. square Boxes. All can be
seen fixed London.
FIRTH BLAKELEY, SONS, AND COMPANY, LIMITED,
Church Fenton, LEENS.

FOR SALE—One "Kirkham's"
SCRUBBER WASHER, 10-inch Vertical Pipe
CONDENSER, 12-inch Vertical Pipe CONDENSER.
ENGINE and Three Blade "Donkin's" EXHAUSTERS
to pass 15,000, 20,000, and 30,000 feet per hour.
FIRTH BLAKELEY, SONS, AND COMPANY, LIMITED,
Church Fenton, near LEENS.

FOR SALE—Weighbridge, First-Class
10 Ton, by Pooleys, with Table 14 ft. by 8 ft. put
on Rails in London for £30. Ninety-six 12 in. by 9 ft.
Socket and Spigot PIPES, and Fifty 12 ft. lengths,
£3 5s. per Ton on Rails London.
FIRTH BLAKELEY, SONS, AND COMPANY, LIMITED,
Church Fenton, LEEDS.

FOR SALE—Sixty Clay Retorts 24 by
14, Moberley & Perry. Ninety-five 20 by 14,
Hickmans, New, 1s. 6d. per foot on Rails.
IRONWORK for Three Beds of Six Retorts, Regenera-
tor, 7-inch ASCENSION PIPES, all Modern Design,
with Floor Plates, Steel Joist Bracing, with 10-inch
Foul Main, sold at half cost, new Three Years ago, by
best makers. Retorts 22 by 16. Single Bed sold if
required.
FIRTH BLAKELEY, SONS, AND COMPANY, LIMITED,
Church Fenton, LEEDS.

WHAT offers for One 50-Light and
Three 100-Light Dry Tin-Cased GAS-METERS?
Thoroughly overhauled, and equal to new.
Address No. 5424, care of Mr. King, 11, Bolt Court,
FLEET STREET, E.C.

COUNTY BOROUGH OF SALFORD.
(GAS DEPARTMENT.)

TENDERS are invited for the Supply
of GENERAL STORES.
Full Particulars may be obtained from Mr. WILLIAM
W. WOONWARN, Engineer, Gas Offices, Bloom Street,
SALFORD.

**GUILDFORD GASLIGHT AND COKE
COMPANY.**
COAL STORE AND CONDENSERS.

THE Directors of the above Company
invite TENDERS for the following:—

- Supply and Erection of Steel Framework for
the proposed New COAL STORE.
- Supply and Erection of a Travelling TELPHER
and COAL GRAB.
- Supply and Erection of a Set of WATER TUBE
CONDENSERS capable of Dealing with One
Million Cubic Feet of Gas per Day.

Blue Prints of the Coal Store (a) (for which a deposit
of Half-a-Guinea will be required and which will not be
returned), and Specifications and further Particulars of
(a), (b) and (c) can be obtained upon Application to
Mr. P. C. Cleasby, Gas Offices, Guildford.

Tenders, sealed and endorsed "Coal Store," "Telpher,"
or "Condensers," addressed to the Chairman of this
Company, to be delivered at these Offices not later than
noon on Friday, the 28th of July, 1911.

The Directors do not bind themselves to accept the
lowest or any Tender.

By order,
WM. TITLEY, F.C.I.S.,
Secretary.

Gas Offices, Onslow Street,
Guildford, July 11, 1911.

**CHAPEL, WHALEY, AND DISTRICT GAS
COMPANY.**

THE Directors of the above Company
invite TENDERS for the Laying of about 9000
Yards of MAINS and a large number of SERVICES.
Specification, with Schedule of Quantities, may be
obtained from the Engineer.

The Contractor whose Tender is accepted will be
required to sign the Form of Contract prepared by the
Company's Solicitors, a copy of which may be seen at
the Office of the Engineer.

Sealed Tenders, endorsed "Tender for Mainlaying,"
with the Schedule of Quantities properly filled up, to
be sent to the undersigned on or before Aug. 7, 1911.

The Directors reserve the right to Divide the work
into two or more Contracts, and do not bind themselves
to accept the lowest or any Tender.

THOMAS BROWN,
Engineer.

Fern Bank, Matlock,
July 15, 1911.

THE Devon Gas Association, Limited,
are prepared to receive TENDERS for about 1100
Tons of Best Screened or Unscreened GAS COAL,
delivered f.o.r. truck loads at either Chudleigh, Moreton-
hampstead, North Tawton, or South Brent Stations, as
required during the Year ending the 31st of July, 1912.
Sealed Tenders, endorsed "Tender for Coal," to be
addressed to the Chairman, and received not later than
Saturday, July 22, 1911.

GEO. LANE,
Secretary.

Haven Road, Exeter,
July 3, 1911.

BOROUGH OF MOSSLEY.

THE Gas Committee invite Tenders
for the Supply of 12,000 Tons of Screened GAS
COAL.

Specification and Form of Tender may be had upon
Application to the undersigned.

Tenders, endorsed "Gas Coal," to be addressed to
the Chairman of the Gas Committee, Gas-Works,
Mossley, and Delivered not later than the first post
Friday morning, the 21st inst.

JAMES TAYLOR,
Engineer and Manager.

Gas-Works, Mossley,
July 4, 1911.

THE Haworth Urban District Council
are prepared to receive TENDERS for the Supply
of 3000 Tons of GAS COAL (Screened, Unscreened, and
Gas Nuts) delivered at the Haworth Station during the
ensuing Twelve Months.

Sealed Tenders, endorsed "Gas Coal Tender," to be
forwarded to me the undersigned, not later than the
24th inst.

No Special Form of Tender.

WILLIAM ROBERTSHAW,
Clerk to the Council.

United Counties Bank Chambers,
North Street, Keighley.

TENDERS FOR COAL.

THE Directors of the Sheffield United
Gaslight Company invite TENDERS for about
250,000 Tons of GAS NUTS and SLACK for delivery
during the Eleven Months ending June 30, 1912.

Tenders (Forms of which can be had on Application)
must be addressed to Mr. Hanbury Thomas, Managing
Director, and delivered not later than the first post on
Tuesday, the 1st day of August next.

The Directors reserve the right to take the whole or
any portion of the quantity offered, and do not bind
themselves to accept the lowest or any Tender.

WM. HAMBY,
Secretary.

Commercial Street, Sheffield.
July 13, 1911.

URBAN DISTRICT COUNCIL OF LYMM.

THE above Council are prepared to
receive TENDERS for the Supply of CANNEL
and Best Screened GAS COAL, to be delivered at their
Gas-Works in Lymm, for a term of Twelve Months
from the 1st day of September, 1911.

The probable quantities required will be about 200
Tons of Cannel and about 2000 Tons of Gas Coal, which
must be freshly Wrought, well Screened, and free from
Sulphurous Pyrites and other objectionable matter;
but the Council reserve the right of increasing or de-
creasing the quantities named.

The Person whose Tender is accepted will be re-
quired to enter into an Agreement with the Council for
the due performance of his Contract.

Sealed Tenders, stating Price per Ton delivered by
Boat alongside the Works, to be sent to the undersigned
on or before the 20th of July, 1911, and endorsed "Coal
Tender."

The Council do not bind themselves to accept the
lowest or any Tender.

Forms of Tender are not Supplied.

Further Particulars may be had on Application to
the Gas Manager, Mr. W. L. Donaldson.

W. MULLARD,
Clerk.

Council Offices, Lymm,
Cheshire, July 1, 1911.

TAR AND AMMONIACAL LIQUOR.

THE Lymm Urban District Council are
prepared to receive TENDERS for the Purchase
of the Surplus TAR and AMMONIACAL LIQUOR
made at their Gas-Works for a term of One Year from
the 1st day of September, 1911 (or for such longer term
as may be contracted for with the consent of the
Council).

Tar and Liquor will be delivered free into contractor's
Boat on the Bridgewater Canal.

Tenders to be sent to the undersigned on or before
the 20th day of July, 1911, endorsed "Tar."

The Purchaser will be required to enter into an Agree-
ment with the Council for the due performance of his
Contract.

The Council do not bind themselves to accept the
highest or any Tender.

Forms of Tender are not Supplied.

Further Particulars may be had on Application to the
Gas Manager, Mr. W. L. Donaldson.

W. MULLARD,
Clerk.

Council Offices, Lymm, Cheshire,
July 1, 1911.

**NEW HUNSTANTON URBAN DISTRICT
COUNCIL.**

THE New Hunstanton Urban District
Council invite TENDERS for the Supply of
MATERIALS and the CONSTRUCTION of WATER-
WORKS in the Parish of Hunstanton as follows:

CONTRACT No. 9, for the Supply of CAST-IRON
MAINS.

CONTRACT No. 10, for the laying of MAIN PIPES.
Drawings and Specifications can be seen, and Forms
of Tender and Quantities obtained, on and after Wed-
nesday, the 12th inst., at the Offices of the undersigned,
or of the Engineer, Mr. E. H. Stevenson, 38, Parliament
Street, Westminster, on payment of Half-a-Guinea for
each Form of Tender, which amount will be returned
on receipt of a *bona-fide* Tender with the Schedule of
Quantities properly filled up.

Sealed Tenders, properly endorsed, to be sent to the
undersigned on or before Tuesday the 25th inst.

The Council do not bind themselves to accept the
lowest or any Tender.

(Signed) J. S. B. GLASIER,
Clerk to the New Hunstanton
Urban District Council.

**DOCKING (NORFOLK) RURAL DISTRICT
COUNCIL.**

THE Docking Rural District Council
invite TENDERS for the Supply of MATERIALS
and the CONSTRUCTION of WATER-WORKS in
the Parish of Heacham as follows:

CONTRACT No. 1, for the Supply of CAST-IRON
MAIN PIPES.

CONTRACT No. 2, for the Erection of a WATER
TOWER and TANK and the LAYING of
MAIN PIPES and APPENDAGES.

Drawings and Specifications can be seen, and Form
of Tender and Quantities obtained, on and after Wed-
nesday, the 12th inst., at the Offices of the Clerk to the
Parish Council, Heacham, or at the Offices of the
Engineer, Mr. E. H. Stevenson, 38, Parliament Street,
Westminster, on payment of Half-a-Guinea for each
Form of Tender, which amount will be returned on re-
ceipt of a *bona-fide* Tender, with the Schedule of Quan-
tities properly filled up.

Sealed Tenders, properly endorsed, to be sent to the
undersigned on or before Tuesday, the 25th inst.

The Council do not bind themselves to accept the
lowest or any Tender.

(Signed) J. A. STOUGHTON,
Clerk to the Docking
Rural District Council.

**SALES BY AUCTION OF GAS AND WATER
STOCKS AND SHARES.**

MESSRS. A. & W. RICHARDS beg to
notify that their SALES BY AUCTION of NEW
CAPITAL ISSUED UNDER PARLIAMENTARY
POWERS, and of STOCKS and SHARES belonging to
EXECUTORS and other PRIVATE OWNERS in LON-
DON, SUBURBAN, and PROVINCIAL GAS and
WATER COMPANIES, take place PERIODICALLY
at the Mart, TOKENHOUSE YARD, E.C.

Terms for Issuing New Capital, and also for including
other Gas and Water Stocks and Shares in these Periodi-
cal Sales, will be forwarded on Application to Messrs.
A. & W. RICHARDS, at 18, FINSBURY CIRCUIS, E.C.

HORNCastle WATER COMPANY.

APPLICATIONS are invited for Mort-
GAGE DEBENTURES in the above Company
bearing Interest at 4 per cent. Full Particulars may
be obtained from the Secretaries, CLITHEROW AND SON,
7, Lindsey Court, HORNCastle.

SOUTH METROPOLITAN GAS COMPANY.
NOTICE is Hereby Given, that the ORDINARY HALF-YEARLY GENERAL MEETING of the Proprietors of this Company will be held at De Keyser's Royal Hotel, Victoria Embankment, in the City of London, on Wednesday, the 9th day of August next, at Two o'clock in the Afternoon precisely, to receive the Directors' Report and the Accounts of the Company for the Half Year ended the 30th of June last; and to declare a Dividend for the same period.

The TRANSFER BOOKS WILL BE CLOSED from the 26th day of July inst. until after the Meeting.

By order,
 F. M'LEOD,
 Secretary.

Offices: 709, Old Kent Road, S.E.
 July 15, 1911.

BRENTFORD GAS COMPANY.

NOTICE is Hereby Given, that a Half-YEARLY ORDINARY GENERAL MEETING of the Proprietors will be held at St. Ermin's Hotel, Caxton Street, Westminster, on Wednesday, the 2nd of August next, at Twelve o'clock (noon), to Transact the usual Business, including the declaration of a Dividend for the half year ending the 30th of June last.

The Dividends to be declared will be paid to the holders of Preference and Ordinary Stocks registered as Stockholders on the 8th of July, when the TRANSFER BOOKS of the Company were CLOSED.

By order,
 WILLIAM MANN,
 Secretary.

Office, Brentford,
 July 17, 1911.

EUROPEAN GAS COMPANY, LIMITED.

SHARE WARRANTS TO BEARER.

NOTICE is Hereby Given that, in accordance with a Resolution passed at the Annual General Meeting of Shareholders held on the 11th inst., a DIVIDEND of 12s. 6d. per Share will be Payable on and after the 1st prox., on the above Shares, subject, however, to a deduction of 1s. 1d. per share for French Stamp and Transfer Duty.

Payment will be made at the Union of London and Smiths Bank, Limited, 2, Princes Street, London, E.C., after Serial Coupon No. 73 has been left Three Clear Days for Examination.

W. B. BRADY,
 Secretary.

Finsbury House, Blomfield Street,
 London, E.C., July 12, 1911.

Price 1s. net.

THE SALE OF GAS APPARATUS

BY
 J. PATER WIATT.

Author of "Chemistry in Physics," "Internal Combustion Engines," &c., &c.

London: WALTER KING, 11, Bolt Court, Fleet St., E.C.

TROTTER, HAINES, & CORBETT, BRETTELL'S ESTATE, LIMITED,

FIRE-CLAY & BRICK WORKS, STOURBRIDGE.

Manufacturers of GAS RETORTS, GLASSHOUSE FURNACE & BLAST-FURNACE BRICKS, LUMPS, TILES, and every description of FIRE-BRICKS.

Special Lumps, Tiles, and Bricks for Regenerative and Furnace Work.

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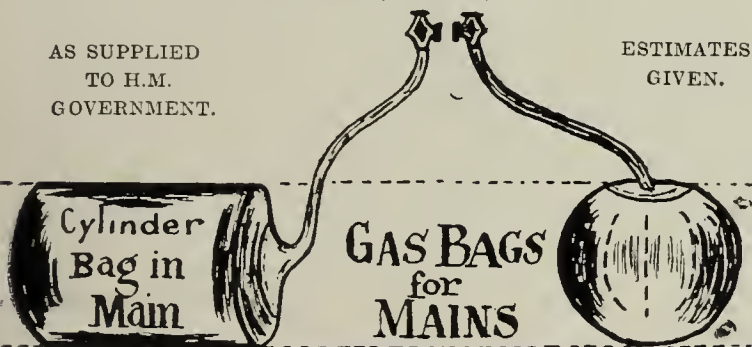
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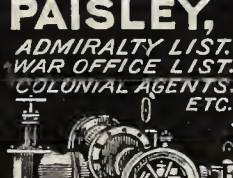
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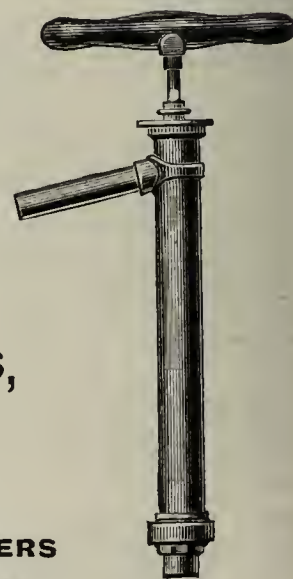
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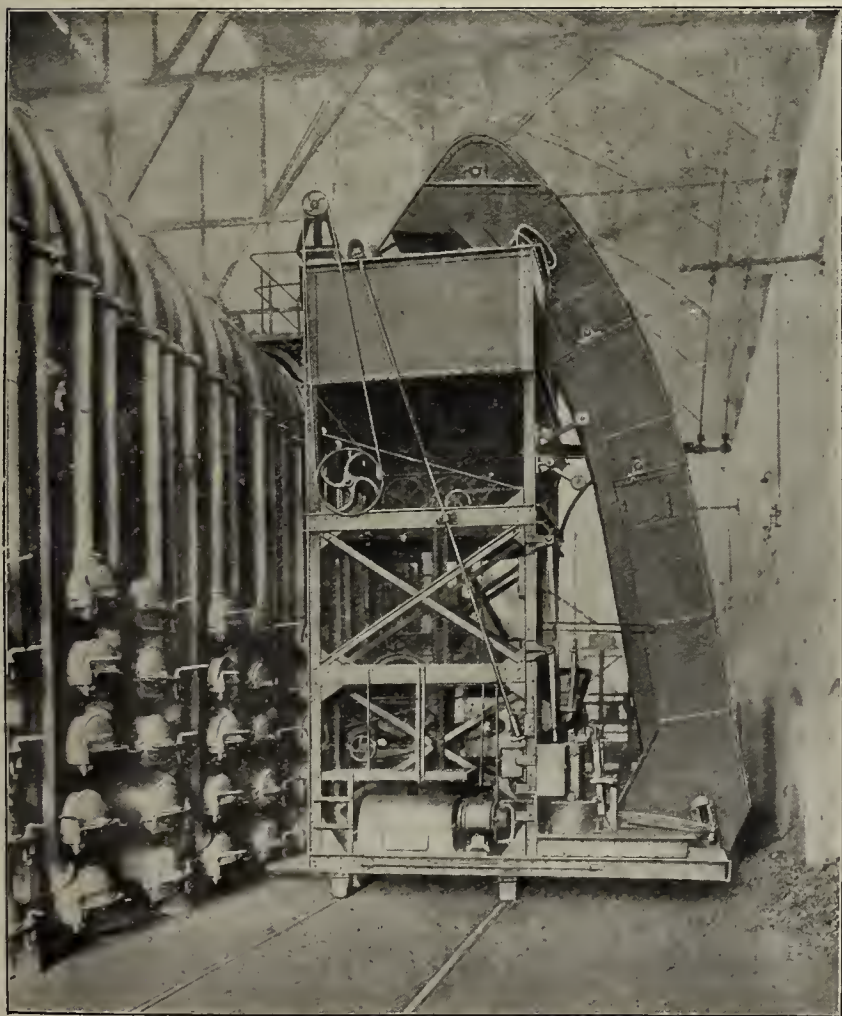
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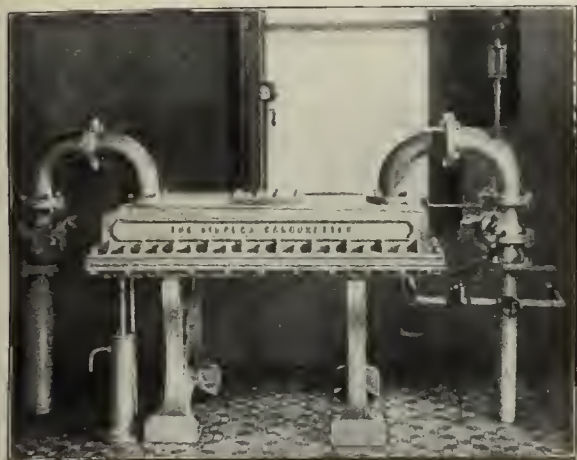
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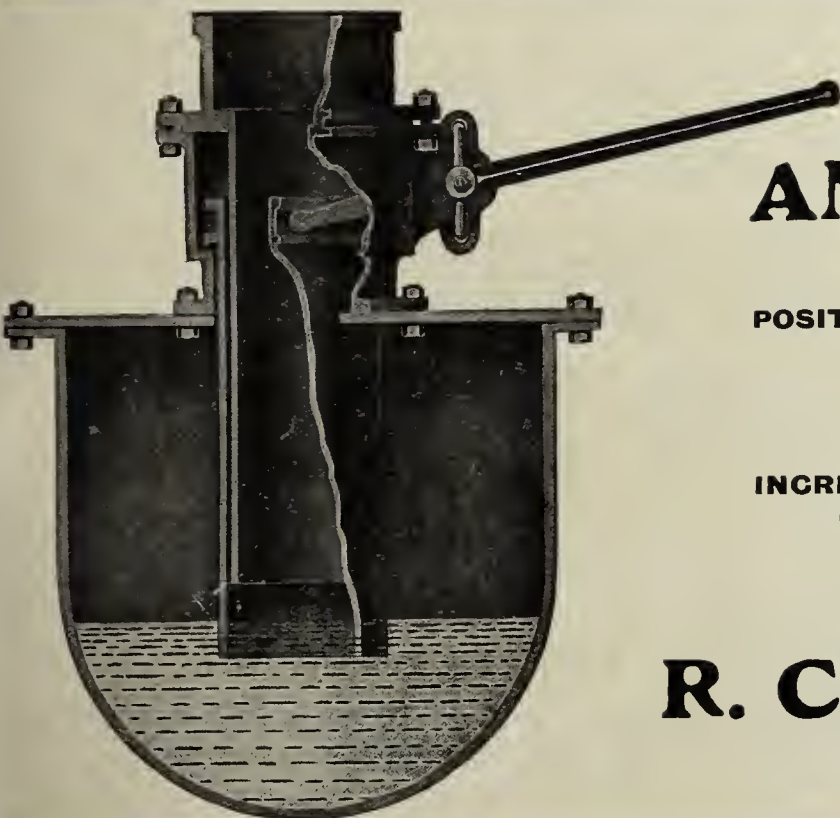
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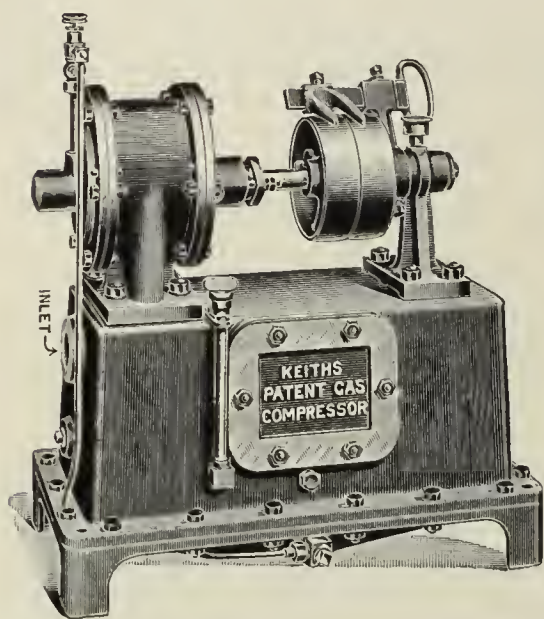
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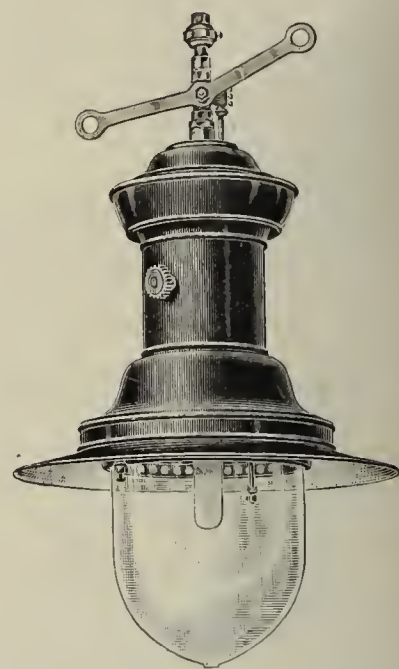
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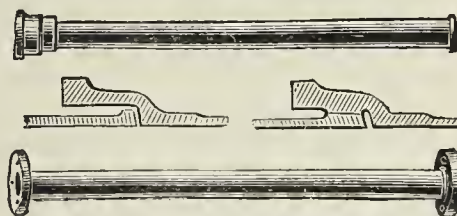
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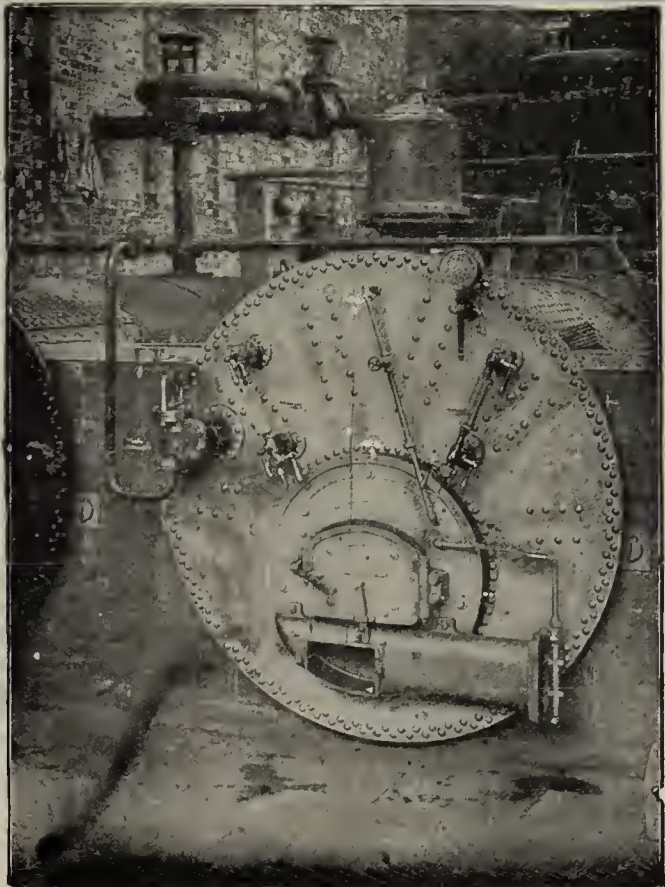
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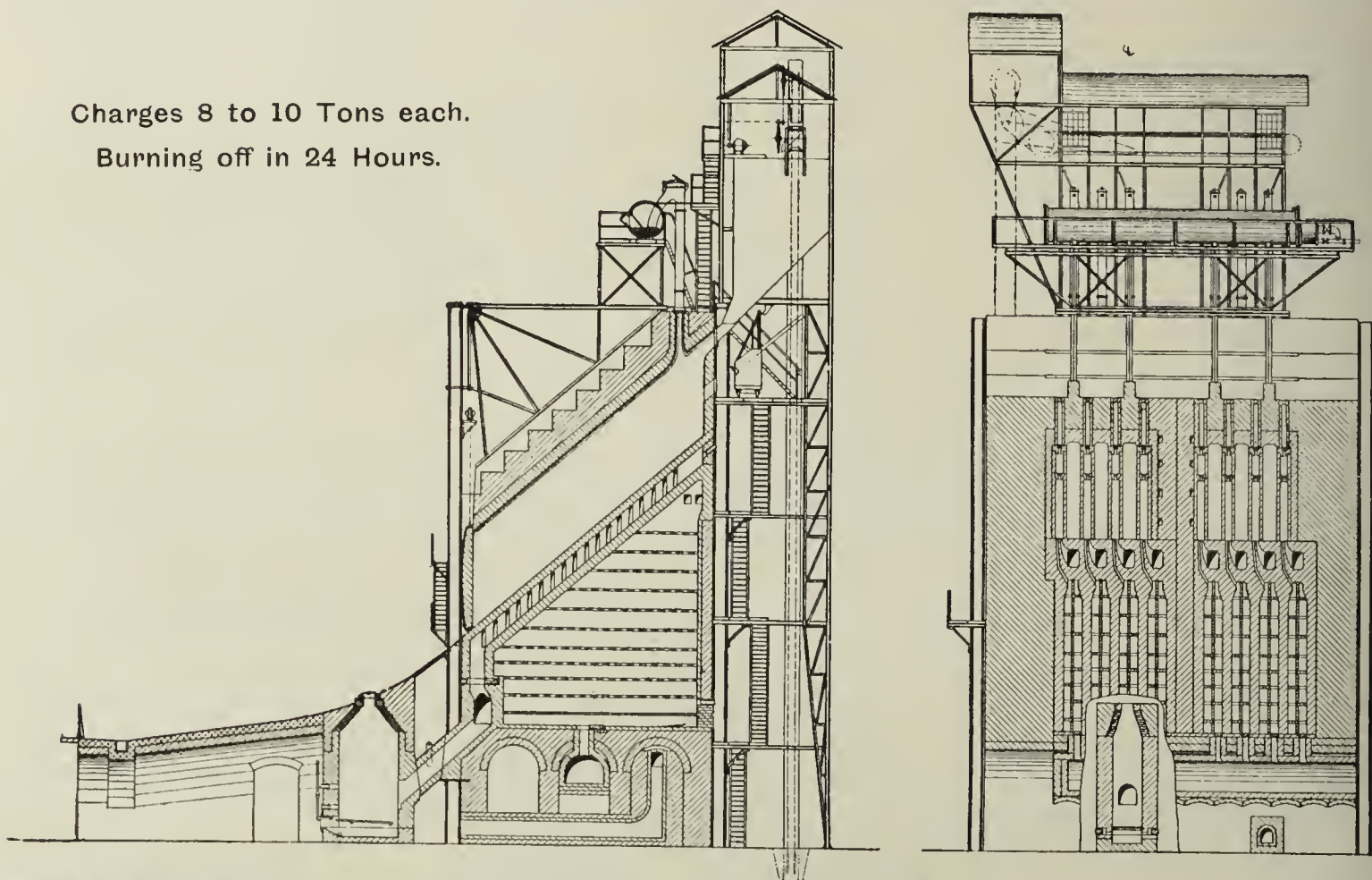
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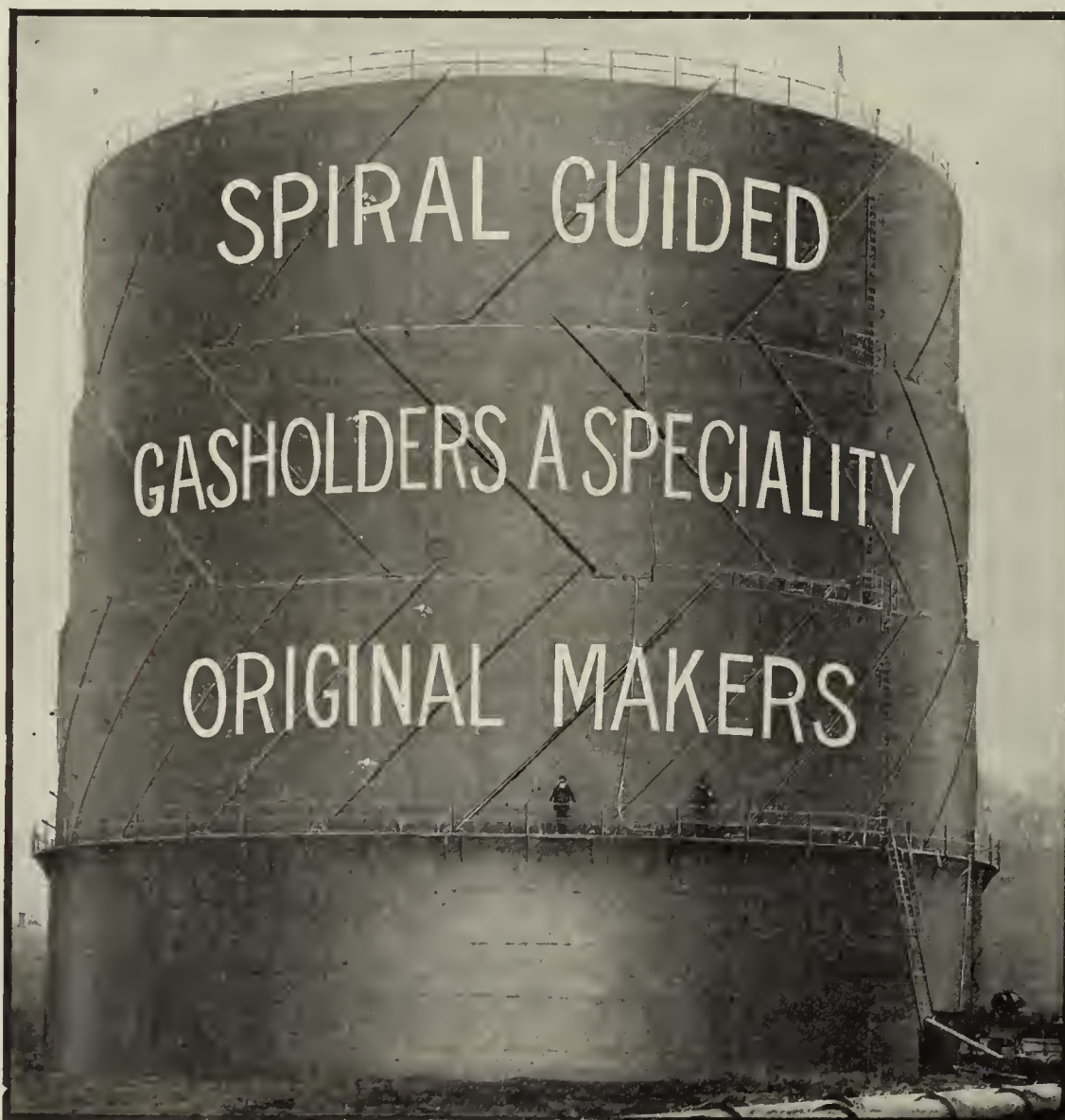
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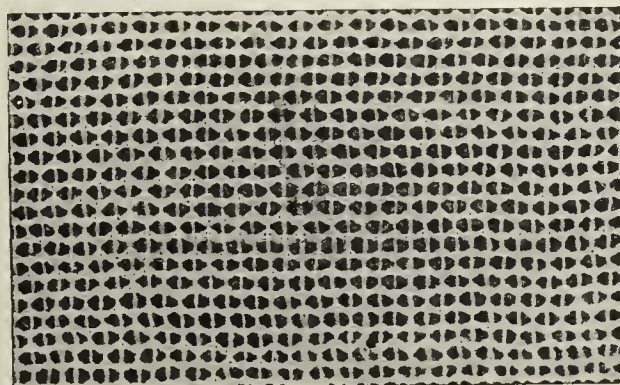
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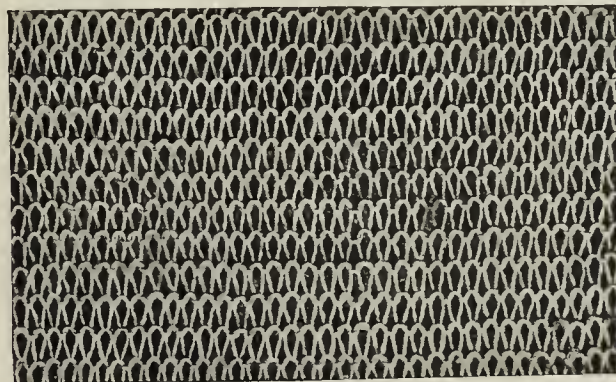
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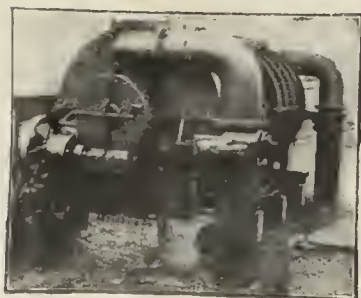
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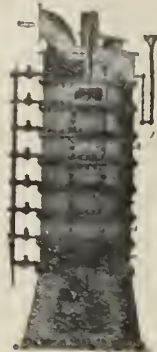


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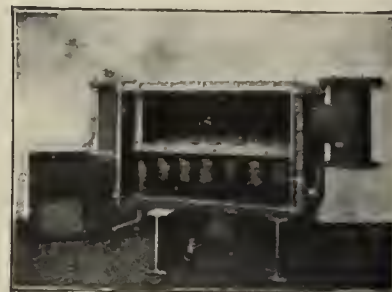
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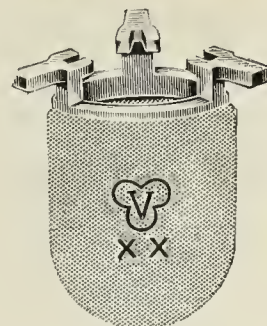
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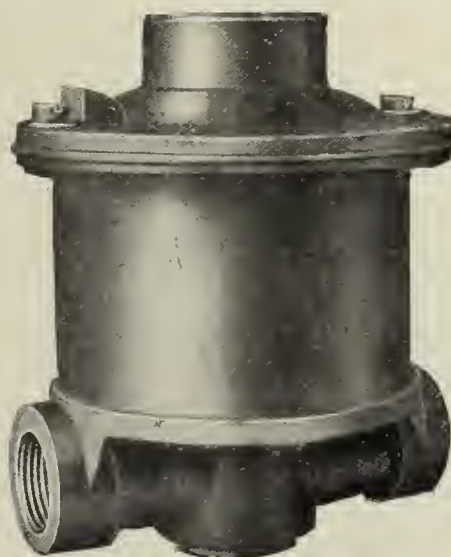
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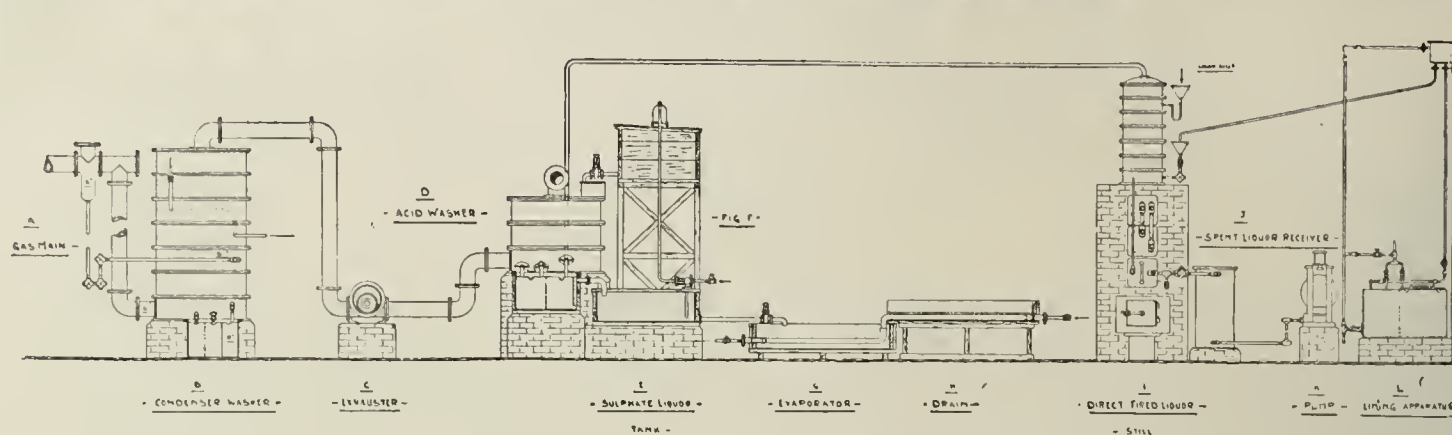
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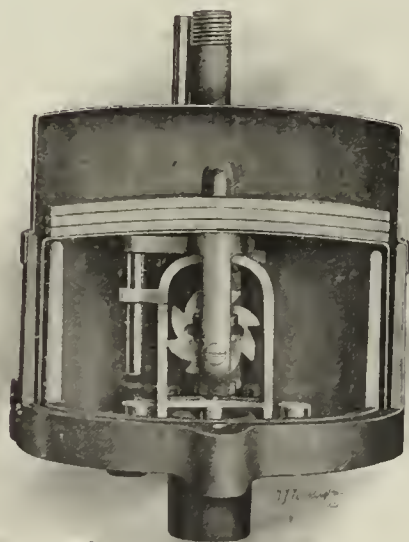
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VOL. CXV., No. 2515.—TUESDAY, JULY 25, 1911.

EDITORIAL NOTES—GAS, &c.

Value of Experimental Works.

ENVIOUS eyes must be turned on the broad opportunity for investigation afforded by the experimental gas-works and laboratory of the German Association at Carlsruhe (which are under the direction of Dr. Karl Bunte). Until a centre of the kind is started, and sets out to fulfil its purpose, one cannot properly gauge the extent or character of the work that can be undertaken there. Carlsruhe is now the home of constantly developing activity. One piece of work suggests others; and initial investigation in a fresh branch leads to further expansion. The indication of the contents of the reports on the work, as published in our columns last week, forces this upon one's notice.

The examination of typical coals used in German gas-works is being continued at Carlsruhe. When the results are published (they include those of British as well as of German coals), the work should be a valuable one as an authoritative statement regarding producing qualities at this particular period, inasmuch as there is no very reliable record in existence to-day as to the merits of large varieties of coal raised from pits long since established and continually worked. Useful suggestions are found in the directions printed last week for sampling coal, coke, tar, and purifying material for examination. To get really reliable comparative results, consistency in sampling is of primary importance. Researches are going to be conducted into the applications of gas; and the road has been prepared for these by a number of fundamental and preliminary investigations, so that the actual work when inaugurated may proceed without interruptions from inefficient appliance and miscalculated method. There is scarcely any, if any, material (as a class, though not of all qualities), used or produced on gas-works that has not already been examined; and that the work is well up to date is attested by the fact that the recent discovery that tar and tar oils, of the vertical retort and carburetted water-gas variety, can be used in internal combustion engines has been promptly taken up for investigation. Domestic gas appliances are also periodically examined to see that they are being kept up to high-water-mark in conforming with practical requirements; and now a set of rules is being compiled for the gas-cooker manufacturers, for guidance in testing their productions. This adumbrates merely one side of the work at the Carlsruhe experimental station; the value of all this activity in training men to serve the gas industry is another side.

Of course, the existence of such a centre has its advantages and its disadvantages. But the former must outweigh the latter. Much work is carried out, and systematically, that was never undertaken before when left solely to private enterprise and opportunity. Much work is prosecuted that could not be conducted except at a place equipped and staffed as are these works and laboratory at Carlsruhe. Here, however, tests of materials are carried out for gas undertakings for stated fees; and that is where the works and laboratory trespass on the province of the professional gas chemist. Other than for those works that have their own laboratories and chemical staff, Carlsruhe bids fair to obtain a monopoly of the work that some of the men who are turned out there may be looking forward to in the future as the source of employment and income. This is one objection we see, and the objection is intensified by the view we hold, that in an industry of the character of gas manufacture and supply, it is not a good thing to restrict too tightly in any direction the number of cultured brains attracted to, and profitably employed by, it. It would be a pity for this work to become a matter of competition in respect of fees as between the private practitioner and Carlsruhe. On the other hand, there is the question of the superiority of facility and equipment at the

latter centre for the prosecution of examinations of materials of all kinds. Nevertheless we cannot but feel an amount of sympathy for those who hold that the work so carried on to an extent trespasses on their domain, and to their personal detriment. It is, however, a question as to the balance of advantage to the gas industry as a whole; but the difficulty to which we have here called attention is not altogether a pleasant one.

Municipal Gas Finance and Parliament.

THE unpretentious and uninformative heading—"Milford Haven Gas Order"—to a short report of proceedings before the Committee on Unopposed Bills that appeared in our "Parliamentary" columns last week may have been sufficient to cause many of our readers, and among them readers interested in municipal gas undertakings, to pass unnoticed what looks like a further revision on the part of the parliamentary authorities of their procedure in connection with the finances of municipal gas undertakings. If this is to be a new rule, we hope that the parliamentary authorities will ensure, in order to effect consistency of procedure, that it applies to all (not only gas) municipal trading concerns. We need scarcely remind readers how, in the Potteries Federation Scheme, in the last Glasgow Corporation Act, in the last Act of the Oldham Corporation referring to the gas and water undertakings, and in one or two measures that have been obtained under the Scottish Legislation Act, as well as in a Salford Corporation Bill (which was withdrawn), Parliament insisted either upon a complete abolition of the system of profit appropriation in aid of the rates, or a curtailment to a reasonable and definite percentage in place of the old *ad libitum* transference that formerly obtained. Now the Chairman of Ways and Means (Mr. Alfred Emmott) tells us that there is yet another manner in which it is intended in future to compel municipal gas undertakings to periodically come up for review by Parliament.

Personally, we do not believe in any undue statutory harnessing of commercial enterprise; but we do believe in the statutory control of all undertakings being on lines of equality. It cannot be said that the control of Parliament over municipal gas undertakings is on an equality with that over company-directed concerns. A company is, as a rule, bound, under present conditions of capital powers and business development, to come to Parliament at least once in ten or twelve years for fresh financial authorization; and the tendency of this must be to keep companies—again, we are speaking generally—under the modern developments or modifications of legislation. But the capital powers conferred on municipal gas undertakings, and the comparatively easy process by which they have hitherto been allowed to extend their borrowings, is partially the reason for the very long intervals between their appearances in Parliament. The Committee have—apparently only just now—discovered this partial reason; but, without general legislation, any step taken to effect a remedy can only be efficacious in the case of those local bodies who happen, from sheer necessity, to be compelled to come to Parliament. There are several municipal gas undertakings whose powers have sufficed to keep them away from Parliament for — we were about to write, "ages," by charging all the extensions (as well as the replacements) to revenue. When we have regard to the price of gas that to-day exists in the districts of some of those concerns, we do not know that any substantial objection can be laid against the past policy of the management of the particular concerns in mind, though, in the case of others, it has paved the way to pandering to the socialistic (and not perhaps all socialistic) clamour for more profits to feed the municipal treasury from other sources than the legitimate rates. If profit appropriation is stopped, it would at once end any great objection to the utilization of surpluses in strengthening the position of a concern by curtailing additions to capital, as the effect would be the

improvement of the efficiency of service and supply, at the lowest possible price.

However, this ability to keep from Parliament, has representation in a good deal of antiquated legislation applying to municipal gas undertakings. And yet without some special means of compelling municipal authorities owning such concerns to come to Parliament to have their position and controlling enactments reviewed, they have the power to keep themselves aloof from the only authority that can exercise any thorough supervision over them. The definite fixing of capital powers can only result in periodically bringing to Parliament those concerns upon which such condition is fixed, and which find it necessary to ask for an enlargement of powers. Hitherto, when a municipal gas concern has applied for capital powers, a sum has generally been named, with the provision attached that further sums may be borrowed with the sanction of the Local Government Board. This, in effect, gives the municipal gas undertaking unlimited borrowing powers; and, in consequence of this, there may be no necessity for such a concern to approach Parliament again till (say) new powers for manufacturing purposes are required.

Here we have the weakness that the proceedings on this little Milford Haven Gas Order have disclosed to the parliamentary authorities, and which they have, it seems, determined to end by fixing capital powers in the case of municipal authorities, and not give them unlimited authorization. The Local Government Board plead for such concerns that the local inquiry enables the Board to keep the undertakings under supervision. The local inquiry, by no twist of the imagination, can be said to be the equivalent of the proceedings before a Parliamentary Committee, nor to compass the powers of the latter. The Board have not the authority to review and, if necessary, amend statutory powers. All they can do is to see that loans are properly expended, sanction, or decline to sanction, new loans, and occasionally administer rebuke if they find over-spending or any other capital malpractice. There is a vast difference between this and what a Parliamentary Committee can do. The Committee over whom the Chairman of Ways and Means so ably presides recognize this. The Committee were inexorable on this occasion to the pleadings of the Board. The representatives of the Board entreated them to let this Order go through, and then for the parliamentary authorities to deal with the whole question next session. The Committee refused, and straightway fixed the capital at £12,000—based upon an expenditure at the rate of £4000 to £5000 per five years. The Chairman observed—and in the double-barrelled remark lies the essence of the matter—that “the Committee do not desire to do anything which will compel a local authority to come to Parliament every three or four years; neither do they wish to encourage a system which enables a local authority to keep away from Parliament for a long period.” The spirit of this remark is carried out in the decision of the Committee.

The Principles and the Specification.

IN our columns this week, a student of the subject of street illumination essays to extract from the recent publication by the “*Illuminating Engineer*” of replies to questions distributed among recognized followers of the science of illumination some conclusions to afford a little light and leading in considering the question of a street-lighting specification. But he has not been very successful, though the examination he makes is useful, in that it helps to sift the practically valueless considerations from those that may be valuable, and which latter are the ones to be pursued in any attempt to arrive at a tentative or definite goal. The contribution also accentuates what the replies under examination indicated, that opinion and judgment are so scattered on the variable problems that constitute the subject, that on not a single one of the knotty points have opinion and judgment been reduced to two sides—comprising either a plain affirmative or a plain negative. It also emphasizes the necessity for great care being exercised in examining every point thoroughly before giving it endorsement, and a place in the constitution of the specification. If the “*Illuminating Engineer*” has done one good piece of service above others in ascertaining the views of experts, it has been in showing that this matter of a specification for street lighting is not one that can be forced hastily into any embodiment without considerable and patient investigation in regard to every point involved.

Indeed, it is very doubtful whether all the members forming the Committee now considering the question of a standard specification for street lighting could give a sound reason for voting on every one of the essential problems. This is just where danger in the present arises. With the premises rough and chaotic, there can be no certainty about the deductions. It is on this point that one may pause. There is no violent hurry for the specification. The world has got along very well without one so far; and the world will not go into ecstasies when it does get one. Therefore let the foundations be well prepared before the constructive work is proceeded with. Otherwise, the specification itself may be a poor thing; and otherwise, too (till there is a fair amount of external agreement and understanding of the fundamentals), there will be the greater difficulty in getting people to adopt the specification, however good it may be. The ground work is not at the present stage sufficiently far advanced; and this is the more manifest, the farther the problems are probed, and the light of fresh minds is brought to bear upon them. Besides which the sceptics as to the value of a street-lighting specification are wanting to know how any single specification can be fitted to conditions that are altogether incongruous and incomparable. The only advice we can tender to the latter is to “wait and see;” for we at all events cannot answer the question. It is a matter that must have consideration when we have exposed to view the character of the fruit of the work of the present Committee.

Energy—Gas Oil Tar and Tar as Engine Fuel.

THE British Association for the Advancement of Science will be meeting at Portsmouth in a few weeks from now; and the programme that has been published shows that there will be a plethora of matter to occupy those who will be attending. But unless the Committees on Gaseous Explosions and Internal Combustion Engines produce something, the proceedings, it seems clear, will not otherwise have a large yield of a nature especially attractive to our readers. “The Times” has published a forecast of the proceedings; and it is stated that the President (Sir William Ramsay) will sound as his leading note the increasing need of scientific training with a view to future, as well as to present-day, requirements. It passes strange that there should be any call for such a note to-day. But so it is; and Sir William’s voice we hope will do something to stir up greater thought, and press home the need in quarters from which scoffs are at present heard, which scoffs reveal deplorable shallowness of conception and contracted view. It is also predicted that the President will consider the subject of the available sources of energy in this country, and whether a reasonably economical use is being made of them. Having come to the conclusion that the present-day methods are wasteful, Sir William will advocate an immediate stock-taking of our possessions of potential energy as the first step towards their judicious conservation. This all has a fascinating ring about it for scientific and practical men who are in any way concerned in our stores of energy.

In the Engineering Section, we shall again come in contact with the question of energy. There is to be a discussion on the respective merits of superheated steam-engines, suction-gas plants, and Diesel engines, upon which subjects papers will be contributed by Captain H. R. Sankey, Mr. W. A. Tookey, and Mr. Charles Day. Will there not be anyone at the meeting from our own industry to say a word for town gas? This British Association meeting is left far too much to the competitors of town-gas in relation to power supply. It may be expected, however, that the exponent of the virtues of the Diesel engine will have something to say upon a topic that formed the subject of a paper before the recent meeting of the German Association [see *ante*, p. 106]—that is to say, the use of gas oil tar or coke oven or vertical retort tar in this particular type of engine. Ordinary gas tar does not appear to be so applicable; and the reason is not very far to seek. Vertical retort and coke-oven tar contains less naphthalene and free carbon than the tar from horizontal and inclined retorts. Therein is the secret. In regard to gas oil tar, a correspondent informs us that it is at the moment at a price above which it does not pay to use it in the Diesel engine. This same correspondent says he has studied the question of gas oil tar fairly well in Germany; and there is not the slightest difficulty in running with such bye-products, providing a mixture is formed containing from 5 to 10 per cent. of petroleum residue. That is a point on which more should be heard.

Labour's Interests.

WHAT with labour wars and rumours of labour wars, and all their disconcerting influences, combined with the prominent position occupied by projected labour legislation in Parliament, and in relation thereto the schism in the labour party and the revolt of a portion of the latter against the Government, we cannot possibly lose sight of the fact that labour is a force among us that is increasing in its might. It is a pity, however, that, while, rightly or wrongly, Parliament is seeking to place labour upon a curiously composite legislative foundation, certain sections of labour should be showing so extensively through the country how lightly they hold in respect even the common law of the land and the rights and property of other people. While such things are going on, labour cannot expect that the country will look with any great amount of sympathy upon the legislative schemes that are framed (again rightly or wrongly) with the view of modifying the more austere conditions of life. But to the onlooker a singular aspect of the present conditions is that the more we have of legislation specially directed to alleviating the troubles and conditions of labour, the more unrest and dissatisfaction appear in its ranks. The more legislation, too, the more evident is it that grievances and wants grow. The insatiety is only equalled by that of the arid desert in respect of water. While the Insurance Bill has been in full parliamentary swing, and under sharp debate, some of the advanced Socialists of the Labour Party have introduced a Bill to create a new Government Department with a Minister of Labour at its head. In his department, all matters affecting labour are to be concentrated—if the measure passes. Among the work to fall to the lot of the man who will occupy this unenviable office is to be that of better organizing the labour market, and to make provision for the prevention of unemployment. It is quite improbable that the Government will give support to this measure at the present time; but if they did, and if the occupant of this new ministerial office could prevent, or approximately prevent, unemployment, then away goes the standing argument for insurance against unemployment. There is a good deal of overlapping in legislative enactments (passed and on the table) in respect of labour; and before many sessions are over our heads, there will surely have to be co-ordination and consolidation. However that may be, one of the other proposals of the Bill before us is that there shall be established a general minimum wage for daily workers—30s. per week is mentioned. For the Minister of Labour, £5000 is proposed as the "minimum wage." If ever he is appointed, he will richly deserve it, as well as all the sympathy that the country can give him.

Itinerant Commercial Agents from Abroad.

GAS engineers and managers have their hands pretty full in these days; and they have to protect themselves against any undue trespass on their time, and personally do their share in preventing any abuse of business privileges by declining to tolerate a system of trading which is not, from our way of thinking, of an altogether legitimate order. Between the particular matter in mind and the last Patents Act, there is some connection. One of the purposes of the Act was to ensure, in return for the protection afforded by the country to a new invention, a satisfactory degree of manufacture and operation on British home territory; otherwise, unless there be some substantial reason to the contrary, the country claims the right to end the protection afforded. There has grown up in our midst a system that has obtained strong root, whereby cute and active agents come over from other countries, and without office or other established place of business in this country—by merely making their headquarters for a day or two at hotels in good centres—travel the country for orders for goods, which are sent direct to those who patronize them from the country in which they are produced; and upon these people there cannot be any very secure hold.

There are two objections to this method of doing business. These travellers from other countries endeavour to inflict their attentions upon busy men at all times; and being foreigners, and exemplary in courtliness so long as it serves their purpose, use fact and manner to force their way into the presence of officials of undertakings large and small—not only gas, but other concerns—so as to secure orders. We have heard of travellers from abroad who have for a long period now been soliciting orders for tool steel. We use this

as an example only. Their attentions at the present time are being directed to the officials of gas undertakings. Their method appears to be to get an interview with a gas engineer, to show sheafs of correspondence containing trial orders (some, we believe, rather remote in date), to flatter the object of their immediate attentions by references to the fame of his successful work, to urge an immediate order, and, if it is not forthcoming, there is a traceable modulation of tone, or, if an order is promisingly imminent, its immediate delivery to an hotel address is requested. If there is no fairly certain prospect of an order—this was so at all events in one case of which we are aware—there is an attempt to recover possession of the papers handed to the person interviewed. In one instance, a gas engineer noted the names of two or three *confreères* who had given sample orders; and, after his visitor left, he inquired of the professional friends as to the genuineness of them. All were correct, except that there was agreement, after making trial of the steel, that its boasted pre-eminence in quality was not justified, and that they could have obtained English-made steel of superior quality at a lower price. That was their opinion; and they stated it for what it was worth. No fraud is imputed. It is a case of business men obtaining the best price that they can for the goods they offer. The first objectionable aspect of the business is the trespass upon the time of busy men by this expansion of the personal interview system of cultivating trade by people whose commercial centres are situated beyond our own shores.

This brings us to the second objection. The system of which complaint is made is spreading. It is not confined to steel in the gas industry; and it is just as well to early do something to discountenance it. We believe in freedom in trade. At the same time, we encourage a sense of patriotism; and, in commercial transactions, there is nothing like having a home connection with those with whom business is done. If these people want to do business with British gas undertakings, let them come among us, and establish proper business centres here, as others have done before them, and have cut out for themselves, by sound commercial methods, a recognized position in our midst. Until these other people do the same thing, then, unless they can satisfy that they can supply something surpassing the merits of the same class of goods in this country at a price that adds to the lustre of the merits, then gas engineers should decline to have their time wasted by the travellers (who are here to-day and will have flitted to-morrow), and confine their patronage to firms with established business centres in this country. It is clearly the safest course to pursue.

Steam-Roller Question Again.

The County Councils of the country seem to have taken a determined attitude to place fresh burdens on the use by gas undertakings of the main roadways over which the Councils have authority; but at every turn in Parliament this session, they have been defeated. It will be remembered that the tale of the session's doings include applications, on the part of the Staffordshire, Warwickshire, and Middlesex County Councils, for unreasonable impositions on Gas Companies' concerns in relation to their pipe-work. But they failed all along the line. Now comes (as reported a week ago) the Uxbridge Gas Company's Order. The Buckinghamshire County Council agreed with the Company to road protection in terms similar to those settled with the Middlesex County Council some five years since. But the Hertfordshire County Council wanted the steam-roller clause (which has only been a matter of agreement heretofore); and they asked to be exonerated for all damage done if the weight of the roller did not exceed 20 tons. The House of Lords Committee before whom the Order Confirmation Bill came were unable to see eye to eye with the County Council, and so they failed to get what they desired.

Coronation Illuminations and Consumption.

The unbroken march in financial strength of the Gaslight and Coke Company as revealed by the notification of their dividend for the past six months and the balance forward led the "Financial Times" to cast around for reasons; and it alighted on the suggestion that the Coronation illuminations were doubtless responsible for a portion of the improvement shown in the net profit. It is no doubt the view of many that the illuminations were good

things for both gas and electricity suppliers. But a little consideration as to the stoppage of business in London for two whole days, with shops, offices, and factories completely closed, and the streets more patronized than homes, must show anyone that the normal course of things rather than the abnormal would have been preferable from the trading standpoint for both gas and electricity suppliers. Mr. D. Milne Watson, the General Manager of the Gaslight and Coke Company, has written to our financial contemporary to correct its impression. He remarks: "In reality, the Coronation holidays occasioned a very serious drop in the ordinary consumption of gas, which was not nearly counterbalanced by the gas consumed for illuminations. The only satisfaction in this is that it proves the increase in business is due to general causes rather than to an exceptional one."

The Position of the Municipal Engineer.

Some aspects of municipal engineering as a profession have been dealt with in the course of a short paper read by Mr. B. Wyand before the Institution of Municipal Engineers. Pointing out that in every direction now municipal trading is being extended, the author remarked that these schemes mean more responsibility for the officer, and the necessity for a better class of officer—a more highly-trained and a more intelligent man. This, again, means higher salary, larger staff, and better accommodation, together with the less frequent requisitioning of the consultant. Referring to a subject on which there has been much talk of late—"improving the status of the profession"—Mr. Wyand argued that the term is a misleading one. What is wanted is to improve the status of the members of the profession; and every man who realizes that he is an adviser, and not a servant, is working on right lines. Municipal engineers must feel their responsibilities, and recognize the fact that supremacy is their place in local life. "Even the chairman of the council," said the author, "is merely a cypher when contrasted with the municipal engineer; and he should, as far as possible, be made to feel this. The chairman may be the better man in many ways; but when it comes to engineering, he should be made to recognize the fact that he must play fourth fiddle, and must feel happy that he has not been relegated to the orchestral triangle. A man is estimated in this world much at the value he places on himself; and the humble, shrinking individual who is led by his council is never likely to command either respect or a periodical increase of salary. The blatant gentleman who boasts freely is much more likely to succeed for a time; but his day is not usually a long one, and he is the last man to make capital out of a reverse of fortune." Security of tenure was the next matter touched upon; and on this Mr. Wyand remarked that he would say nothing harsher of councillors than that they are entirely unnecessary, and that he is sadly afraid security of tenure will be difficult of attainment so long as district councils exist. The sole duty of the council, he argued, should be the making of the rate; and this could be as well done by one man as by twenty. Directly a council concern themselves in engineering matters, they become ridiculous; and the effect of their interference is to hamper the technical officers. The suggestion of the author is that the officers "should be appointed by a central controlling authority, and should be removable only for misconduct, or at an age when a pension (and a sufficient one) falls due. Their appointment would, in fact, be a life one, with promotion to larger appointments as vacancies occur. They would be responsible to the central department only, just as are police and post office officials." Among other things, Mr. Wyand is of opinion that municipal engineers are usually woefully underpaid and overworked. He places municipal engineering at the top of all the professions; and concludes with the assertion that the time has arrived when the municipal engineer must take the place which is his by right.

Exhibitions.

The electrical industry are very much alive over their electrical exhibition to be held at Olympia from Sept. 23 to Oct. 21. They are hoping for great things from it, as they hoped for great things from the last one held in the same place. It is a pity for them that they chose such a bad year for the show—bad because there are so many counter and more imposing attractions beckoning the public. Throughout the summer gas is being well represented at the Festival of Empire and the Coronation Exhibitions—even

to the generation of electricity for lighting and power by the use of town-gas driven engines. Only at the far end of the summer and the beginning of the autumn, there is to be this electrical exhibition at Olympia. The list of exhibitors at present includes about 190 firms, and in addition a dozen or so trade newspapers will occupy floor space—for what purpose other than to supplement the exchequer of the exhibition promoters, we fail to see. However, they are contributing their share.

Gas and Death by Easy Stages.

Weekly, daily, and other newspapers which do not get sufficient material locally or through their advertisement connection to fill their columns, frequently have recourse to one of the news or magazine agencies which supply for a price any quantity of columns of matter in "stereo" form, which matter has been prepared by men who specially lay themselves out for this particular class of popular work. In this way, such writings obtain a wide circulation. In notes of this type there are at times found some curious things. We suppose "Robert Watson, M.D.," is a gentleman who supplements his income by writing notes of the kind for general consumption—at all events, it looks like it, seeing that a column of notes on "Health and Home," bearing his name, is found in papers as far apart as the North of England and South Wales. Dr. Robert appears to like to play a little upon the string of sensationalism. He has a paragraph about gas-cookers in an article before us, but little is found in it about these useful and almost universally used contrivances. "Every leak by which gas escapes," he says, "is a definite source of injury to health. Even a short exposure to a trivial escape kills (there is no other word for it) a portion of your body." Horrible man this to adopt such methods of trying to frighten the public. In the first place, there ought not to be gas escapes in house fittings. In the second place, the thousands upon thousands of gas workers, who are constantly living in an atmosphere containing more or less of the gas to which Dr. Watson refers, are notorious for their good (among industrial workers) average length of life. We have known gas workers who have so lived for fifty and more years, and have retired to enjoy and are enjoying their pensions. But, according to Dr. Robert Watson, they ought to be dead instead of now restfully spending life. They ought to have been killed little bit by little bit, until now they ought to be no more.

And Tortures While Alive.

Not only so, but during their long working years, they ought to have suffered tortures. They ought to have suffered from "headache, turns of dizziness, want of energy, want of will, alarming weakness, neuralgia, indigestion, and sleeplessness." In fact, so terrible ought to have been their experiences that they ought to have been glad to have known that they were about to shake off their mortal coils. Why gas making, under the circumstances, should be an occupation much sought after is another mysterious thing; and it points to an old-standing human idiosyncrasy. We do not mind so much Dr. Watson's warnings regarding householders ascertaining that the connections of gas apparatus are sound; but he has had some experience which assures him that "a test to the average connections of a gas-ring or gas-iron would reveal a flaw in seven cases out of ten. So lightly are life and death considered by most of us." This is really nerve-racking. But gas-fitting must be badly done in this "M.D.'s" part of the country if it is so fruitful in leaks as he declares. But we cannot award Dr. Watson the biscuit. The "Dundee Advertiser" recently contained a letter signed "Hygiene," in which it was stated that "it is not perhaps generally known that the gas supplied in Dundee contains a very deadly poison—viz., water gas, or carbon monoxide, a single whiff of which, if inhaled, will cause immediate death." Who wrote this? The men on the top of the water-gas generators are bearing false witness against "Hygiene" by the number of "whiffs" they have had, and continue to indulge in, and yet persist in living.

South Metropolitan Gas Company's Dividend.—We learn from the Secretary of the South Metropolitan Gas Company (Mr. F. M'Leod) that the accounts for the six months ended the 30th of June will, subject to audit, allow of the payment of the full statutory dividends, and increase the carry forward to nearly £120,000.

GAS STOCK AND SHARE MARKET.

(For Stock and Share List, see p. 248.)

LAST week was a very disappointing one on the Stock Exchange. It commenced well and, by way of a sharp contrast from what had recently ruled, the gilt-edged was the strongest market. This was largely due to the extreme abundance of money, but not even this once powerful factor could keep Consols up in face of the increasing difficulties of the Morocco situation and of developments in Home politics. With labour questions and other troubles, it is no wonder that prices crumbled away. Monday was about the best day of the week, thanks to the agreeable change noted above. Rails, Americans, and Foreign were all pretty good; but the last prices were not the best. The weakening tendency was in force on Tuesday. Consols fell $\frac{1}{16}$, and the other markets were down, too—the announcement of a couple of failures not making things happier. Misgivings as to the Morocco position ushered in Wednesday and made prices weaker. Government issues were quite flat, and Rails fell partly in sympathy and partly on their own worries. But Americans were strong, and the rest recovered somewhat before the close. Thursday was depressed by the reported German demands in Africa, and every market was more or less affected. Apprehension continued on Friday, and much heaviness prevailed. Consols were done at $78\frac{1}{4}$, and Rails were weaker. Saturday was very inactive in the intense heat, and the tone was thoroughly dull. Consols closed at $78\frac{1}{4}$ — $78\frac{1}{2}$ —a loss of $\frac{1}{2}$ in the week. In the Money Market, the commodity was cheaper than ever, so superabundant was the supply; but discount rates were rather harder. Business in the Gas Market was a pretty fair average in the aggregate; but the bulk of it was in a few concerns, and the rest were left very much alone. In Gaslight and Coke, the announcement of an increased dividend with a carry-forward of nearly £700,000 gave gratification; and the price rose from 107 on Monday to 108 on Friday and Saturday. In the secured issues, the maximum marked from $85\frac{3}{8}$ to $86\frac{1}{2}$, the preference from $103\frac{1}{2}$ to $104\frac{1}{2}$, and the debenture from 79 to 80. In South Metropolitan there was not much doing, and prices were close at from $119\frac{3}{4}$ to $120\frac{1}{4}$. The debenture realized $78\frac{1}{2}$. In Commercial, only the 4 per cent. was touched, and that changed hands at $114\frac{3}{4}$. Among the Suburban and Provincial group, Alliance and Dublin was marked at 83, Brentford new at $205\frac{1}{2}$, Southampton at 107 (a fall of 2), and Tottenham B at 118. In the Continental companies, Imperial showed a continued disposition to easier figures, changing hands at from 185 down to 183 (a fall of $\frac{1}{2}$), and European was firm at $19\frac{3}{4}$ and 20. Among the undertakings of the remoter world, Bombay was done at from $6\frac{3}{8}$ to $6\frac{5}{8}$, Primitiva at $7\frac{3}{8}$ and $7\frac{1}{2}$, ditto preference at from $5\frac{1}{4}$ to $5\frac{7}{16}$, ditto debenture at $97\frac{3}{8}$ and 98, San Paulo at $21\frac{1}{2}$, and ditto debenture at $49\frac{1}{16}$ and 50—a rise of $\frac{1}{2}$.

ELECTRICITY SUPPLY MEMORANDA.

Nothing to be Left for the Gas Industry—The House of Peace and Plenty—Electricity Lessens the Butcher's Bills—Explanations Wanted—Cooking Costs—Sandwich Men and the Poison Slander—Candle Power Inside and Outside the Laboratory.

IN last week's "Memoranda" attention was directed to the fact that a benign writer in the "Electrician" had most generously handed over to the gas industry the provision of heat for the cooking and house warming of the country; but he claimed that the lighting was ear-marked for the electricity industry. Unfortunately for the gas industry, the writer referred to is not the only literary pebble on the electrical littoral; and, if we piece together the views that are prevalent among the electrical writers, and have any belief in their prophetic powers, then we must begin to prepare for a rapid and permanent closing of the progressive and prosperous career of the gas industry. The lighting business, we are told, on the one hand, has got to go from the gas industry (the municipal electrical engineers meeting at Brighton recently thought that some of their own lighting was taking a wrong turning); while, on the other hand, another writer in the "Electrical Times," blessed with superhuman foresight, asserts that "the electric cooking era is not so far distant as many electrical men think, or as the gas people would wish." This looks bad. Then we are confronted with something else that is not intended to conduce to our peace of mind. It is that "developments in the design of cooking apparatus have been very rapid during the last year or so, and evolution is taking place on the lines of greater efficiency, simplicity, and fool-proof design." There was room for something of the kind. But worse and worse for the gas industry. A householder at Ealing has been using the "Tricity" cooker, and has found that the waste of meat (by weight) may be halved by using this wonderful contrivance of the Berry Construction Company. It is a matter of immense importance; we cannot lay too great stress upon it. By adopting electricity (the definite cost of doing so is not published) for cooking meat, a man may indulge in a larger family, and yet not spend more on his butcher's bill, because the heat of electricity is different from all other heat, and does not cause such a great amount of waste in the weight of a joint. The butchers will not like this economy that electricity introduces; but from the national point of view, it is a matter of

which we must not lose sight. Butchers, like gas shareholders, must treat the matter in an altruistic light. Putting the matter in another way, the makers of the "Tricity" cooker point out that "in money value this means that, out of every £50 spent with the butcher nearly £17 is lost in the cooking process when gas or coal is employed; and one-half of this loss—i.e., £8 10s.—can be saved by cooking meat electrically."

Now, in the figures supplied by this householder at Ealing (he appears to have had in his house simultaneously and quite recently the means of cooking by coal, gas, and electricity, so that he must surely be a millionaire), out of four tests—three with coal, and one only with gas—the percentage loss in weight of the meat in the gas test is worse than in one test with coal, and only slightly better than the results in the other two coal cases. It is a curious thing that only one test is recorded with gas; while there are five with the "Tricity" cooker. However, this is an unsolicited testimonial on the part of this particular Ealing householder; and this Ealing householder must be an excellent, good-natured individual, for he went to a good deal of trouble to obtain the material for the unsolicited testimonial, by weighing meat before and after cooking. We hope the Berry Construction Company have been truly thankful. It is not supposed that all the meat that was cooked in this household was weighed during the five weeks over which the tests ran; seeing that sometimes just about a week elapsed between the tests. But there are indications that this must be a large family, or the members of the household mayhap are heavy-handed with meat, or perhaps the dwellers in the house of Mr. A. Haynes, of 25, Woodfield Road, Ealing, are fond of cold meat. We cannot say. But it is observed that on March 23 ribs of beef, weighing 5 lbs. 7 oz., were cooked; on March 26 a leg of mutton, weighing 8 lbs. 8 oz.; and on March 29, a shoulder of mutton weighing 6 lbs. 13 oz. On April 15 we have a shoulder of mutton cooked weighing 4 lbs. 12 oz., and next day, ribs of beef weighing 9 lbs. 1 oz.! This is a house of peace and plenty. We see that the leg of mutton that gas condescended to cook weighed 8 lbs. 4 oz. when in the pristine condition in which it was received from the butcher; after the oven had done its work (we should say worst), it only weighed 6 lbs.—a loss of 2 lbs. 4 oz. A leg of mutton weighing 9 lbs. in its original condition, when cooked in the "Tricity" oven weighed 7 lbs. 12 oz.—a loss of only 1 lb. 4 oz. Another leg of mutton did not fare so well in a "Tricity" cooker. It weighed 9 lbs. 1 oz. before being cooked, and 7 lbs. 10 oz. afterwards—a loss of 1 lb. 7 oz.

There is no explanation given of this particular phenomena. But it is all very silly. There is no reason why a gas-oven should waste the meat to any greater extent than an electric oven. The heat inside a gas-oven is a moist heat; and by the exercising of normal care, and not over-cooking the meat, the weight should not be less than if treated in an electric oven. For comparison purposes, it is quite possible for an oven to be hard-driven and the meat cooked almost to a cinder; and it is quite possible for another joint to be underdone. We should have liked to have seen the joints of April 2 and April 9, before and after cooking. It is hoped Mr. Haynes is not getting angry. No aspersions are intended. Our respective views as to overdone and underdone meat may vary. The views in our respective households as to how to cook meat may vary. The whole world, in fact, in its habits and practices differs very largely. But this all takes us back to the early days of gas cooking, when it was claimed that meat cooked in a gas-oven lost less weight than meat cooked in a coal-heated oven; but gas-ovens have made such headway, and are so popular, that not much is heard of the claim to-day. It is a case of merit having forced the pace of popularity. It was but a few years since that a gentleman who had made, and was professionally competent to make, an investigation as to the cause of meat properly cooked in a gas-oven not losing so much weight as meat cooked in a coal-heated oven, gave this explanation: "Through the instantaneous action of the heat to the whole surface of the meat to be cooked, the albumen is at once coagulated, and thereby prevents the escape of the juices from the interior, which, on reaching their respective boiling-points, expand the cell fibres, and thus contribute in the interior to that chemical and physiological action and reaction intended with the process of cooking in a more perfect manner than has hitherto been attained by either cooking, roasting, stewing, or steaming of meat, &c."

Will the Berry Construction Company, or Mr. Haynes, of Ealing, tell us whether there is anything wrong about this scientific explanation? Will they further add to the interest and indebtedness that we shall experience by telling us why in a gas-heated oven meat should lose a greater weight, and therefore presumably more of its nutritive properties, than meat cooked in an electric oven? We want a fair explanation, and not a mere writing-round the question. We have given them good reasons why we think they are wrong; and, in the most amiable manner, we invite them to state the reasons for the phenomena which they have not yet ventured to explain. We are not in agreement as to the cost of cooking by electricity bearing favourable comparison with gas and coal. Comparatively, very few people have tried electric ovens; but among those who have are examples of those who have gladly reverted to gas, and not because they found with the electric cooker that "every joint is now most tender, and has the appearance of being larger when cooked by electricity, instead of being drawn and shrivelled up as it is when cooked by gas or coal." Ah! have we discovered here the reason for Mr. Haynes' 8 lb. 4 oz. leg of mutton, when cooked in a gas-stove, yielding up

2 lb. 4 oz.? We think a lady demonstrator from the Brentford Gas Company could show Mr. Haynes and the Berry Construction Company how a leg of mutton can be cooked by gas without being "drawn and shrivelled up." Electricity is a wonderful thing when employed for cooking.

The electrical papers are once again trying to stimulate interest in this cooking business; and reduced meat shrinkage is one of their present pet arguments. It has been trotted out at Dover. What is lost on the roundabouts is gained on the swings. From Dover it is stated that the cost of electric cooking, as compared with gas cooking, is about 25 per cent. more; but "the less shrinkage of joints with electric cooking makes the increased cost only 15 per cent."—that is to say, the problematical saving in meat (in which the skill or desire of the cook plays part) only reduces the extra cost of cooking by electricity by 10 per cent. on the terms in existence at Dover. It is not stated that the electricity cooking prices are generally in the region of 1d., 1½d., or 2d. per unit, while the prices of gas used for cooking are at the rates charged for lighting; nor is it mentioned that about 3420 B.Th.U. is the thermal value of a unit of electricity, while a pennyworth of gas, at 2s. 6d. per 1000 cubic feet, represents approximately 16,500 B.Th.U. The electrical people are not quite at home in this matter yet. The same paper that spoke of this 15 per cent. difference in cost (the modesty is admirable) states, in another recent issue, that the "Tricity" oven is made of light material with a bright surface. The metal has only a small capacity for heat, so that the interior quickly arrives at the working temperature, and the loss by radiation and convection is small. "The consumption of energy is remarkably low; it enables electricity to compete with gas for cooking, even on the score of cost alone." Up to the present few people have been found to believe the fairy tales on this subject. We see, too, in one of the newest forms of cooker—the "Eclipse"—that a sort of "danger" lamp is used. A ruby indicating lamp, says one description, is provided to show when the cooker is on circuit, and to serve as a reminder (we can see the cook or the cook-general paying much heed to it) to the user to turn off all switches (including the main switch controlling the cooker) when the cooker is not in use. It is also remarked that the heating elements consist of round or flat wire, wound on to mica strips, which have a life of 3000 or 4000 hours, and cost about 1s. 6d. each. This oven is the nearest of all comers in appearance to a gas-oven. Its consumption is rated at 2 units per hour; and one paper says a 4½-lb. joint can be comfortably cooked for 2d. at 1d. per unit. But there are the vegetables; and the boiling-ring and the hot-plate and grill each consumes 800 watts per hour. There are also the sweets. And yet some people think that electricity can compete with gas for cooking even on the score of cost alone! This is one of the ripest examples of human credulity that we have ever met with.

The "Electrician" states that sandwich men have been parading the scene of the late Incorporated Municipal Association convention, at Brighton, announcing that reliable electric lamps can be purchased at 2s. 6d. (230 volts) and at 2s. (115 volts). The lamps in question are stated to be supplied by the Gabriel Lamp Company. There is no objection to the method of advertising from the gutter the prices of electrical commodities. But our contemporary proceeds to state—

The fight with gas has been borne in mind in the lettering on the sandwich boards; the passer-by being admonished upon its use and warned not to poison himself by allowing it in the house as an illuminant. As far as we ourselves are concerned, we have no opinion to express.

We should like to know whether the Electrical Engineer of the Brighton Corporation (Mr. John Christie) in any way countenanced the exhibition of these sandwich boards with the "admonition" and "warning" upon them either personally or as an official of the Corporation. We should hardly think so. The Brighton Gas Company, however, will do well (they no doubt know who are directly responsible for the boards) to make a strict investigation to ascertain whether, in the event of any gas consumer turning over to electric lighting about this time, the "admonition" and "warning" were the persuading causes. There are ways and means open for dealing effectively with any material damage that may be suffered through injury to business by the circulation of malicious slanders. Besides which the Brighton Gas Company have a legal right (conferred upon them and frequently confirmed by Parliament) to carry on the business of gas suppliers, for lighting, heating, cooking, motive power, and all other purposes for which gas can be usefully employed.

Our electricity contemporaries have grasped eagerly, and almost feverishly, a report from America. Reports do occasionally come from America. This report not only comes from America, but its source is the National Electric Light Association. There is nothing new about reports regarding gas emanating from electrical associations. This particular report mentions that not more than 60 to 70 per cent. of the laboratory rating of candle power can be obtained from gas-lamps under service conditions. This is not so bad as certain electrical contemporaries and electrical advertisers who have allowed incandescent mantles to have an efficiency of about 4 or 5 candles per cubic foot of gas consumed. It is stated that the American tests have been borne out by tests made by gas engineers. Who are the gas engineers? And what burners did they use? If certain results can be obtained in the laboratory with incandescent gas-lamps, they can be realized elsewhere, and maintained by occasional attention, if the gas-supply conditions are the same as those ruling in the

laboratory. Is there any reason why they should not be, Mr. "Electrician" and others? Of course, the metallic filament lamp, according to electrical faith, carries its laboratory results loyally into service. However, the testimony from America is not to be despised. Assuming, in service conditions, that 70 per cent. of the laboratory result is realized. An inverted lamp giving 100 candles on 4 cubic feet in the laboratory would afford 70 candles in the house. The lamp would not absorb 100 cubic feet, costing 3d. or 4d., in less than 25 hours. A 70-candle power metallic filament lamp would run away with a unit of electricity, costing 3d. or 4d. (perhaps more), in 11½ hours. Thanks Mr. "Electrician" and others for the testimony to the economy of gas.

PERSONAL.

During his visit to Edinburgh last week, His Majesty the King conferred the dignity of knighthood upon Mr. W. S. BROWN, the Lord Provost of Edinburgh, and Mr. ARCHIBALD M'INNES SHAW, the Lord Provost of Glasgow. Both gentlemen are the nominal heads of the Gas Departments in their respective cities.

An interesting ceremony took place last Wednesday, at the office of the Ipswich Gas Company, when the officials assembled in the Board-room to bid farewell to another of their colleagues—Mr. W. E. FREE, who, as already announced in the "JOURNAL," has been appointed Secretary to the Windsor Royal Gas Company. In the unavoidable absence of Mr. J. T. Jolliffe, the Secretary and Manager, Mr. Frank Prentice presided, and mentioned that no less than three of the Company's officials had left them in as many months, to fill better appointments. He heartily congratulated Mr. Free on his success, and asked his acceptance from his colleagues of a handsome marble clock as a token of their good-will, and with their best wishes for a successful career at Windsor. After a few words from Mr. G. A. Mallett, who expressed gratification at seeing some of the members of the staff obtaining such good appointments, Mr. Free made a suitable response. He alluded to his long and pleasant connection with the Company, and acknowledged the kindness he had ever received from those associated with it.

OBITUARY.

The death has been announced, in his 57th year, of Mr. HENRY HOWELL, the Manager of Howellite, Limited, of Farringdon Avenue, E.C. Deceased was one of the veterans of the incandescent lighting industry; having been connected with the old Welsbach Company in its early days. He was the inventor of several improvements in connection with incandescent gas lighting; his latest success being the Howellite inverted burner.

We regret to record the sudden death, last Sunday afternoon, as the result of heart failure, at the age of 65, of Mr. H. W. AMOS, the Secretary of the Bromley and Crays Gas Company—a position he had filled for 21 years. Originally, the offices of Secretary and Manager were held by Mr. G. H. Osborn, on whose death in 1890, after 35 years' service, they were divided; Mr. Amos, who had been with the Company since 1863, and was then the Chief Clerk, being made Secretary, and Mr. W. Woodward, of Bury, being appointed Manager. Mr. Amos was highly respected, alike by the shareholders of the Company and by the residents in Bromley. He was a Deacon, and for several years past had been the Secretary of the Congregational Church, from the pulpit of which the announcement of his death was made at the evening service. He was well known for the keen interest he took in politics, being a staunch Liberal; and he was an active member of the Bromley Bowling Club.

Irish Association of Gas Managers.—The annual meeting of the Association will be held in the Queen's Hotel, Queenstown, on the 8th prox., under the presidency of Mr. John Paterson, the Manager of the Queenstown Gas-Works. According to the programme issued by the Hon. Secretary and Treasurer (Mr. George Airth, of Dundalk), the business will include the President's Address, the reading of three papers, and (time permitting) the discussion of two suggestions. The following are the titles of the papers: "Notes on Purification," by Mr. A. Percy Hoskins, of Belfast; "The Construction and Working of a Small Sulphate of Ammonia Plant," by Mr. T. Hornby, of Longford; "Gas Apparatus for Workshop and Laboratory Purposes," by Mr. G. F. Hurst, of Birmingham. The subjects suggested for discussion are: "Is the improved upright incandescent burner better than the inverted for ordinary gas pressures?" and "The best means of disposing of tar, in view of the deterioration in prices lately." A pleasant incident of the meeting will be the presentation of an illuminated address to Mr. James Whimster, J.P., of Armagh, for his long and valued services to the Association. A new honorary member will be elected; and Mr. J. E. Enright's proposition (brought forward last year) to alter the date of the annual meeting, will be considered. Opportunity will be afforded the members of inspecting the Cork Gas-Works, where De Brouwer machines, with coal and coke hauling plant, have lately been installed. On Wednesday, the 9th, there will be an excursion to Youghal, with luncheon at the Green Park Hotel, and a steamboat trip on the Blackwater.

THE SUGGESTED STANDARD SPECIFICATION OF STREET LIGHTING.

[COMMUNICATED.]

FOLLOWING the reference in the recent report of the Council of the Institution of Gas Engineers to the proposed standard specification for street lighting, the replies to the inquiry instituted by the "Illuminating Engineer" [see *ante*, p. 99] will be read with some degree of interest by all those who are concerned with public lighting matters.

According to the Institution Council's report, the preliminary and fundamental points under discussion by the Street Lighting Specification Joint Committee had regard to the unit, whether of light or illumination, which should be the basis of the contract. Sequent to an expression of opinion in favour of illumination with the foot-candle as the unit, discussion took place as to the method of determining or testing foot-candle values; and it was stated that some difference in opinion occurred as to whether these should be determined on the horizontal plane or on the plane facing the light rays tested. The inquiry of the "Illuminating Engineer" covers these and other debatable points; and the replies received from authorities (principally electrical and professorial) living and practising abroad, suggest that agreement in views is not likely to be achieved at once, the problems involved in street photometric practice being far from easily solved. The inquiry, however, is not complete; other communications being expected. It will be noted that opinions from homelighting experts, from their point of view and for English conditions, have still to be obtained.

It is acknowledged that in dealing with a subject like public lighting, where not only light-sources vary considerably in design and distributive effect, but where the streets themselves differ in importance, character, and adaptability, the application of tests and standards to all conditions alike may not be easily possible. It is not surprising to find, therefore, that the replies to the "Illuminating Engineer" queries suggest that there are obstacles in the way of the evolution of a standard specification which will afford satisfaction to all parties. In any case, it is certain that the difficulties of (to speak of nothing else) properly appraising the value of light-sources and the resultant illumination, having regard to the varied needs of the several types of thoroughfares, are such that very careful thought will be required before asking public authorities to adopt definite specification clauses for general lighting purposes. Abnormal and unnecessary trouble may easily be occasioned, and possibly grave injustice done, to either the contractor or the public or both; and, when once standard specification clauses are issued, it will not be altogether easy, without reflection on the originators, to modify them afterwards.

The "Illuminating Engineer" has so far obtained ten replies to the questions advanced, and the extent of agreement obtained is indicated in a table published in the number containing them. With reference to the first query, practically all the correspondents are in accord that the proposed specification should contain a statement of the energy or gas (as the case may be) consumed, and the amount of light furnished. So far as the amount of light is concerned, five are in favour of a "certain actual minimum illumination in the street;" while four wish simply for "lamps of a certified candle power." Assuming an "illumination" basis be generally accepted, nearly all favour the suggestion of measurement on the horizontal plane at a stated height above the ground. As already indicated, however, several had expressed their preference for lamps of a certified candle power, and they therefore qualify their replies to this query—evidently regarding the method as insufficient, and wishing it to be either supplemented by the vertical-plane measurements or else preceded by laboratory tests. Even the advocates of the horizontal illumination tests consider it desirable to have the latter.

It may be noted in passing that the illumination test in query No. 3 deals with the measurement on the horizontal, the vertical, and the 45° inclined planes. There is no reference to a test made at right angles to the light-ray, which should also have had some consideration.

In the case of measurement of the intensity or candle power of the light-source—as an alternative to that of illumination—the fourth query is directed to tests of the (a) mean spherical, (b) mean hemispherical, or (c) specified angular candle powers; and here opinion is divided between the second and third methods. The imposition of a test of the "constancy of the candle power of the lamps" in use does not meet with any great favour; nor does the suggestion of stipulations as to the height of light-sources, or their shading. The idea of prescribing any specific colour for the light does not receive acceptance.

From the above brief analysis, it will be noted that the authorities so far consulted consider that street lighting specifications should state both the form and the amount of light to be furnished. But, although there is some feeling in favour of the prescription of a "certain actual minimum horizontal illumination," very few care to do without supplementary laboratory tests of candle power or vertical-plane illumination measurements; the inference being that horizontal plane tests alone do not afford all the information necessary. In this connection, therefore, it is useful to read again the remarks of Dr. Louis Bell, of Boston, and of Mr. P. S. Millar, of New York. The former does not believe in the specification of illumination in any form as the

basis of payment in a municipal contract; and he points out—and in the writer's opinion rightly—that the measurement of minimum illumination under some conditions of spacing could only be an approximation, and that the easily possible differences of 5 to 10 per cent. in tests made by the two contracting parties are likely to involve no inconsiderable sum when it comes to payment. On the other hand, the provision of a specified minimum candle power ensures that at least a certain minimum flux of light will be available, and it is simply a matter of using it to the best advantage. Mr. Millar also emphasizes the objection—stating his belief that illumination measurements on any single plane do not tell the whole story; and he remarks that where photometric tests are involved in a contract, a reasonable non-penalty margin should be provided, in order to allow for "inherent variables and fallibility of tests."

It is true that the advocates of the horizontal-plane test have shown their faith in the method by supporting the recommendation of the Verband Deutscher Elektrotechniker, which specifically makes mean horizontal illumination measured at a height of one metre above the ground level, the practical measure of the illumination of outdoor areas and interiors, but requires also the determination and statement of the maximum and the minimum illumination.

One argument which has been advanced in favour of the principle is that, from the point of view of the buyers, an exact knowledge of the candle power of the light-source is not so much desired as that of the illumination actually received. This may be true; but the proposition to pay by results—to purchase effect rather than the factor itself—is an unusual one, and is not made in other and ordinary lines of business. No butcher or grocer, for instance, bases the price of his commodity upon the effect it has on the physique of his customer. Some commonsense in usage is expected on the part of the latter individual. It is further suggested that while vertical illumination is not unimportant, the horizontal-plane test practically serves both purposes, since the former is nearly always greater than the horizontal illumination. The undoubted ease, however, with which the horizontal-plane test can be made, has probably had much to do with its ready acceptance. There is nevertheless something, and in the minds of some people a good deal, to be said against the method.

The horizontal screen obviously takes into cognizance not only the light received from all the lamps in the vicinity, but also that from any neighbouring shops. It is also affected by reflected light from houses and walls to varying extents, according to their position, nature, and colour, and even by the condition of the atmosphere itself. The readings are usually much lower than those of a direct-ray reading instrument, and are capable of a greater range of error—a trouble which may be further accentuated by the fact that the inadvertent tilting of the screen is in itself a source of inaccuracy. On the latter score, it has been stated that 1 or 2 per cent. difference in level may cause an error of 10 per cent. in the result.

Differences in the value of the readings—due to varying distance and the Purkinje phenomenon—are also liable to be caused by the alterations in the spectra of one or more of the several lights concerned. Apart from these difficulties, the method is not a consistent one, since the horizontal testing-screen is affected by oblique light when (say) midway between two lamps; but as it is brought close under any single lamp, it takes less cognizance of this light, and virtually becomes a direct-ray testing-plane.

One or two of the objections alluded to are advanced even against direct-ray testing, but admittedly with not the same force. It is stated, for instance, that reflection effects are still possible. These, however, are relatively small, and may, as a matter of fact, be practically avoided by shielding the testing-screen.

On the face of it, if "illumination" is to be the basis of a street-lighting specification, it is advisable in the test adopted to reduce the number of "inherent variables," and to lessen the possibility of test "fallibility"—to use Mr. Millar's phrases. And for this reason, and in the belief that the method is at once more useful and equitable, the test or computation of direct-ray illumination is preferred by some. It is more useful because it is probably a better index of the illumination which is of most service in the streets. While uniform lighting is advisable, the light principally in request is that for seeing the faces of people, vehicles, steps, and obstacles generally. The method is more equitable because, so far as the lighting contractor is concerned, it is less subject to photometric and experimental error, and it can be made to be totally independent of surroundings. It is also much more convenient for purposes of practical work. A contractor is asked to provide certain illumination for certain streets. If his work is to be judged by direct-ray foot-candle values, he may set up an experimental lamp in his own workshop, and vary the design of both lantern and reflector until he obtains a satisfactory distributive effect. He may then from the polar diagram plot out a scheme on any ordinary Ordnance survey map which will fulfil the conditions of the specification, and tender with the assurance that the results are not going to be influenced by adventitious circumstances such as the nature and width of the street, or the presence of trees and walls. This surely has the additional advantage of encouraging makers in their

work of improving and even standardizing lamps, as they have not to go into particular streets to see how far the relative position of various light-sources and buildings is likely to affect illumination results generally or the minimum foot-candle specified.

From the point of view of lighting contractors, the matter is of great importance, since the stipulation of necessarily small and fractional foot-candle values as minima for any part of a street or open space may involve monetary loss, in the way of penalties, founded on what may be at any time very unsatisfactory tests. The latter trouble may be obviated to some extent by making the non-penalty margin fairly wide. But the very existence of a wide margin suggests the uncertainty and the absurdity of the testing method requiring it.

A further advantage of the direct-test method is that there is distinct relationship between the foot-candle illumination ascertained and the candle power of the lamp; and the values are therefore easily convertible. Where tests are unnecessary or inadvisable, as they well may be in the case of the low readings obtainable with widely-spaced lamps in side streets or roads, the polar diagram of the lamps concerned will sufficiently serve the purpose for ascertaining the illumination received; and it is much more likely to be accurate in view of the fact that street photometry is not yet an exact science. With a unit thus so easily converted into candle power, the standardization of specification clauses will be more easily effected and generally accepted, since it is open for contracting parties by agreement to determine foot-candles either by test or by calculation as may be thought best by them.

Speaking generally, if illumination is to be adopted as the basis of future contracts, there would seem to be many practical considerations which favour the direct-ray method of testing; but, at present, it is questionable whether the time is ripe or illumination photometry sufficiently exact for the suggested change.

GERMAN ASSOCIATION OF GAS AND WATER ENGINEERS.

Reports of Technical Committees.

THE following are summaries of reports not already dealt with [see last week's "JOURNAL," p. 160] presented at the meeting at Dresden last month by the Technical Committees appointed by the Association.

HEATING COMMITTEE.

The report of this Committee, which is signed by Dr. E. Schilling, of Munich, the Chairman, states that the set of prescriptions and rules for the sale and use of gas which had been prepared by the Committee and received the approval of the Association at the general meeting at Königsberg last year (see "JOURNAL," Vol. CXI., p. 34) have been issued in pamphlet form and have met with a large sale. It is hoped that this set of rules will form the basis of any special prescriptions made by municipal authorities and gas-works in regard to gas supply and fitting.

The question as to the participation of the Association in the Hygiene Exhibition at Dresden was dealt with by the Committee in conjunction with the Central Organization for Promoting the Sale of Gas; but, unfortunately, as already reported, the negotiations broke down. It is stated, however, that the Central Organization believe that the discussion in this case has disclosed a way by which the gas industry will be assured of participation in other large exhibitions; and the Committee consider that such questions may confidently be left in future to the Central Organization. The matter of the training of Lady Instructors in gas cooking has been energetically taken up by the Central Organization, with very satisfactory results. Any points which may arise in future in connection with this matter the Committee therefore consider may also be dealt with by the Central Organization with, if necessary, the assistance of the Karlsruhe Instructional and Experimental Works in regard to any investigations of heating and cooking apparatus. The newly-formed Committee on the Working of Gas-Works will also be in a position to handle this in conjunction with other industrial questions which come before them. On this account, it is a question whether the time has not arrived for the dissolution of the Heating Committee.

At a meeting of the Committee held in Berlin in March, it was considered whether the efforts being made by the pottery trade in many towns to construct a closed tiled stove (of Continental type) for the consumption of gas should be supported by the Committee. The opinion of the Committee is that a gas-stove of this type is irrational and unsuitable for continuous heating. On the other hand, they consider it desirable that there should be co-operation of the pottery trade with the makers of gas-stoves and with architects with a view to settling standards or rules for the insertion of gas-heating apparatus in closed tiled stoves or tiled hearths so as to supplement heating from central plant or from stoves. It was decided to ascertain the views of gas-stove makers and of the pottery trade in regard to this matter.

The Committee are clearly of opinion that the general introduction of gas heating would not improve the load curve of gas-works, but would make it worse, and would put more unfavourable strain on the distributing system than it bears at present. Also gas heating, if introduced on a large scale, would prejudice the sale of coke by gas-works. The chief burden of heating should be placed

on coke, and gas will then supplement the central heating and in special cases give valuable service otherwise. The pottery industry should be advised to discontinue its efforts to construct a closed tiled stove for gas heating, because, apart from the bad efficiency of such a stove, the large wall surface to be heated only affords opportunity for the deposition of moisture, and the large hollow spaces between the surfaces present an appreciable risk on account of the possible accumulation therein of explosive mixtures of gas and air. On the other hand, it cannot be denied that the gas tiled stove, on account of its artistic merits, especially when it is built in a tiled casing, is being more and more introduced into dwellings provided with central heating. The stove makers and the pottery trade have hitherto worked independently; and consequently the result leaves much to be desired. Suitable standard types of gas-stoves for insertion in the tiled casing should be agreed upon, so that air warmed by the stove, instead of flue gases, should pass through the passages of the tiled casing. The Committee will endeavour to bring about such desirable co-operation between the gas-stove and the pottery trades in the ensuing year. With this object in view, they ask for a grant of £50, as in the previous year.

GAS-METER COMMITTEE.

Two of the objects which the Committee have on their programme were advanced, but not brought to a conclusion. These were the investigation of the durability of artificial membranes in dry gas-meters and the standardization of the external dimensions of gas-meters from different manufacturers. The Committee also considered questions raised from various quarters, and while not reporting on them at present, must not be supposed to be disregarding them.

With reference to artificial membranes for gas-meters, the Committee had in the previous year experimented in conjunction with the Meter Stamping Committee on the manufacture by a special process of membranes for dry gas-meters from cotton and pure linseed oil. After experimental pieces, containing on the average 82 per cent. of linolin, had been shown to withstand the effects of the stream of gas, large pieces of the material were produced in the Mayence Gas-Meter Factory and used in the manufacture of eighty-five five-light and twenty-five twenty-light gas-meters. Some of these were distributed last June to eleven different gas undertakings, with directions and forms for the observations to be made on them. These directions stated that the meter should be set up where the temperature and gas consumption were fairly uniform, and that a second meter of the same size should be placed after them for control purposes. The anticipation that by the adoption of a uniform method of investigation the results from the different places would show good agreement has, however, not been fulfilled.

The reports received after five to six months' run of the experimental meters showed that almost the whole of them were recording in advance of the control meter, and the surplus shown was often far in excess of the permissible limit of error. This result was the more disconcerting because all the experimental meters had been officially tested and found satisfactory before installation. In one instance, a meter after one month's use was recording 25 per cent. in excess of the gas passed. The reports received from the different works were considered at a meeting of the Committee in March last. The tendency to register fast was prominent throughout; and the five-light meters were, in this respect, worse than the twenty-light meters. It was decided at the meeting that, in order to exclude the effects of uncertain variations in the temperature and rate of passage of the gas, meters with the experimental membrane should be set up in the governor room at two gas-works where their behaviour could be readily observed. These trials are still in progress.

In regard to the membrane, it has been found experimentally that its behaviour in a current of air is different from that in a current of gas. The moisture taken up from the gas seems to cause a shrinkage of the membrane with a consequent fast registration. This shrinkage disappears rapidly if the membrane is exposed to a current of dry air. Experiments showed that meters when tested with air recorded less than when tested immediately before with gas. The sensitiveness to the hygroscopic condition of the gas depends, in the view of the Committee, on the method of weaving the cotton. The Committee are now in communication with weavers, with a view to ascertaining whether every care had been used in the preparation of the membranes; and the unsatisfactory result in the first instance will not deter them from pursuing investigations in this direction. For the rest, the experiments have shown that the use of pure linseed oil after conversion to a high proportion of linolin is quite appropriate for the preparation of artificial membrane. As, apart from the effect produced by moisture, the membrane has proved in the experimental meter to be pliant, completely gas tight, and free from liability of dissolution of the impregnating material by the gas, the Committee contemplate continuing experiments on a smaller and less costly scale. They extend their thanks to the authorities of the gas-works which have co-operated with them in the trials of the experimental meters.

The Committee also investigated the question of the effect of pressure waves, as now used for the distant lighting of street lamps, on the water in wet gas-meters. Their report states that the introduction of the use of pressure waves has been attended with certain disadvantages, especially in regard to wet gas-meters and gas-fittings in which there is a water seal. Trouble, however, from this cause has been reported actually only from one town,

notwithstanding the numerous cases in which pressure waves are now being used. The rise of pressure is usually 6-10ths above the maximum evening pressure, and extends every night and morning for three to four minutes. The rise is sudden; and therefore it differs from the rise of pressure which is found necessary in many towns to meet the increase of consumption at the hours of maximum output. If, therefore, there are governors or other apparatus with an inadequate seal, there may be an escape of gas through the imposition of the pressure wave. Water may also be expelled from wet meters of old types of construction if the pressure rises to about 26-10ths. Other old wet meters, owing to the expulsion of water from the drum by the pressure wave, may afterwards register slow. The maximum pressure in any part of the distributing system when the pressure wave is applied may, however, in elevated parts of the district, reach 45-10ths or more. The highest points of the district of supply are, however, usually the furthest from the gas-works, and consequently the pressure-wave will have become reduced by the time it reaches them.

The pressure-wave obviously plays a less important part than local conditions in affecting the pressure in distributing systems. The only question to be considered when introducing the pressure-wave system of ignition is whether the height of the water seal in wet gas-meters is adequate for the prevailing pressure, or whether it is desirable to abolish the use of wet meters in the highest parts of the district or where the pressure wave is most intense. Compared with a gas pressure of 36-10ths to 43-10ths, the seal on wet meters is, with meters of old types of construction, from 18-10ths to 32-10ths, according as they increase in size from three to ten lights, and with meters of recent construction from 34-10ths to 47-10ths, according to size. It is obvious that the seal of the old meters is low for ordinary working conditions of pressure, and that there has been some risk in using them hitherto in certain instances. The use of pressure waves has certainly raised the danger limit slightly; but it has not introduced any new danger. In new meters, however, the water seal should be required to be increased to 42-10ths to 48-10ths, which is a condition with which a number of meter works now comply. With the smaller meters, however, this involves giving up the present pattern and adopting the more costly pattern of wet meters used for acetylene. The conversion of old wet meters to a safe pattern cannot be readily effected; and meter makers have informed the Committee that their efforts to devise simple means of overcoming the faults due to the seal have been unsuccessful, and that they suggest that the difficulties arising from the pressure wave with wet meters should be avoided by substituting dry meters for the latter. The Committee, however, are disinclined to share this view.

In concluding their remarks on this subject, the Committee sum up with the following propositions: (1) Existing gas supply appliances, and especially wet meters, must be adapted to the requirements of pressure-wave ignition of street lamps; (2) pressure-waves present no new source of danger, but increase the risk attendant on the existing use of wet meters with unclosed re-filling openings and overflows; (3) new wet meters should have a deep water seal—say, 4 to 5 inches; (4) there is no acceptable method of making old wet gas-meters with shallow water seal safe against exceptional increases of pressure—automatic flaps on the re-filling orifices afford no permanent security; (5) it is more than ever important that the meter-inspecting staff should be careful about screwing-up the meters properly and that unauthorized persons should not interfere with them; (6) governors with seals of volatile liquid should be treated with the same care as wet meters.

The Committee have also had under consideration the question of the amount of gas which a meter, which has been stamped in the ordinary way by the German authorities entrusted with the duty of stamping gas-meters, will pass at a low rate of flow. The question arose from a representation that a single small incandescent burner consumed much less gas than an old flat-flame burner, and the inference that the smaller consumption might escape registration. The Committee discuss the procedure followed in the examination which precedes stamping, and arrive at the conclusion that it admits of no serious risk of meters which do not register a comparatively small consumption being passed for stamping. Another matter referred to is a suggestion made by a firm of makers of gas-heating apparatus that the time is ripe for the abolition of the method of designating the sizes of meters by the number of "lights." The Committee point out that this nomenclature of the different sized meters is well understood, and is recognized in many enactments, and its abolition would be attended by many difficulties and would possess but few compensating advantages. The Committee express their thanks to the German Standards Committee and their Chief Officer for the attention given to their representations from time to time.

A grant of £30 is asked for to assist the Committee to continue their work this year. The report is signed by the Chairman of the Committee, Herr C. Kohn, of Frankfurt-on-the-Maine.

European Gas Company and their Employees.—With reference to the remarks of the Chairman of the European Gas Company (Mr. R. Hesketh Jones) at the recent annual meeting, on the subject of labour troubles, as published in the "JOURNAL" last week, we are asked to state that the staff at Amiens have voluntarily written to the Press in the town to thank the Manager and the Directors not only for an unsolicited increase in their wages some short time since, but also for the recent free grant of a week's holiday every year.

THE "CENTROL" GAS-PENDANT.

IN the designing of gas-fittings, difficulty has generally been experienced in disposing of the taps, which, while being necessary adjuncts to the fittings, often prove obstacles to the carrying out of an artistic device. In the case of a three-light pendant, a tap has hitherto been placed on each arm; and much trouble has arisen in arranging them in convenient positions for turning on and off and at the same time preserving artistic lines. This defect is now remedied by Messrs. Best and Lloyd, who have patented an arrangement for controlling the supply of gas from the centre of the bottom of the pendant, to which they have given the name of "Centrol." It is shown in the accompanying illustration.



The taps are concealed inside the body, and are controlled by the bottom knob, which is seen from the under side, with the indicating peg at "off." A turn of the knob to the right opens the gas-plug of the arm A; the arrow on the knob then pointing direct to the arm—showing that the gas-way is open. A further turn towards the arm B allows gas to pass to this arm; and in a similar way the passage is opened to C. The arrow on the knob always points to the arm last turned on; and the further turning of the knob is arrested by the peg after the third light is ignited. The lights are turned off by moving the control knob in the reverse way; and when all the lights are out, the position of the peg on the knob is as shown in the illustration. The arrangement certainly lends itself to the production of artistic fittings, as evidenced by some which have been brought under our notice, and which show a considerable advance upon the old form of three-light pendant.

SOME "VICTOR" BOILER TESTS.

WITH a natural faith in the good old truth that "seeing is believing," Mr. Thomas Potterton, of Cavendish Works, Balham, S.W., has organized on his premises a series of practical tests of the well-known "Victor" gas-boiler. This is a good idea; and invitations to witness the tests have been largely taken advantage of, particularly by those who are engaged in the distribution departments of gas undertakings. Apart, too, from the actual tests—which may, of course, be reckoned as the main item of attraction—a visit to the works can hardly fail to be of interest; for Mr. Potterton has had a half-century or so of experience in connection with range and hot-water service fitting, and he is thus in a position to impart many useful hints to any who may seek his advice.

The tests referred to, it may be remarked, have been organized in as simple, but at the same time as thorough, a manner as possible, in order to demonstrate in a practical way the results that are obtainable under every-day conditions with "Victor" gas-boilers applied to domestic hot-water supply apparatus. That is to say, the various appliances that are operated upon have all been fitted for testing in a form which is considered the average proportion of circulation and delivery; there being some 16 feet run of delivery pipe from the apparatus to the measuring tank, and a run of about 8 feet of circulating pipes between the boilers and cylinders—the whole being unlagged. Hot-water apparatus constructed on this system, it should be pointed out, consists of a boiler and a cylinder—there being thus provided separate boiler and storage. When interviewing prospective users of "Victor" gas-boilers, gas officials have, of course, in the majority of cases, to deal with existing hot-water installations; and various questions are likely to arise as to the time taken in supplying hot water for scullery and bath purposes, as well as the temperatures at which water can be obtained. In this connection, the tests provide

much useful data. In the testing-room on the works there are to be found models of the different patterns of "Victor" boiler, fitted up with separate storage vessels, to ensure the tests commencing quite cold; while thermometers are provided to record the temperatures of the flue gases and of the water both as leaving the apparatus and as reaching the measuring tank. This permits of the heat losses being ascertained, as well as the actual efficiencies of the boilers.

To deal with a definite series of tests, we may take Wednesday afternoon last, when half-a-dozen practical men visited the works, and witnessed a thorough test of two "Victor" boilers. In fact, they took an active part in the test, for members of the party themselves looked after the reading of the thermometers and the gas-meter. On this occasion, the boilers used were Nos. 18 and 20, of the new pattern "D" series—a model of recent production; and the results of the tests are reproduced here, as it is felt that they should prove of interest to many who may not be able to pay a personal visit to the works. Those who study the figures will note how far they bear out two points on which Mr. Potterton lays much emphasis in connection with his system. These are the low flue temperatures of the boilers and the rapidity with which they supply hot water at a high temperature; the latter, of course, being a matter of considerable importance to householders.

Mr. Potterton draws attention to the fact that, with the separate boiler and storage apparatus, like the "Victor," the heated water is not drawn off from the boiler and circulating pipes, as the cold inlet is connected to the bottom of the storage, which accounts for the temperature of the first bath in the following test of No. 20 Boiler being somewhat less than that of those following, any quantity of which, with this commencing temperature, and using 20 cubic feet of gas, can be had, consisting of 20 gallons of water at 113°. This, he says, shows a running efficiency of 420 B.Th.U.

PARTICULARS OF TESTS.

No. 18 "Victor" Boiler, supplying a 20-Gallon Bath, with a Consumption of 20 Cubic Feet of Gas—Noting also the Temperature at which Hot Water can be Obtained, such as would be required for Culinary Purposes.

Water temperature at starting, 71°.

Outside temperature, 79°.

Gas consumption, 34½ cubic feet per hour.

		Flow. Deg. Fahr.	Flue. Deg. Fahr.
Gas lighted—	3.45 p.m.	71	—
	3.50 "	92	128
	3.55 "	137	144
	4.0 "	146	154
	4.5 "	150	156
	4.10 "	151	161
	4.15 "	152	164
Gas turned out	4.19½ "	156	168

20 cubic feet of gas consumed.

20 gallons of water drawn into the measuring tank.

Hottest water, 152°.

The whole in bulk, 110°.

Test of No. 20 "Victor" Boiler (the largest of the "D" Series), showing the Time Required in Supplying a Succession of Baths. This Boiler, having a Standard Consumption of 80 Cubic Feet Per Hour, will Supply Four 20-Gallon Warm Baths Hourly. The Consumption at the Test was at the Rate of 72½ Cubic Feet Per Hour.

Water temperature at starting, 71°.

	Gas Used. Cubic Feet.	Flow. Deg. Fahr.	Flue. Deg. Fahr.
Gas lighted—4.30 p.m.		71	—
	4.35	95	131
	4.40	135	149
	4.45	150	160
	4.46½	20	155
	4.46½		163
First bath completed.	4.54	28½ (total)	110°
Continuing—4.55		148	168
	5.0	154	172
	5.3	40 (total)	158
	5.3		174
Second bath completed.	5.10½	48½ (total)	113°
Continuing—5.15		154	178
	5.20	60 (total)	160
	5.20		180
Third bath completed.	5.27	68½ (total)	113°

The apparatus having reached its normal running capacity after first heating the boiler and contents, the test was continued with the lower part of the cylinder cut out, leaving 10 gallons in circulation, and the gas kept burning until the thermostat came into operation at 5.45 p.m., when water temperatures were registered as stated below.

	Gas Used.	Flow. Deg. Fahr.	Flue. Deg. Fahr.
5.27 p.m. ..		150	180
5.30 ..		156	180
5.35 ..		160	182
5.39 ..		163	183
5.43 ..		168	184
Gas cut down 5.45 ..	90½ (total)	168	178

by thermostat.

At 5.45 the water was run into the measuring tank, the hottest being 166°; 10 gallons in bulk registering 149°, and 20 gallons in bulk 127°.

per cubic foot, which is obtainable from a complete installation such as would ordinarily be used in a flat, allowing for heat losses in circulation and in delivery, though with the cylinder and pipes covered, somewhat higher figures would be recorded, in proportion to the effectiveness of the covering adopted. It must, however, be borne in mind that the heat taken up by the boiler and pipes at the commencement is not wasted, as, upon turning out the gas, the contents immediately circulate into the top of the storage vessel, and become available for use. Finally, it is pointed out that the figures quoted should not be confused with separate tests for boiler efficiency, which would show 90 per cent. of the heat utilized.

VOELKER MANTLE-MAKING AT THE FESTIVAL OF EMPIRE—CRYSTAL PALACE.



WE have pleasure in giving the accompanying illustration as representing the working exhibit of incandescent mantle-making which the Voelker Lighting Corporation, Limited, in conjunction with the South Suburban Gas Company, are showing in the south transept of the Crystal Palace at the Festival of Empire Exhibition. The exhibit includes the knitting of the ramie thread for the production of the mantle-stocking, the shaping of the mantles and the burning of them off—the whole demonstration giving the public a fairly good idea as to how Voelker incandescent mantles are made. The installation is a very compact and interesting one; and if we may judge from the crowds of people surrounding the exhibit when in operation, we should say it proves that the public are keen to learn something as to the actual manufacture of gas-mantles.

The Voelker Lighting Corporation ask us to say that they will be very pleased if any gas engineers visiting the exhibition will inspect the installation.

Reported Vertical Retort Litigation.—We understand that the owners of the Dessau vertical retort patents have issued a writ against the Manchester Corporation in connection with their use of the Glover-West system of continuous carbonization at the Droylsden works. We are further informed that the Corporation are protected by the contract agreement with the makers of the plant.

Association of Consulting Engineers.—Since the draft rules, drawn up by the Provisional Committee, were circulated in December last, a considerable number of meetings have been held to deal with points that have been raised by various engineers. Unfortunately, owing to the large number of interests to be considered and the complexity of the considerations involved, it has been found impossible to call a meeting until after the holidays. Meantime, Mr. Dykes, the Hon. Secretary, would be obliged if all letters were sent to his new address, 11, Victoria Street, S.W.

INVERTED INCANDESCENT GAS LIGHTING.

PROGRESS OF HIGH AND LOW PRESSURE.

At the Spring Meeting of Gas and Electric Engineers of the Province of Brandenburg, held in Berlin, Herr MAX SCHOLZ, a Director of the firm of Ehrich and Graetz, the manufacturers of the well-known "Graetzin" lamps, delivered a lecture dealing with the progress of high and low pressure inverted incandescent gas lighting, of which the following is a full translation.

When in 1905 Professor Drehschmidt first gave the expert testimony in favour of the inverted incandescent gas lighting system, and published the economical results then obtained with indoor burners, probably not one of the large audience had a conception of the great influence which the inverted system was to exercise at some future time upon the development of the general gas interests. The first inverted indoor burners were followed by the construction of outdoor lamps first of all installed in February, 1906, for public lighting purposes in the Invalidenstrasse at Berlin; and the outdoor lamps for low-pressure gas by those for high-pressure gas, which the City of Berlin was again the first to use for street lighting. It is a well-known fact that the high development of the gas lighting devices must be largely attributed to the eminent assistance rendered to the industry by the Berlin Municipal Gas-Works.

The success of the new gas lighting was not only fully recognized by the gas experts, but the public also proved its high interest, by the always increasing introduction of the inverted lighting for any number of commercial purposes. Whoever may have had any doubts as to the reality of these advantages will certainly have been thoroughly convinced of them by the opposition which the electrical people raised against the new illuminant. The advertisement which the gas industry made for inverted gas lighting by word and deed seems to have created a certain uneasiness in these circles; and they availed themselves of whatever opportunity offered itself to belittle the success obtained by their opponents. The article which Professor Wedding published in "Technische Rundschau," under the heading "Light Sources and the Illumination of Large Premises and Public Localities," must be considered as a new attempt to this effect. Although Herr Himmel, of Tuebingen, in the "JOURNAL OF GAS LIGHTING," has made it a point to go carefully into certain questions that were raised by Professor Wedding, he restricted himself mainly to discussing the possibility of suspending high-candle power lamps from overhead wires. There are, however, several other points which demand a more thorough investigation of the matter.

Although Professor Wedding had to recognize the progress made by gas lighting in consequence of the introduction of the inverted burner, he gave some figures relative to the economy of the inverted burner, which are not correct, and which are in opposition to those obtained by Professor Drehschmidt as early as 1906. Professor Wedding gives the consumption of gas per hefner candle as 1 litre per hour, while Professor Drehschmidt determined it to be about 0.87 litre per hefner candle. Professor Wedding only mentions that the advantages obtained have certainly been increased, without taking any notice, however, of the improved economy. He seems to be unaware of the progress made, especially in the development of low-pressure gas-lamps for outdoor lighting, which caused the City of Berlin to place an order for 500 to 600 candle power Graetzin lamps, with a specific economy of 0.69 litre per hefner, for public lighting purposes. Whenever Professor Wedding makes some concession to our industry, as the one "that the new high-pressure inverted gas-lamps have become a very dangerous competitor to electric arc lamps," it is always followed by a restriction, or by a so-called proof that, in spite of all, electric lighting must be considered as being superior. In one instance, Professor Wedding states that the amount of heat and carbonic acid developed by a 1000-candle power lamp corresponds to the process of breathing of a gathering of 40 to 50 persons. Suppose this calculation to be correct, does the Professor really believe any reception hall or room for 40 to 50 persons to be in existence which does not provide for ventilation? And does not Professor Wedding know that gas lighting causes an increase of ventilation? Can he be absolutely unaware of the experiments made by well-known experts in this direction, such as those made by Professor Vivian B. Lewes, of London? I would also call attention to the report published in 1905 by the Heating Commission of the German Gas and Water Engineering Association, regarding experiments made in 1904 with gas lighting in school rooms and drawing offices, and of which 1400 copies were sent to various municipalities, colleges, universities, &c.

Another publication to be considered is that of Mr. G. Stanley Cooper, regarding the influence of gas and electric light on the purity of atmospheric air; the *résumé* of the article being that the quantity of carbonic acid contained in the air of a room used by men increases much less when gas lighting is employed than when it is lighted by electric lamps. The explanation of this fact, observed so many times, must be found in the air being caused by the hot gas-flame to rise much quicker. The gas-flame thus causes a better air circulation and ensures a superior ventilation of the room by more quickly getting rid of the carbonic acid produced by the people in the hall. All these experiments prove over and over again that the old story of the injurious gas lighting, repeated by Professor Wedding in favour of his "hobby,"

belongs to the sphere of fairy tales. For indoor lighting, Professor Wedding feels much disturbed by the noise sometimes produced by gas-lamps. He forgets entirely that electric arc lamps also cause disagreeable noises, and that the noise produced by gas-lamps can easily be avoided, or at least be reduced to a minimum by reasonable attendance, which is not possible with electric lamps.

Professor Wedding agrees that for outdoor lighting the new high-candle power inverted gas-lamps must be suffered to take a place alongside of electric arc lighting, and that in future, when electric and gas lamps are in competition with each other, the question will no longer be which one of the two systems gives the highest candle power respecting the better illumination, but which of the two systems requires the least cost for maintenance and attendance. However, not only must the consumption of gas or electrical energy, the cost of new mantles or carbons, and the consumption of burners and globes be taken into consideration, but also the cost of attendance. The sentence pronounced by Professor Wedding is just what gas people want. In earlier days, the arguments of the electrical people were not the same. Then they said: Gas-lamps will never be able to show the same efficiency as electric lamps; now they say that the higher candle power and the better illumination need not be considered—for the reason, probably, that the electrical people must admit having been beaten in this respect. Professor Wedding, however, seems to rely upon the cost of attendance and maintenance being less with electric lamps; and if ever a supposition was erroneous, it is this one. It has not only been for the reason of the better light or the better illumination, but just on account of the lower cost of attendance and maintenance that cities like Paris and London decided to follow the Berlin example by introducing high-pressure gas-lamps—London, even, by substituting them for the existing electric system.

According to my calculation, based upon Berlin conditions, the yearly costs are as follows:

(1) Three-burner 2000-candle power high-pressure gas-lamp with two half-night and one all-night flame—

	Marks.
(a) Gas consumption, including cost of compressing	about 260
(b) Maintenance and attendance, including mantles required, globes, and repairing work	65
Total	325

Against
One 12-ampere arc lamp, with triplex arc lamp carbons, with two pairs of carbons, of approximately the same efficiency, all-night service—

	Marks.
(a) Watt consumption	about 310
(b) Attendance and maintenance	265
Total	575
Same arc lamp, with half-night service—	
(a) Watt consumption	about 160
(b) Attendance and maintenance	155
Total	315

(2) Three-flame 1000-candle power high-pressure gas-lamp with two half-night and one all-night flame—

	Marks.
(a) Gas consumption, including cost of compressing	about 130
(b) Maintenance and attendance, including mantles required, extra globes, and repairing work	65
Total	195

Against
One 8-ampere T.B. carbon lamp (of about 1000 candles), all-night service—

	Marks.
(a) Watt consumption	about 205
(b) Attendance and maintenance	265
Total	470
Same arc-lamp, half-night service—	
(a) Watt consumption	about 105
(b) Attendance and maintenance	155
Total	260

The electrical people not being in the position to reduce the intensity of individual lamps, we must compare two high-pressure gas-lamps of equal efficiency with one half-night electric arc lamp and one all-night electric arc lamp of equal efficiency. This comparison gives the following result:

	Marks.
1. Two 2000-candle power high-pressure gas-lamps per year	650
Two 2000 " arc lamps	890
2. Two 1000 " high-pressure gas-lamps	390
Two 1000 " arc lamps	730

The electric people will, of course, object by saying that the 12-ampere T.B. electric arc lamps will give more than 2000-candle power, and the 8-ampere arc lamps more than 1000-candle power. Before, therefore, drawing any conclusion out of the above data, I want to reply to these probable objections. According to the "Calendar for Electrical Engineers for 1911," electric arc lamps, with salted carbon and two phase connections, give the following efficiencies:

110 volts at 8 amperes = 1900 Hefner candles J	□
" 12 " = 3100 " " "	measured with clear glass globe

According to the special prospectus of the German General

Electric Company, dealing with " Intensities of Arc Lamps," some of these lamps show partly better results—viz.:

At 8 amperes = 1890 Hefner candles J □
 " 12 " = 3510 " " "

or if measured with opaline globes:

At 8 amperes = 1680 Hefner candles J □
 " 12 " = 3120 " " "

the light absorption by opaline globes supposed to be 25 per cent.

These figures refer to carbons giving a yellow-coloured light. In Berlin, however, only carbons producing a white light arc used, which, according to the "Calendar for Electrical Engineers for 1911," render about 25 per cent. less light. This 25 per cent. has, therefore, to be deducted from the above figures. We therefore obtain the following result:

8-ampere lamps = 1260 Hefner candles J □
 12 " " = 3340 " " "

The candle power of electric arc lamps in the lower hemisphere is therefore higher than that of high-pressure gas-lamps, with which I compare them. If we consider, however, that electric arc lamps have to be suspended much higher than high-pressure gas-lamps, it will be seen that the loss of light is much greater with them than with high-pressure gas-lamps; so that at about 4 ft. 6 in. above the road surface the illumination value obtained with high-pressure gas-lamps is, as a matter of fact, higher than that obtained with the seemingly more efficient electric arc lamps. In the following table, the illumination obtained by both kinds of illuminants is calculated upon the height of suspension used in the City of Berlin.

1000-Candle Power High-Pressure Gas-Lamp at 5.7 m. Height of Mantle; 8-Ampere Flame Arc Lamp with T.B. Carbons at 8 m. Height of Focus; Illumination 1.5 m. above Road Surface.

Candle Power.		Illumination.		Distance from Base of Column of the High-Pressure Gas-Lamps.	Distance from Base of Column of the Electric Lamps.
"J" High-Pressure Gas.	"J" Electric Flame Arc Lamps.	"E" High- Pressure Gas.	"E" Electric.		
N.K.	N.K.	Lux.	Lux.	Beneath the lamp.	
0° 780	731	44.6	17.4	0.75 m	1.17 m
10° 800	788	43.0	17.6		
20° 980	900	45.9	17.6		
30° 1050	1238	39.0	19.2		
40° 1100	1425	28.3	15.3		
50° 1080	1500	15.4	8.9		
60° 1079	1463	7.3	4.2		
70° 1050	1312	3.0	1.6		
80° 1000	1068	0.57	0.25		
90° 930	900	0	0		

2000-Candle Power High-Pressure Gas-Lamp, at 5.7 m. Height of Mantle; 12 Ampere Flame Arc Lamp (with Triplex Flame Arc Light Carbons) at 8 and 12 m. Height of Focus; Illumination, 1.5 m. above Road Surface.

"J" High-Pressure Gas.	"J" Electric Flame Arc Lamps.	"E" High-Pressure Gas.	"E" Electric Flame Arc Lamps 8 m. Height of Focus.	"E" Electric Flame Arc Lamps 12 m. Height of Focus.	Distance from Base of Column High-Pressure Gas.	Distance from Base of Column Flame Arc at 8 m. Height of Focus.	Distance from Base of Column Flame Arc at 12 m. Height of Focus.
N.K.	N.K.	Lux.	Lux.	Lux.	Beneath the lamp.		
0° 1400	1365	79.5	32.2	12.4	0.75 m.	1.17 m.	1.89 m.
10° 1550	1470	82.7	32.6	12.6	1.5 "	2.34 "	3.78 "
20° 1800	1680	83.8	32.5	12.5	2.4 "	3.77 "	6.09 "
30° 2100	2213	77.5	33.9	13.0	4.2 "	6.5 "	10.5 "
40° 2150	2625	54.9	27.9	10.7	5.0 "	7.7 "	12.5 "
50° 2170	3255	30.8	19.2	7.4	7.3 "	11.2 "	18.1 "
60° 2130	2730	14.5	7.7	2.9	11.6 "	17.9 "	28.9 "
70° 2100	2438	5.9	2.9	1.1	23.5 "	36.4 "	58.8 "
80° 1975	2100	1.1	0.5	0.2	..	..	..
90° 1881	1680	0	0	0	..	..	..

I think it has been proved by the above calculation that lamps of equal value have been compared. The total cost for attendance and maintenance of a 2000-candle power electric arc lamp is therefore about 30 per cent., and that of a 1000-candle power electric arc lamp about 85 per cent., higher than that of high-pressure gas-lamps of equal values, without considering the well-known advantage that with gas-lamps a thoroughly uniform illumination can be obtained during night-time, while when electric lamps are used, in order to obtain a saving, every second lamp must be extinguished, which, of course, causes dark patches on the road surface. The figures on which my calculation is based are as follows: Gas consumption, 10 pfs. per cubic metre; cost of compressing the gas according to the calculations of Herr Bremer; attendance and maintenance according to practice. For electricity, 12.85 pfs. per kilowatt hour; attendance and maintenance according to the contract with the City of Berlin. These figures are taken from the Budget of the City of Berlin. It is remarkable to note the high cost for attendance and maintenance of electric lamps, which is about four times higher than that for high-pressure gas-lamps.

The table shows clearly the enormous economical superiority of high-pressure gas over electric arc lighting on the base of equal intensity. Anyone who still is sceptical regarding these data, should apply to the Berlin Municipality; and I am fully convinced he would receive full confirmation of the above.

Professor Wedding pretends it to be an advantage that electric arc lamps can be suspended from great heights, which is not possible with gas-lamps, on account of the necessary attendance by workmen, &c. It is well known, however, that what the Professor calls an advantage is just the contrary, as high suspension means high cost of maintenance for electric lamps also, and last, but not least, considerable loss of light.

If Professor Wedding calls the high suspension an advantage, he is making a virtue of necessity. High suspension really is an absolute necessity for electric arc lamps, in consequence of their distributing their light at a much less favourable angle than high-pressure gas-lamps. This is clearly shown in the accompanying diagram showing the light curves of a three-burner high-pressure gas-lamp and of an ordinary electric arc lamp.

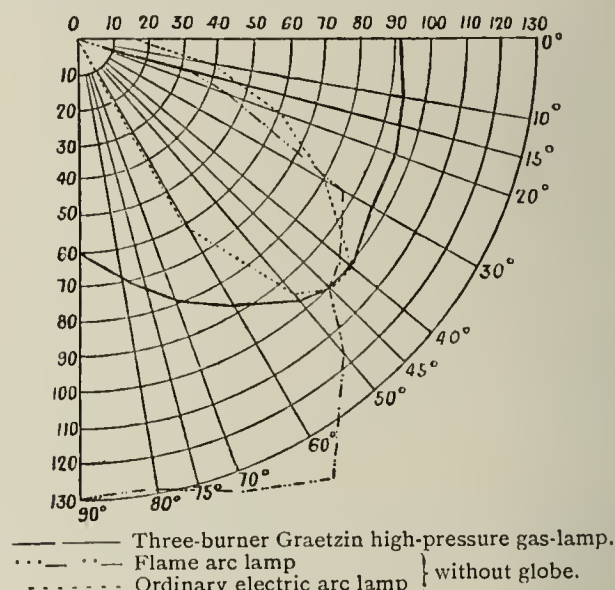


Fig. 1.

High suspension is, furthermore, a necessity in consequence of the considerable glare having proved to be dangerous to the eyes of pedestrians and to the traffic, and which is only caused by the small focus peculiar to electric lamps. The best proof of the above is the fact that the electrical people suspended their lamps in the Friedrichstrasse, Berlin, about 1½ m. lower than before—and this in consequence of the competition of high-pressure gas-lamps in the Königgrätzerstrasse. We have the advantage on our side of the more favourable light distribution and of the large incandescent surface of the mantles, which does not cause any remarkable glare. So we may remain closer to the road surface, and thus avoid the high cost of installation and the greater cost of maintenance and attendance peculiar to electric lamps.

Professor Wedding furthermore discusses the possibility of distance lighting and extinguishing. It is well known that all the high-pressure gas-lamps used in the City of Berlin are lighted from a central station, and extinguished in the same way; and there are appliances in existence allowing the same to be done with ordinary low-pressure gas-lamps. It will, however, be interesting to mention that we have succeeded in installing a distance lighter for high-pressure gas-lamps which enables two mantles to be extinguished in a three-burner lamp and one in a two-burner lamp at about midnight—thus dispensing with special men for the midnight service. This distance lighter enables all the lighting and extinguishing work to be done from a central station. No other men need be sent out, except one or two for controlling the entire system—the number required depending, of course, upon the total lamps in use.

Whatever Professor Wedding may say in the course of his further explanations regarding the balancing of advantages and disadvantages of one or the other system, I am thoroughly convinced that it can only be of advantage to gas interests.

I cannot leave the subject without mentioning that very good solutions of overhead wire suspension for gas-lamps have been arrived at. The following illustration shows the arrangement of high-pressure gas-lamp suspension made by the Municipal Gas-Works above the central promenade in the Greifswalderstrasse, Berlin.

I also want to refer to a circular sent out by a Commission of Municipal Authorities, which contained, among other questions, one asking why a certain city gave preference to some other system of lighting than electricity. The question was answered by a prominent gas-works manager, who stated that he preferred gas lighting to electricity for the following reasons: (1) Greater uniformity of illumination; (2) more favourable light distribution; (3) quieter lighting effect; and (4) more economical working. As soon as the public arrive at the same opinion, the gas industry will be able to brave, in all tranquillity, any attacks of its electric competitors.

I now come to the latest novelty among illuminants—high-candle power lamps for low-pressure gas. The initiative for the

construction of these lamps was given in the advertisement of the City of Berlin for the purchase of 500 lamps of 500-candle power each, which led to the construction of our present 600-candle power low-pressure gas-lamps, of which 500 are in successful use in the City of Berlin. In May of last year, we introduced into the market a three-burner low-pressure lamp of 1000-candle power, which met with the full approval of all interested in gas lighting. Small defects of a constructive nature have since been overcome. All gas undertakings now using our improved 1000-candle power lamp have intimated that they are highly satisfied with it.

The 1000-candle power lamps having given a satisfactory solution of the principle of pre-heating gas and air, we have also introduced a single-burner lamp of about 350-candle power and a two-burner lamp of about 700-candle power, in order to create uniform patterns. The single-burner lamp has another very remarkable advantage. Everyone will have noticed over and over again, when passing outside shops using two-burner or three-burner inverted gas-lamps, instances where one or two mantles of these lamps were broken—only one being in good order. If instead of the three-burner lamp a one-burner lamp of about the same efficiency had been used in the same place, it may be relied upon that the shopkeeper would have taken the necessary care to keep it in good order, as otherwise he would not have any light at all. This is an important argument. Gas-lamps are not so difficult to maintain as our competitors like to pretend; but wherever irregularities are to be noted, they must doubtless be attributed to nothing but carelessness.

The light distribution of 350, 700, and 1000 candle power lamps is shown in fig. 3. It must be acknowledged that the curve is uniform, which again proves our pretension of better light distribution to be correct.

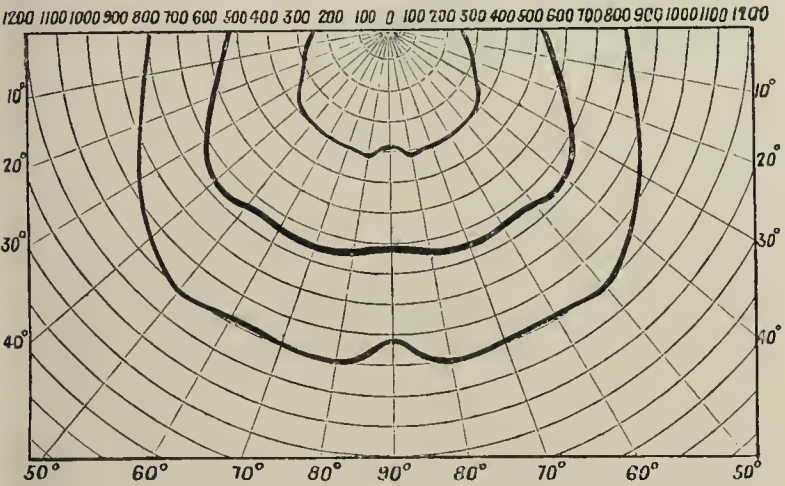


Fig. 3.—Curves from 350, 700, and 1000 Candle Power Graetzin High-Candle Power Low-Pressure Gas-Lamps.

The specific economy of these lamps is about '61 to '64 i per candle power. The exact figures are as follows:—

			Lighting Intensity.	Consumption per Hour.	Economy.
One-burner	300 c.p. lamps .	350	Hefner candles	225 I	0'64
Two-burner	600 c.p. „ .	650	„ „	400 I	0'62
Three-burner	1000 c.p. „ .	1012	„ „	620 I	0'61

Although these three patterns form a remarkable step forward toward the absolute perfection of gas illuminants, it must be admitted that they cannot yet be considered to be an absolute equivalent for high-pressure gas or compressed air illuminants for higher efficiencies. We are constantly studying the problem of obtaining higher efficiencies in low-pressure gas, and we have now succeeded in producing a three-burner low-pressure lamp which, according to the curve in fig. 4, will produce about 1650 Hefners with a gas consumption of 975 litres, which corresponds to a specific efficiency of 0'59 litre per Hefner candle. Thus this

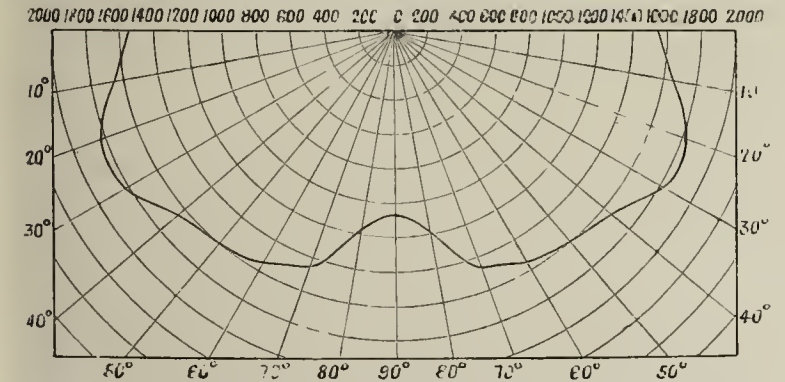


Fig. 4.—A Curve from a 1650-Candle Power Graetzin High-Candle Power Low-Pressure Gas-Lamp.

lamp shows the specific efficiency which Professor Wedding, in his article of January last, indicates as normal for high-pressure gas-lamps. Supposing that the average specific efficiency of high-



pressure gas or compressed-air lamps to be about 0'5 litre per Hefner candle, it must be acknowledged that, by the construction of this lamp, we have come rather close to the desired result.

I need not specify the many advantages which may be derived from the construction of low-pressure gas-lamps producing the same intensity available through the use of high-pressure gas only, and the enormous economies that would especially be made in the cost of installation.

You see that progress has been made; and I hope to be able shortly to report further progress. It is, however, of the utmost importance to us to be sure of your assistance in the future in the same way as you rendered it in the past; and I firmly believe that you will continue to give it in the interest of a continuous and prosperous development of the gas industry.

STREET LIGHTING BY KEITH LAMPS IN TURIN.

About eighteen months ago, the Turin Gas Company carried out with complete success, and for the first time in Italy, the lighting of the large spinning-mills of Tollegno, in the Regio Pareo, with suspended Keith lamps, each of 500-candle power. The gas is compressed to 56 inches water pressure; and the burners are inverted. We learn from a local paper just to hand that the Company followed up this success on Monday evening last week by lighting two of the principal thoroughfares—the Vie Lagrange and Carlo Alberto—on the same system. The plant consists of 55 lamps, of 500-candle power, in the two streets named, and four with lyre suspensions, each of 1500-candle power, on the Piazza Carlo Alberto. The main serving the lamps is rather more than 1¼ miles in length. The lamps are lighted and extinguished automatically by means of pilot-jets inside them. The gas is compressed by a small Keith rotary compressor and a gas-engine; a reserve compressor, with an electric-motor, being fixed in a suitable building in the Gas Company's garden in the Via Lagrange. The light produced is stated to be "perfectly fixed, continuous, and silvery, without the least shade;" and the cost is only one-fourth or one-fifth that of the ordinary electric light. The plant was supplied by a Paris firm to the order of the Municipality, by way of experiment for a year; but the commune will only have to bear the expense of the gas—the machinery, main, &c., being provided by the Company.

Gas-Works Bye-Products for Generating Electricity.

Discussing the question of the use of internal combustion engines, working on the Diesel principle, at the meeting of the Incorporated Municipal Electrical Engineers, Mr. H. L. Howard, Electrical Engineer of Barking, referred to the question of the fluctuation of fuel costs, owing to the various influences affecting the oil market. He spoke hopefully on the point, in view of the extension of the sources of supply. Among other factors, bearing on the question, he remarked: "There is the possibility of using the bye-products from gas-works—gas-oil tar, and gas-tar oil. The former is the bye-product from carburetted water-gas plants, where gas oil is used to enrich the gas for illuminating purposes. It has a calorific value of about 16,500 B.Th.U. per lb., and is being extensively used on the Continent. The latter is the bye-product from the distillation of gas tar. The author recently made a careful inspection of some plants using gas-oil tar, including a large double-acting tandem four-cycle engine, and a twin-cylinder horizontal two-cycle engine—the sets working with a 10 per cent. addition of crude petroleum. He was perfectly satisfied as to the practicability of using such fuel; so much so that a 600 B.H.P. engine is now being built to his specification by the Diesel Engine Company, to run on either petroleum residue or gas-oil tar, and will be in commission this autumn."

COKES AND OILS FOR MAKING WATER GAS.

This subject was dealt with by Mr. J. H. WARNICK, of Omaha (Neb.), in a paper that he read at the seventh annual meeting of the Iowa District Gas Association. The following are some extracts from it.

In a paper published by Mr. W. H. Fulwiler in 1909, he very ably discussed the constituents and properties to be considered in choosing a good gas coke. Accordingly, we will endeavour to study the materials that represent the backbone of water-gas manufacture as follows: (1) The constituents and properties to be considered in choosing a good gas coke, and the bearing of the properties, when considered, to give a minimum cost and the best machine results. (2) The sources of supply. (3) Oils available for water-gas manufacture.

In choosing a good gas coke, one should bear in mind the following percentages: (1) Of fixed and volatile carbon; (2) of the composition of the ash; (3) of moisture; (4) of sulphur; (5) size of the coke and physical properties with reference to handling.

With regard to the percentage of fixed and volatile carbon, primarily generator fuel is used as a source of carbon; therefore its value depends upon the amount of fixed carbon obtained for a minimum cost, other things being equal. In classifying generator fuel, the ratio of the fixed to the volatile carbon has been used as a basis. The best generator fuel has from 21 to 32 times as much fixed as volatile carbon.

The ash is detrimental in two ways. First of all, it replaces carbon; secondly, it necessitates more frequent cleaning, and consequent loss in capacity on the machine. Theoretically, 1 per cent. of ash is equivalent to 2 per cent. of carbon in waste; and the composition of the ash is very important from the standpoint of operation. The gas maker should aim to get an ash with a high fusing point, for if this is too low, the ash will run down over the grate-bars and form so-called "icicles," hindering the cleaning of the fires, and increasing the manufacturing labour cost. There is also danger of the molten ash coming in contact with the iron parts round the fire-doors and fusing the grate-bars, causing them to melt—thus necessitating more repairs on the machine.

The best analysis of ash shows about equal proportions of silica and alumina, a minimum amount of calcium, and the lowest possible percentage of iron, magnesia, and alkalis. An undesirable ash analysis would show silica to the extent of about 30 per cent., iron above 15 per cent., calcium above 10 per cent., and alkali and magnesia above 3 per cent. Iron is the usual flux appearing in the ash which tends to reduce the fusing-point. A comparison of good, fair, and bad analyses of ash would be as follows:

Constituents.	Good, per Cent.	Fair, per Cent.	Bad, per Cent.
Silica (SiO ₂)	54.67	46.23	46.40
Alumina (Al ₂ O ₃)	41.95	31.93	16.45
Iron oxide (FeO)	trace	14.54	18.15
Lime (CaO)	1.82	5.04	11.80
Magnesia (MgO)	1.46	2.26	4.63

Moisture is often a big factor in accounting for the discrepancies between the weight shipped and weights as charged to the generators. Some coke has been received with as high as 12 to 14 per cent. of moisture. After storage for a time, the moisture usually decreases to about 4 per cent. or less when charged to the generators.

Sulphur is detrimental, as it must be removed, and consequently influences the purification results. About one-half of the sulphur is volatile; the other half goes into the gas. The best analysis should not show more than 1.1 per cent.

The size of the coke has an influence on the amount of acid in the gas, and consequently on candle power efficiencies. The quantity of breeze caused by handling, due to the physical properties of the coke, is important, as there is always a certain amount of loss due to it; and this should be reduced to a minimum.

The author then gave a number of analyses showing what might be expected from the various American sources of supply, and pointed out that the best cokes come from the fields of West Virginia and Pennsylvania.

Turning to the oils available for manufacturing water gas, Mr. Warnick said practically all gas oils contain paraffins and benzines. Broadly speaking, the larger the percentage of paraffins, the better the oil for making water gas. Benzines are the oils distilled off from 302° to 572° Fahr.; and paraffins are those distilled from 572° to 700° Fahr. Sulphur is a detriment, and should be a minimum. Having quoted some analyses from a paper by Mr. J. L. F. Cheetham, on "The Ultimate Analysis of United States Gas Oils," the author showed that the paraffins and benzines exist to a more or less extent in all the oils of the country, except those from California. As all the compounds have never been separated out, the actual percentage is not known. The petroleum of the Appalachian field consist chiefly of the paraffin series, with some benzines. The oils of the Ohio and Indiana fields are principally of the paraffin series also, but to a lesser extent than those of the Appalachian field, and contain more of the benzol series. California oil consists chiefly of benzols with no paraffins.

Texas oils contain but little of the paraffin or benzol series. The oils from Kansas differ widely in composition from those of any other section. The very light oils are composed to a great extent of members of the paraffin series; the heavy oils, however,

contain but a small percentage of these. The Louisiana field is similar to the Texas field.

In conclusion, the author pointed out that oil from each field must be handled differently in the machines. With Kansas oil, at Omaha they had the best oil efficiencies, carrying about 1330° Fahr. at the base of the superheater, and from 1250° to 1300° Fahr. at the top.

OPERATING A WATER-GAS PLANT.

One of the papers read at the annual meeting of the Pennsylvania Gas Association was on the subject of "The Method and Cost of Operating Water-Gas Plant;" the author being Mr. J. W. MURDOCK, of Bethlehem (Pa.). He explained that the plant was not equipped with modern appliances, and that the cost of operating it included materials, purification, repairs, and cost of maintenance; also the expense of pumping 60 per cent. of the output to the distributing station (about 1½ miles away), and a proportionate share of the manager's and the superintendent's salaries. He then gave the following particulars.

The plant consists of one 6-foot and one 5-foot "straight run" water-gas set of the United Gas Improvement Company. The 6-foot machine was rebuilt in 1904, and was then changed from one of the Springer type. We operate these machines on the up and down run principle, as follows: We make three straight runs up and reverse each fourth and make one down run. This is made as follows: We close the valve between the condenser and the wash-box, open the clean-out doors at the bottom of the generator, start the blower, open the blast valve or carburettor between the generator and the superheater, and close the stack-valve. We then blow the fire downwards until the full flame comes out of the clean-out doors, showing that we have a solid bed of fire in the generator. This down-blow usually requires from eight to twelve minutes. The blast is now shut off, stack-valve opened, clean-out doors closed, blast again turned on, and the "straight-run" method resumed. It requires from two to three minutes' blowing-up to get the fire to the proper temperature to admit oil and steam. While this is taking place, the valve between the wash-box and the condenser is opened. This valve is closed at the beginning of the down-blow, to prevent the seal in the wash-box from being broken, and thus forcing "blue" gas into the relief holder.

We have recently changed our method by making each third run a down-blow instead of each fourth run; and we find our results are much better, because our down-blow time is reduced from eight to twelve minutes to from five to ten minutes. We find this method of operating the type of machine in question most economical, because the down-blow fixes the fire thoroughly in the generator, frequent cleaning of which is not necessary—one cleaning of the fire being sufficient for a 12-hour run. The average make during this period is 20,000 cubic feet per hour.

The economy obtained in operating by this method is clearly shown by the following figures, which are the results of working during the year 1910:—

Gas made	78,126,000 cub. ft.
Generator coal used	3,242,884 lbs.
Boiler coal used	1,727,970 "
Gas oil used	295,533 gallons.
Average generator coal used per 1000 cubic feet of gas	41.50 lbs.
Average boiler coal used per 1000 cubic feet of gas	22.11 "
Average gas oil used per 1000 cubic feet of gas	3.78 gallons.
" heating value per cubic foot of gas	600 B.Th.U.
" illuminating power	22 candles.

No barometer or temperature corrections were made in the above figures of the total amount of gas made.

The material we use in purifying is the ordinary iron oxide mixture; and our plant consists of three boxes, 17 ft. by 11 ft. by 3 ft. 6 in. deep. Our method of revivifying *in situ* is a departure from the ordinary practice, and gives us very good results. We first close the gas-inlet valve between the exhauster and the relief holder, open the air-inlet valve between the gas-valve and the exhauster, so as to admit air to the exhauster, and then close the valve on the outlet from the purifying-box, remove the caps from the covers of the boxes, and blow air through by means of the exhauster. The average time required each day for blowing air through the boxes is from two to three hours. This is done at night by the night fireman while no gas is being made; and therefore it does not cause any additional expense.

International Photometrical Congress.—There is a meeting of the Congress being held this week in Zurich—starting to-morrow afternoon at 2 o'clock and continuing the following days. The arrangements for the meeting have been made by M. Th. Vautier, of Lyons. Mr. J. W. Helps is not going to Zurich on the present occasion as representative of the Institution of Gas Engineers; and Dr. Harold G. Colman has been nominated in place of Mr. Helps. Mr. W. J. A. Butterfield (the reader of a paper at the Congress) is acting as substitute for Mr. Charles Carpenter, who is unable to leave England just now. The paper to be submitted by Mr. Butterfield is a joint contribution by himself, Dr. Haldane, F.R.S., and Mr. A. P. Trotter, M.Inst.C.E., entitled "Corrections for the Effects of Atmospheric Conditions on Photometric Flame Standards."

THE CONTINUOUS PURIFICATION OF GAS IN
CLOSED VESSELS.

An American Process.

A recent number of "Progressive Age" contained the following article by Mr. J. G. O'NEILL, the Chief Chemist to the Empire Coke Company, of Geneva (N.Y.), describing a process for the continuous purification of coal gas from hydrogen sulphide in closed vessels.

A successful continuous process for purifying coal gas from hydrogen sulphide in closed vessels, for use in American coal-gas plants, must be simple in operation, economical of labour and material, and easily adapted to our present practice of coal gas manufacture. The following process which I have discovered is remarkably well adapted to our use, not only because it meets all these requirements, but also because practically every coal-gas plant in the United States contains an ammonia concentrator, for making concentrated ammonia liquor, and every plant contains pumps for pumping gas liquor and gas-scrubbers. This apparatus, with the addition of a suitable liquor cooler, constitutes all the machinery required for carrying out my process.

Just above the lime leg of the ordinary continuous ammonia concentrator, we have generally eight or nine washing-rings, or better called fractionation-rings. Their real purpose is to give at the top of the machine a vapour carrying a large percentage of ammonia gas. The weak liquor, after being fed into the top washing-ring, is heated up by the vapours which are caused to bubble through it, and then flows into the next lower ring.

Let us see what chemical change takes place in the liquor in the first ring—in what way the liquor coming from the ring differs from the original gas liquor going into the ring. We find that the outflowing liquor has lost to the ammonia condenser about 20 per cent. of its free ammonia, and about 90 per cent. of its hydrogen sulphide. We now tap this ring near its overflow, so that we can draw off any quantity of liquor desired, and considerably increase the amount of liquor flowing into this ring—drawing off this increase of liquor through the pipe near the overflow without changing the actual amount of liquor being distilled. The liquor flowing from the ring through the pipe which now taps it shows a loss of only about 5 per cent. of ammonia to the condenser, and about 80 per cent. loss of hydrogen sulphide. The liquor from this pipe is now cooled to below 86° Fahr., and is pumped through the first scrubber; taking the place of the weak ammonia liquor wash usually employed. The result of washing the unpurified gas with this treated liquor is as follows. The quantity of gas flowing through the scrubber was 35,000 cubic feet per hour.

Grains Hydrogen Sulphide per 100 Cubic Feet in Crude Gas.	Grains Hydrogen Sulphide per 100 Cubic Feet Left in Gas after Using Treated Wash.
417.4	104.2
422.0	117.0
413.1	104.2
486.5	122.4

On an average, I found 150 grains of hydrogen sulphide eliminated per gallon of liquor wash.

The following is the composition of the weak liquor before and after washing the gas:

	Grains Free Ammonia per Gallon.	Grains Hydrogen Sulphide per Gallon.
Ordinary weak gas liquor before heat treatment	248.0	115.9
Weak gas liquor after heat treatment	195.9	96.1
Treated liquor after being used for washing gas	241.1	25.4
	189.7	21.0
	255.5	221.9
	218.8	178.5

To ascertain the amount of hydrogen sulphide taken out of the crude gas by the ordinary liquor wash, which had not been subjected to treatment, the liquor was analyzed before and after the scrubber; and the following results were obtained (from testing the gas before and after washing scarcely any difference was found):

	Grains Free Ammonia per Gallon of Liquor.	Grains Hydrogen Sulphide per Gallon of Liquor.
Ordinary weak gas liquor to scrubber	231.8	110.9
Weak liquor coming from scrubber after washing crude gas	209.8	93.0
	242.4	122.7
	225.0	119.0

Very little hydrogen sulphide is taken up by the ordinary liquor wash which has not been subjected to heat treatment. By properly regulating the flow of heat-treated liquor to the scrubber, all the hydrogen sulphide can be eliminated from the crude gas. The gas is first washed with this liquor, and then with the regular fresh-water wash.

The very surprising fact of the whole process is that the weak liquor, after being exposed to this treatment and used to scrub the unpurified gas, is now able to take up almost twice as much hydrogen sulphide as it was in its original state.

The most efficient cooler to use is the tubular cooler, made from steel plate and tubes. In this way we can utilize the heat

from the hot liquor in warming-up the cold liquor going to the still, and at the same time cool the liquor for use in the gas-scrubber. In addition to this, a cooling-coil, with water spray, will be necessary during the summer weather. It is important that the wash liquor should be cooled to at least 86° Fahr.; and better results are obtained if it is kept below this temperature. If the liquor wash is not cooled to at least 86° Fahr., the wash becomes a detriment, as the reaction is entirely a temperature reaction, and at temperatures above 86° Fahr. the liquor gives off hydrogen sulphide instead of taking it up.

Very little additional steam is required in the ammonia machine, since the extra quantity of liquor acts as a condenser to the ammonia vapours, and a stronger concentrated ammonia liquor is obtained. The additional impurities thrown into the ammonia condenser from purifying the gas have no effect on the crude concentrated ammonia, as they are always saturated with them.

The zone of treatment for the weak liquor may vary with different types of ammonia stills. It may be found necessary with some types to include the two top washing-rings for treatment purposes. These conditions will undoubtedly have to be worked out for each still. The results of the treatment may also vary slightly with the temperature of the liquor feed, volume of feed, and manner of operating the still.

Unfortunately, I have been unable to work with liquor containing more than 4 per cent. of ammonia, but, judging from the way in which the absorption of hydrogen sulphide runs up from a weaker to a stronger solution of ammonia, I believe that, working with the ordinary gas liquor of about 1 per cent. ammonia content, a gallon of liquor will purify 100 cubic feet of gas—the only cost of purifying it being an extremely small quantity of steam. Nowhere in the process is there the least chance for loss of ammonia.

The heated liquor wash also absorbs considerable carbon dioxide from the gas; but, owing to the fact that the gas contains relatively a large amount of carbon dioxide, and the liquor absorbs much less of it than it does of hydrogen sulphide, I have found that the absorption of carbon dioxide from the gas will vary from 10 to 25 per cent. of the total carbon dioxide in the gas.

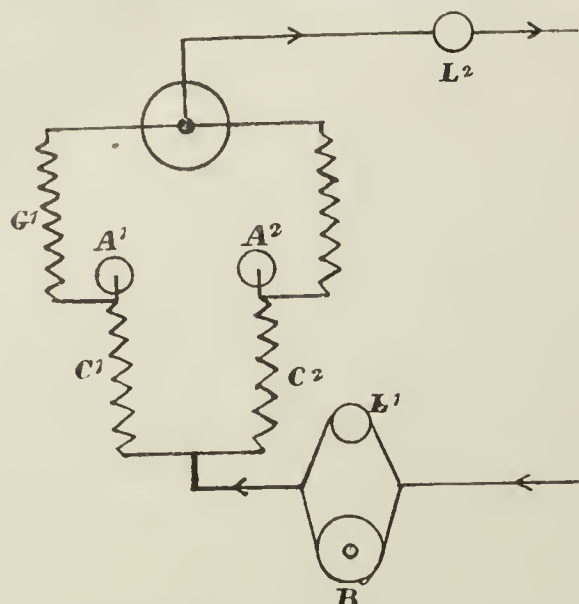
By means of a special apparatus, I have succeeded in obtaining this same liquor wash without being connected in any way with the ammonia still—obtaining the same results as stated above, and regenerating and using over and over again the same liquor. I obtain the hydrogen sulphide as a gas free from ammonia; and it can be ignited and burnt exactly the same as illuminating gas, producing sulphur dioxide. By oxidizing this to sulphuric acid, more than sufficient acid can be made to convert all the ammonia from the gas plant into ammonium sulphate. We have at our disposal the complete raw materials for making sulphate of ammonia, and I believe that the future holds very many interesting processes along this line.

DETECTION OF INFLAMMABLE GAS IN AIR.

At the Meeting of the London Section of the Society of Chemical Industry held at Burlington House on Monday, June 12, two papers were presented dealing with the detection of inflammable gas and vapour in air. Mr. E. Grant Hooper, Chairman of the London Section of the Society, presided. A paper by Mr. H. de Mosenthal, on "Cotton and Nitrated Cotton" was taken first, and occupied a good deal of the time available, so that the two papers referred to were not read in full.

The first of the papers, by Messrs. A. Philip and L. G. Steele, was on "A New Form of Automatic Detector of Inflammable Gases and Vapour." A brief description of the detector was given by Mr. Philip, who showed the instrument in operation. He pointed out that most detectors of inflammable gas or vapour depend on the principle of the Davy lamp; but others depend on the effect of the gas on platinum wire or platinum black. The activity of the platinum, however, diminishes in the course of time. If the atmosphere contains much gas, the wire fuses; or if platinum black is used, its surface becomes fused, and so is rendered inactive. The new apparatus which the authors had arranged embodied a device for guarding against over-heating of the platinum wire used. This device depended on the sensitivity of a relay. The apparatus was intended to act as an automatic indicator of the presence of inflammable gas or vapour in air, and it gave a warning signal when the proportion of gas or vapour amounted to about one-fourth of that which corresponded with the lower explosive limit of the mixture of the particular gas or vapour and air. The air to be tested was drawn through a pipe from the spot where inflammable gas or vapour was likely to collect by means of a pump, and passed in a regular stream over a platinum wire enclosed in a tube, through which an electric current was passing. If the air contained more than the small proportion named of inflammable gas or vapour, the heating of the wire thereby resulted in the relay making contact, so that a bell was rung and a valve opened by which the stream of air was made to by-pass the platinum wire until it had cooled, whereupon the original circuit was re-made. In the original circuit, which remained closed so long as the air circulating over the wire contained less than the stated proportion of inflammable gas or vapour, there was a white glow lamp, which remained alight so long as the circuit was unbroken. But

when the platinum wire became heated by inflammable gas or vapour, the original circuit was broken, the white lamp went out, and a red lamp on the fresh circuit was lighted.



The general arrangement of the circuit is shown in the preceding diagram, in which L^1 is a lamp of low resistance, B is a circuit-breaker which has the effect of giving a pulsating effect to the current and the light in the lamps, C^1 and C^2 are platinum coils over the latter of which only the air to be tested is circulated, A^1 and A^2 are the enunciators, G^1 and G^2 are the coils of the relay, and L^2 is a lamp for altering the voltage as required according to the voltage of the electric supply with which the apparatus is connected. The details of the relay by the action of which the current was transferred from the white to the red lamp and the valves on the air circulation changed and the signal bell rung, were shown in a second diagram, which, with some other explanatory diagrams, was like the first thrown upon the screen. The air circuits are not shown, but are arranged so that the coil C^2 is kept from contact with the outer air by means of a glass tube; while the air to be tested by-passes it as soon as the coil becomes heated to the extent necessary to give the indication of the presence of inflammable gas. As soon as the wire has cooled again, the air to be tested is once more circulated over it, and the warning is repeated. Thus the apparatus continues to give intermittent signals of the presence of inflammable gas or air until the accumulation has been removed by pumping out or better ventilation.

The authors said the apparatus as arranged was not so sensitive to small proportions of inflammable gas or vapour as the flame cap of the Clowes detector, which consists of a small safety lamp consuming hydrogen from a high-pressure cylinder; but by the use of a sensitive differential galvanometer the apparatus could be rendered as sensitive as the flame cap detector. The apparatus had been installed in petroleum-carrying vessels belonging to the Admiralty at Portsmouth, and had given complete satisfaction. It was fitted permanently to such ships, and once installed worked satisfactorily, though in the first instance the arrangements had to be modified to suit the voltage of current available, and the circulating pump, &c. On this account, the authors, had had considerable difficulty in arranging the demonstration apparatus in the lecture hall at Burlington House; but ultimately they had succeeded in demonstrating there the working of the apparatus on a mixture of air with small proportions of coal gas.

The second of the papers was on "Methods of Testing Inflammable Gas and Vapour Detectors," by Messrs. A. Philip and Stenhouse; and a brief *résumé* of its contents was given by the latter gentleman. He said the paper described different ways of making inflammable mixtures and of detecting them. The methods of detection comprised those depending on special forms of safety lamps and those relying on the catalytic action of platinum or palladium. It was essential that, during each experiment for testing the efficiency of different detectors, the composition of the air should remain constant. The detectors might be tested by either of two methods, the first of which might be termed testing in static mixtures. According to this method, a measured volume of inflammable gas or vapour was introduced into the air and was mixed with it by some stirring device. The apparatus was then introduced through a suitable door, and the composition of the mixture was ascertained afresh. This method had been thoroughly worked out by Dr. Clowes, who had used it in connection with his hydrogen-flame detector. The objections to it were that the preparation of the atmosphere to be used occupied considerable time, and that the atmosphere was subject to changes in composition—momentarily, while the apparatus was being introduced into it, and afterwards continuously, owing to the consumption of oxygen by the lamp flame. The second method of testing detectors was termed by the authors the kinetic method. According to it a uniform stream of the mixture of air and gas was passed by means of a pump through a chamber in which the detector was placed. The mixture of air with inflammable gas or vapour on which the tests were to be made could be either: (1) Air and coal gas taken from the ordinary supply; (2) air and hydrogen prepared electrolytically; (3) dry air saturated with a volatile organic liquid

at a fixed temperature; (4) a store of mixed gas and air contained in a gasholder; (5) gas withdrawn from a high-pressure cylinder. The methods of making these mixtures for testing detectors were dealt with fully in the paper, as were also those of working out the proportion of inflammable gas in the mixture made. The uses of such mixtures were mainly twofold—first, for the purpose of demonstration to miners and others of the effect of different proportions of gas on the flame-cap of lamps; and, secondly, for comparing the efficiency of different forms of safety lamps.

The two papers were discussed together.

Sir BOVERTON REDWOOD said he attended about a year ago at Portsmouth at the Admiralty test of the apparatus described by Messrs. Philip and Steele. He could bear testimony to the value of their invention for showing the presence of the proportion of petroleum vapour which would produce a combustible atmosphere, and consequently of any proportion which would give an explosive atmosphere. He did not wish to institute a comparison between the apparatus and the hydrogen-flame cap test which had been described by him many years ago, and had been used continuously by his brother and others in testing the air of petroleum tanks. In the use of this apparatus, samples were collected from the tanks and examined. The apparatus was not, at least in the first instance, taken into the tanks themselves.

Admiral LITTLE remarked that there were a large number of sources of inflammable gas. At first the Admiralty had only to consider the question of gas evolved from coal in bunkers; but later they had to consider the larger question of the inflammable gas from the oils used as fuels. It was a question as to what extent the Davy lamp could be safely used by stokers and others who were unaccustomed to interpreting its indications. Sometimes they only expected to find carbonic acid in the air of a tank, and looked for it in the lower part; but meantime an explosion resulted from an accumulation of inflammable gas in the upper part of the tank. If there were any fault with the apparatus devised by Messrs. Philip and Steele, it was that it was too sensitive for ordinary use. To his mind, it indicated too small a proportion of inflammable gas; and hence its indications would be apt to be ignored. Where a vessel was divided into a few compartments only, it was undoubtedly good. When, however, there were many compartments, its application seemed to present several difficulties; and he thought there was wide scope for an improved portable device.

Another speaker inquired if the failure in course of time of the catalytic action of platinum did not render the apparatus of Messrs. Philip and Steele unreliable.

Mr. W. J. A. BUTTERFIELD said he did not know if the authors in their papers had drawn attention to the remarkable improvement effected within the last twelve months in the sensitiveness of the safety lamp, as a detector of inflammable gas, by Sir Henry Cunyngham and Professor Cadman. It consisted in inserting at intervals in the flame an asbestos comb impregnated with a sodium salt, the effect of which was to render the flame-cap much more readily visible. By this means smaller proportions of inflammable gas could be detected with certainty, and variations in the proportions observed; so that the safety lamp was applicable as a reliable detector over a much wider range of inflammable mixtures than formerly. Moreover, the flame-cap of the sodium-impregnated flame could be observed by persons with defective eyesight who were incapable of observing the ordinary flame-cap. The new apparatus had all the simplicity of the ordinary safety lamp, but, of course, depended on observation. It would not, like the apparatus of Messrs. Philip and Steele, ring a warning bell. It seemed to him that their apparatus was eminently suitable for permanent installations. With regard to the second paper, by Messrs. Philip and Stenhouse, he was not sure that the authors had referred to the simplest of all methods of preparing a mixture in given proportions of an inflammable gas and air, which consisted in gearing together the spindles of two wet gas-meters through one of which the air, and through the other the gas, was passing. The proportions in the mixture could be varied by altering the gearing.

Mr. PHILIP, replying for himself and his collaborators, said he regretted that he had used Dr. Clowes's name only in connection with the hydrogen-flame detector. He had not intended to ignore Sir Boverton Redwood's work in connection with it. In regard to the platinum coils, their catalytic action did not fail in course of time because they were protected from overheating. The one shown had been in use since the apparatus was first devised. The cost of a coil was, however, only about eighteenpence. He had there a specimen of the Cunyngham-Cadman safety lamp detector, but had not had an opportunity of making comparisons with it. He understood, however, that it gave very good results. The apparatus he and Mr. Steele had devised was, however, when used with a sensitive differential galvanometer, as sensitive as the Clowes-Redwood hydrogen-flame cap detector.

The meeting closed with a vote of thanks to the authors for their papers and demonstration.

Soap water in concrete has been used in Germany, instead of ordinary water, to make reinforced concrete water-tight. A grain elevator, which was exposed to inundation, was built on the Danube; and according to "Beton und Eisen," the gauging water was replaced by a solution of potash soap. The building has stood one inundation well; while another building of the same material, without the soap, did not quite keep out the water.

OIL-GAS SUPPLY IN MEXICO.

In a recent number of "Progressive Age" (New York), there was an illustrated article by Mr. C. D. Lamson, the General Superintendent of the Mexican National Gas Company, describing the plant by which the oil gas is produced for lighting the city of Mexico. As no coal-gas plant is in operation in the Republic and as outside the city the only Company supplying gas is at Merida, in the State of Yucatan, where the Lowe process is used, the following particulars may be of interest.

Had it not been for the discovery of petroleum in the States of Vera Cruz and San Luis Potosi, the gas industry in Mexico could not have attained any degree of importance, owing to the high cost of gas coal and the limited demand for residuals. But the apparently inexhaustible deposits of petroleum in the Ebano and Huasteca fields uncovered by Messrs. Doheny, Canfield, and Bridge, of Los Angeles, California, who acquired large tracts of oil land, and connected them with 60 miles of 8-inch pipe-line with five pumping-stations, all of a proved capacity for delivering 31,000 barrels per day of 20° petroleum at the port of Tampico, led to the organization by them of the Mexican National Gas Company for the purpose of building plants and furnishing gas in the Republic. A concession was obtained from the Government providing for the free entry of all materials used in the construction of the works and distributing plant built by the Company in any part of the Republic, and relieving them of all taxes, with certain exceptions, for ten years from the date on which the concession was granted. The Company immediately proceeded with their plans for constructing plant in the City of Mexico; commenced its erection in September, 1909; and on June 1, 1910, turned gas on the city with 22 miles of mains laid and 1,400 services connected.

The works are situated in a suburb of Mexico, three miles from the business centre of the city. The site is seven acres in extent; and about half of it is occupied by the buildings and plant. A branch of the Mexican Central Railway passes directly through the property, and a private siding runs along the entire extent of the works; thereby affording excellent facilities for the prompt and economical handling of freight and tank-cars. Ample drainage is provided; so that even during the torrential summer rains all parts of the works are free from surface water. An artesian well, about 500 feet deep, gives a good supply of pure water; and its natural flow may be increased by using the air-lift with which the well is equipped. The water raised is collected in a reinforced concrete reservoir, which has a capacity of upwards of 300,000 gallons; thus ensuring at all times an abundant supply for condensing, scrubbing, and fire purposes. From the reservoir or from the well direct an overhead steel storage tank of 68,000 gallons capacity is supplied.

The oil used in the manufacture of gas comes from the now famous Huasteca oil-fields. It averages about 20° Beaumé, and is brought direct to the plant in tank-cars, from which it is pumped into the storage-tank by two outside plunger type pumps, which, when working together, will discharge the contents of a 300-barrel tank-car in from 45 to 50 minutes. The tank is built of steel, underground, and will hold 304,500 gallons of oil.

The gas-generators are two in number, each having an actual capacity of approximately 40,000 cubic feet per hour. Each consists of an upper and a lower vaporizing chamber and a fixing chamber; the latter being a vertical cylindrical shell into which the vaporizing chambers are built, but at right angles thereto. In starting-up or blasting, the oil, previously heated to 150° Fahr. (which temperature is maintained with but slight variations during the entire process of generating and blasting), is fed through the burners in the front of the generators, and the necessary air is supplied by direct-connected steam-turbine driven blowers. After the blast is off and gas-making begins, steam alone is admitted to the lower chamber, and oil is injected into the upper one. Both oil and steam enter in finely atomized sprays, which are regulated by the use of needle valves and a specially constructed atomizer. The resultant gases are finally brought together in the fixing chamber, and go off as a fixed illuminating gas.

Leaving the generator, the off-take nozzle, which is in combination with the stack-valve, leads off to a horizontal leader, where the flow of gas is divided up through five dip-pipes, and passed into the primary wash-box or seal, where the lampblack and tar are separated from it. The secondary wash-box is practically a duplicate of the first, so far as construction is concerned, though its functions are somewhat different. Both of these boxes or seals are constructed much after the fashion of the hydraulic main used with ordinary retort-benches; being equipped with the customary dip-pipes, diaphragms, and tar off-takes. Some difference occurs in the water feed, which in this instance is had through the dip-pipes following the flow of gas, but sprayed under pressure by a conical shaped spreader in such a manner that all the inner surfaces of the dip-pipes are subjected to a constant scouring process through the impact of the water thereon. After passing through the secondary wash-box, the gas is taken up by a steam-jet exhaustor regulated to hold the pressure at its inlet at even gauge to 5-10ths vacuum, according to the period of the "run."

The gas is then delivered to the first scrubber, which is of the tower type, 14 feet in diameter and 30 feet high. The trays are of wood, and are set with the slats at right angles to one another.

The intervening sections between the tray courses are filled with bright scrap tin, rolled up in the shape of sponges, so that a great area of wetted surface is presented to the gas in its passage through. The water used in this scrubber is that which has been previously used in the seals, and is employed because of its effectiveness in ridding the gas absolutely of its naphthalene content. From the first scrubber the gas passes into the second one, which is a counterpart of it, and which is similarly filled and operated, except that cold fresh water is used. From the second scrubber the gas goes directly into the relief holder, which is of 75,000 cubic feet capacity, in a steel tank.

The exhausters are two in number, each having a capacity of 112,000 cubic feet per hour. They are steam-driven; and their speed is governed entirely by the quantity of the gas in the relief holder. From the exhausters the gas is passed into the purifiers, five in number, set in two groups; the first two vessels being 32 ft. by 14 ft., with reversing gear and top and bottom regulating valves for adjusting the flow of gas. These two boxes are used to remove the sulphuretted hydrogen, and are charged with oxide of iron. The three remaining vessels are filled with lime.

From the purifiers the gas passes through a rotary station meter, having a maximum capacity of 85,000 cubic feet per hour, into the holder—a three-lift one of 500,000 cubic feet capacity, and built in a steel tank. From the holder the gas is boosted into the city by two single steam-actuated compressors, through three compression tanks having a combined free air capacity of 1200 cubic feet. The lines leading from these tanks are of wrought-iron pipe, 6 inches diameter, and diverge, after entering the city limits, to the various district governors, where the pressure is reduced to a uniform 3-inch head of water.

Despite the fact that labour is extremely cheap, a liberal number of mechanical appliances have been adopted. Wherever possible, compressed air has been employed for operating the valves and other devices. This air is delivered by a steam-actuated compressor having a capacity of 10,000 cubic feet per hour. The air receiver has a capacity of 54 cubic feet of free air, and is equipped with an unloading device adjustable to any desired pressure within the limits of the compressor. As operated at present, 50 lbs. pressure suffices for all the demands. To avoid the danger of rupture, all the piping round the works is provided with adjustable hangers and supports fitted with spiral springs to automatically take up any shock that might occur. Expansion joints on all lines are also freely used, and every known source of danger is either entirely eliminated or the emergency provided for.

By Dec. 31, 1910, 41 miles of street mains were laid and in service, of which 23 miles are 4-inch, 14 miles 6-inch, 1½ miles 8-inch, 1¼ miles 10-inch, and 1 mile 12-inch. The low-pressure mains are of cast iron, well coated on the outside with asphalt paint, and laid with lead joints. Under street railway crossings, and extending about 10 yards each side of the track, the pipe is boxed, and the latter filled with hot asphalt. The system of gas distribution is divided into four districts, embracing the business centre of the city and three residential sections, each of the latter being supplied from the high-pressure lines through a double district regulator. The business section, however, through which a 12-inch low-pressure line extends one mile east and west, is supplied through two double district regulators. This arrangement gives absolute pressure control, and permits isolation of any district without disturbing the service.

Gaslight and Coke Company's Dividend.

We are informed by the Secretary of the Gaslight and Coke Company (Mr. Henry Rayner) that the accounts of the Company for the past half year show that (subject to audit) the balance to the credit of the net revenue account will enable the Directors to recommend the payment of a dividend at the rate of £4 14s. 8d. per cent. per annum, carrying forward to the next account the sum of £699,350 1s. 7d. The dividend for the June half of last year was at the rate of £4 13s. 4d. per cent. per annum; while the carry-forward (including a balance of £32,746 taken over from the West Ham Gas Company on Jan. 1, 1910) was £542,370.

Gas Lighting and Ventilation.—One of the "Notes for Gas Users" in the "Ironmonger" for the 15th inst. is on this subject. The writer calls attention to an article in a recent number of the "Revue Industrielle," giving an account of some experiments carried out in a large room when lighted first by gas and afterwards by electricity. The room had one door, two windows, and a couple of ventilator gratings. The lights employed for the experiment were a Tantalum lamp and an upright incandescent gas-burner of the same lighting power, occupying the same positions in the two separate experiments. The experimenters remained in the room, and took precautions in order that the two experiments should be conducted under comparable conditions. The result was that the percentage of carbon dioxide increased from 0.064 to 0.218 in three hours when electric light was employed, and from 0.071 to 0.203 for the same time when gaslight was substituted. The two increases were 0.154 and 0.132 respectively. The writer of the "Notes" remarks that, "seeing that the electric light could not have generated any carbon dioxide, the increase must have been due to the persons in the room. But it certainly looks as if the gas behaved better as a ventilating agent."

HIGH-PRESSURE GAS PLANT WITH MEDIUM MAIN PRESSURE.

At the Annual Meeting of the Southern Gas Association, held at Montgomery (Ala.) a short time ago, a paper on "High-Pressure Gas Plant with Medium Pressure on the Mains" was read by Mr. F. H. SAWYER, of New Bern (N.C.). It contained a description of the plant erected last year at Goldsboro (N.C.), of which the following are some particulars.

When considering the erection of the plant and the laying of the mains (no gas plant having previously been established), seeing that a considerable mileage of pipe would be required to cover the town, it was thought that medium-pressure plant would be the best. This would be specially advantageous, as it would be possible to reach sparsely-built sections of the town with small wrought-iron mains; thereby causing the supply to be available to practically all the inhabitants requiring gas. It was also felt that the consumer could have a service that would be almost perfect; for most managers have had to contend with complaints of want of pressure on low-pressure systems at points where extensions were made with pipes that soon proved too small.

There are in Goldsboro nine miles of mains running in size from $1\frac{1}{2}$ inches up to 3 inches, all of wrought steel; the principal or main trunk line being 3-inch, and all lateral lines of the small sizes. The mains are laid in the roadway, 30 inches from the kerb and 37 inches deep. No attention was paid to grading these lines beyond following the kerb as established by the City Engineer. A Dresser coupling, or expansion joint, was placed at each 500 feet. Valves were put in at certain points on the main system, for cutting off any section for repairs, &c. They are in brick man-holes, so that they can be easily and quickly reached. The mains were all tested to 45 lbs. pressure immediately after being laid. Practically all the services are $1\frac{1}{2}$ -inch, and are of galvanized iron. Individual regulators are placed on each service; reducing the pressure from pounds to inches.

At the works the gas is dealt with as follows: From the water-gas set it goes direct to the holder; thence it is drawn by a compressor through the purifying boxes into a reservoir; then through the compressor and into two compression-tanks. The pressure carried in these tanks fluctuates between $7\frac{1}{2}$ lbs. and 35 lbs. A governor placed on the outlet connections of the tanks reduces the pressure to 5 lbs.; this being the regular pressure carried on the mains. The tanks are located between the retort-house and the holder. They are 8 feet diameter and 36 feet long. Practically all the condensation from the gas takes place in the tanks; drain-cocks being placed on the bottom of each for its release. No drips are used on the whole of the main system, and no evidence of water or oil has been seen.

The compressor is run during the day while gas is being made (the extra coal used for steam for this purpose being very small). Afterwards it is run only when the pressure in the tanks drops to $7\frac{1}{2}$ lbs. The two or three times that the compressor has to be run during the early morning and evening necessitates the consumption of about 170 lbs. of coal for the boiler each time. Two men are required to run the plant. The gas maker comes on duty at 6 a.m. and remains until 6 p.m. The helper is on duty from 12 noon till 12 midnight; and the gas is made in the afternoon, when both men are at the plant.

INTERNATIONAL CONGRESS ON CARBIDE AND ACETYLENE.

The Sixth International Congress on Carbide and Acetylene was held at Vienna on May 11 to 13. It was attended by representatives of Austria, Belgium, England, France, Germany, Holland, Hungary, Italy, Norway, Russia, Spain, Sweden, Switzerland, and the United States of America. The total number present on the opening day was estimated at not less than 250. The following summary of the proceedings is taken from a more detailed report in "Carbid und Acetylen."

The proceedings were opened on the morning of the 11th ult. by His Excellency Dr. Wilhelm Exner, the Honorary President of the Congress, in a speech delivered partly in German and partly in French, in which he referred to the importance of the successive International Congresses on Acetylene. Councillor Haas, of the Austrian Office of Public Works, expressed welcome to the delegates on behalf of the Austrian Government; and a similar welcome was expressed by representatives of the Hungarian and Croatian State Authorities. The technical proceedings opened under the presidency of Dr. Hugo Koller, of Vienna. In an inaugural address, he traced the development of the carbide and acetylene industries, and referred to their great economical importance. There were then elected as Vice-Presidents of the Congress, Herr Knappich, of Augsburg, M. Gandillon, of Geneva, Dr. Schuhmacher-Kopp, of Lucerne, M. de Seynes, of Paris, and Dr. Michaelis, of Berlin. The first paper presented was by Herr Kautny, of Cologne, entitled "The Position and Development of Acetylene Lighting and of the Autogenous Soldering Industry in Germany." The author deprecated the tendency, which he said manufacturers of acetylene plant displayed at the present time,

to neglect acetylene lighting altogether in favour of welding apparatus. There was, however, no question that the greatest field for development at the present time was in the application of acetylene welding to new branches of industry. The reading of the next paper on the list, by Dr. Caro, of Berlin, on "The Lime-Nitrogen Industry," unfortunately had to be postponed, as Dr. Caro was prevented from attending the Congress. M. de Seynes, the President of the French Acetylene Association, then gave an interesting paper on "The Importance of Lime-Nitrogen in Agriculture, and the Practical Results of its Application."

A trade exhibition of carbide and acetylene, for which accommodation had been provided in the Technological and Industrial Museum, was then formally opened, and inspected by the members. The exhibits were of an instructive character for those not engaged in the acetylene industry; but to the latter there did not appear to be much of very special novelty. Nevertheless, the impression created by the exhibition as a whole was favourable. In the afternoon, Herr Knappich, of Augsburg, read a paper on "Acetylene Central Works for the Lighting of Small Towns and Communities." He pointed out that, notwithstanding the competition of coal gas and electricity, there were at the present time in Germany alone 155 central acetylene works, and that the places supplied from them varied in size up to a population of 23,000. In view of the very active propaganda instituted in favour of cross country supplies of electricity, it was imperatively necessary that authorities should be warned of the injury which frequently resulted from the establishment of such central electricity works. Herr Dezsényi, of Buda-Pesth, then read a paper on "The Use of Acetylene in Mining," which he demonstrated by reference to a number of models. Herre Dalén, of Stockholm, was to have presented a paper on "The Use of Acetylene for Marine Lighting," but unfortunately he was unable to be present at the Congress. A demonstration of autogenous acetylene welding concluded the proceedings for the day.

The second day's proceedings opened with a paper by Herr Immanuel Friedmann, of Vienna, on "Advances in the Use of Dissolved Acetylene." He predicted a great future for dissolved acetylene for portable lamps, if requisite charging stations were established all over the country. Professor F. Sandor, of Agram, then gave an address on "The Development and Present Position of the Acetylene Industry in Croatia and Slavonia." A discussion was next opened by M. Gandillon, of Geneva, on "The Influence of Authorities, Technical Associations, and Private Initiative on the Development of the Acetylene Industry in Different Countries." M. de Seynes, of Paris, pointed out that the great development of the acetylene industry in France was due to the co-operation of private initiative with technical associations, among which he specially named the Office Central de l'Acétylène, which he said had doubled the consumption of carbide. Herr Knappich, of Augsburg, pointed out that, notwithstanding the many official requirements in Germany, the efforts of the German Acetylene Association had been instrumental in putting Germany at the head of carbide-consuming countries. Its consumption of 40,000 tons of carbide per annum was 2000 tons more than that of the United States with Canada. Dr. Levy, of Berlin, pointed out that the initiative of the German acetylene and carbide firms had provided the German Acetylene Association with a fully-equipped laboratory for testing acetylene apparatus, and its tests of plant were recognized and accepted by the Prussian Government.

The afternoon of the second day of the Congress was occupied with visits to a dissolved acetylene works at Möllersdorf, the central acetylene supply works at Gumpoldskirchen, and an oxygen works at the same place. The banquet in connection with the Congress was held on the evening of this day.

On the last day of the Congress, Dr. Michaelis, of Berlin, proposed a resolution to the effect that the congress held the view that the official prescriptions in different countries should be drawn up or altered so that they should not make the regulations in regard to acetylene apparatus for metal working different from those relating to acetylene apparatus for lighting purposes. The intention underlying this resolution was evidently to admit of portable generators being made available for welding in interiors. The moving of this resolution provoked a prolonged and lively discussion; the opponents to it being chiefly the members who are interested in the dissolved acetylene branch of the industry. Ultimately, however, it was decided to defer the consideration of the resolution to the next Congress. Papers were then read as follows: By M. Granjon, of Paris, on "The Position of the Acetylene Welding Industry in France;" by Herr Bernatschek, of Vienna, on "The Furtherance of Autogenous Metal Working in Austria by the State;" by M. Amédéo, of Paris, on "The Use of Acetylene in Autogenous Metal Working;" and by Professor J. Wittal, of Buda-Pesth, on "The Position, Development, and State Furtherance of Autogenous Metal Working in Hungary." The discussion on these papers led to the consideration of the question of organization of instruction in autogenous metal working, and the training of men to do the work. In the afternoon of the last day of the Congress, Dr. R. Linde, of Munich, read a paper on "The Production of Nitrogen for Lime-Nitrogen Manufacture." After describing different methods of producing lime-nitrogen, the author referred to the recovery of nitrogen in oxygen manufacture by the dephlegmation or fractional condensation process. Herr Kassler then read a short paper on "The Chlorine Derivatives of Acetylene." A short discussion on a commercial standard of quality for lime-nitrogen closed the business at the congress.

The next International Congress is to be held at Rome.

PROPERTIES OF THE XYLENES.

In the Faraday Lecture recently delivered before the Fellows of the Chemical Society, Professor Theodore W. Richards expounded the theory of the compressibility of atoms, at which he and his coadjutors have been working experimentally during the past decade. The chemical laboratory of Harvard University enjoys a world-wide reputation for accuracy; and instances of the work done there were given by Professor Richards to show the intimate relation of various fundamental properties of substances physical and chemical. Among these instances is one that is of considerable interest to gas engineers, referring as it does to a product of the distillation of coal, and one which has an influence upon the deposition or otherwise of naphthalene in the distributing system.

It is now known, from experience gained and investigations carried on within the gas industry during recent years, that it is equally important to keep the light oils in coal gas "up," as it is to keep the naphthalene content "down." Among these light oils, solvents of naphthalene, the xylenes occupy a leading place. They are three in number, isomeric—that is, of the same percentage composition and the same vapour density, but having certain differences of boiling-point, freezing-point, and density in the liquid state. Their position in the benzene series (C_nH_{2n-6}) is shown by the following sequence: Firstly, benzene (C_6H_6); secondly, toluene (C_7H_8) or methylbenzene ($C_6H_5\cdot CH_3$); and thirdly, xylene (C_8H_{10}) or ($CH_3\cdot C_6H_4\cdot CH_3$, dimethyl benzene). While only one benzene and one toluene are known, three xylenes are known, determined by the relative position in space of the CH_3 groups towards the benzene nucleus and distinguished by the prefixes "ortho," "meta," and "para."

The suitability of such a multiform substance for the testing of Professor Richards' views as to the behaviour of elements and compounds is summed up by him as follows: "Thus as regards two substances otherwise similar, the less volatile one would be less compressible, denser, and possess greater surface tension. These outcomes of the theory correspond with the facts in a majority of cases thus far studied. For example, orthoxylene is denser, less volatile, less compressible, and possesses a greater surface tension, than either metaxylene or paraxylene." Professor Richards and Mr. C. L. Speyers have determined these constants with great care. The substances they employed were unusually pure; the paraxylene freezing at $13.2^{\circ}C$. The details of the experiments are not yet published, but the results are given in the following table:—

Substance Tested.	Boiling-Point in Deg. C.	Density at $20^{\circ}C$, Compared with Water at $4^{\circ}C$.	Surface Tension at $20^{\circ}C$, in Milligrammes per Millimetre.	Compressibility at $20^{\circ}C$. $\times 10^6$.
Orthoxylene . .	144.0	0.8811	3.09	60.0
Metaxylene . .	139.0	0.8658	2.96	63.5
Paraxylene . .	136.2	0.8611	2.92	65.2

The consistency manifested in these results of testing the four properties of the three isomers is a strong recommendation of their general accuracy; and the data thus provided will be of great value to all concerned in chemical questions, and especially to those engaged in gas manufacture and the cognate industries of tar distilling and aniline colour production.

GAS-DRIVEN FIRE-PUMPS.

Most readers of the "JOURNAL" have doubtless heard of, and possibly some have visited, the New York pleasure resort bearing the name of Coney Island. The buildings there have been and are very inflammable; and consequently fire policies were limited to 10 per cent. of the value and a 5 per cent. rate charged. The location is distant from the general fire system of the borough of Brooklyn; and to maintain an adequate number of fire-steamers to cope with the possibilities would have entailed a very heavy expense. Abundance of water was available; but the question of power was important. What was needed was such a solution of this problem as would enable a large amount of power to become available quickly, yet entail little or no expense in the intervals when it was not required. The problem was successfully solved by using gas-engines supplied with ordinary illuminating gas. An account of the installation was given by Mr. J. F. Springer, of New York City, in a recent number of "Progressive Age;" and from it the following particulars are taken.

A large gasholder in the vicinity was available; and suitable connections were made with it. Three Nash gas-engines, of the vertical three-cylinder four-cycle type, were installed. The cylinders are $13\frac{3}{4}$ inches diameter, with 16-inch stroke. When the engines are run at 260 revolutions per minute, 175 H.P. is developed by each. This is accomplished with gas of a calorific value of only 590 B.Th.U. per cubic foot by using only 17.4 cubic feet per brake-horse-power per hour. The valves of one cylinder in each engine are arranged to permit the use of compressed air to start it. There are two separate compressors, one of which has its own small gas-engine. There are in addition a series of storage-tanks for compressed air, of a capacity equal to starting all the engines twice. It will thus be seen that very adequate provision has been made for starting-up. In fact, the

men in charge do not have to exert themselves at all. The compressed air starts the engine forward, operating through one of the three cylinders. The other two cylinders quickly develop power from the gas—indeed, in one or two revolutions. The engine is put into full operation by gas in 20 seconds, and all three engines and the entire plant in about $2\frac{1}{2}$ minutes.

This power equipment drives a very efficient pumping plant, consisting of three triplex double-acting piston pumps, each directly connected to one of the gas-engines, and forming with it a water-handling equipment independent of the other pumps. The pistons are 12 inches diameter with a 14-inch stroke. There is a capacity of 40.3 gallons at each revolution of the three-arm crank-shaft; and as the ordinary speed of this is $38\frac{5}{8}$ revolutions per minute, there is a pumping capacity of 1551 gallons per minute per pump. Each of the pumps has a bye-pass permitting the discharge to pass into the overflow-pipe. While the engine is getting under way, the bye-pass valve is open; but when full speed is attained, the valve is gradually closed by an electric motor. The valve is opened or closed in 20 seconds; and the electric motor automatically stops when its work is completed. The total capacity of the three pumps is 4650 gallons per minute. The pressure is 150 lbs. per square inch at the pumps. For a hydrant seven-eighths of a mile away, the pressure falls to only 140 lbs. when the full capacity of the plant is employed. The area protected totals about 65 acres. There are numerous hydrants, so distributed that the whole energy of the pumping plant can be concentrated upon any one block of buildings. These hydrants have $2\frac{1}{2}$ -inch hose connections, and are joined to the service mains by 8-inch piping. The full capacity of 4650 gallons per minute can be developed with 15 to 20 streams.

Mr. Springer says this pumping plant seems to have been admirably conceived. It is economical, as it is operated only when needed; and the attendance expense is low. It can be started up with great rapidity and with entire certainty. If the city water fails, the Atlantic Ocean can be called upon. The whole plant need not be put into operation if the situation does not require it; and the starting-up of the plant does not depend upon the muscular strength of the persons at the moment in attendance. A great volume of water per minute is available. Further, the streams are very powerful, so that considerable heights can be reached. A pressure of 140 lbs. per square inch is equivalent to that obtainable from an elevated tank or stand-pipe 320 feet high. The high-pressure pumping plant had a severe test in 1907, during a serious conflagration. The total capacity of the plant is, as already stated, 4650 gallons per minute with a pressure of 150 lbs. per square inch at the pumps. The 1907 blaze made demands that were just about equal to the capacity. A considerable number of steamers were summoned to the spot; but it is stated that only a few were really used. The cost for gas for the 16-hour run of the plant amounted to \$58.

PHOTOMETER FOR OUTDOOR OR INDOOR USE.

In a recent number of the "Comptes Rendus," a description was given by M. Henri Malosse of a photometer suitable for testing either street or house burners. It consists of two smoked glass prisms and two of ordinary glass united so as to form two plates with parallel sides which can be made to slide horizontally one before the other and in the opposite direction, by means of a rack and pinion. This combination represents an absorbing medium the thickness of which may vary from about zero to a sufficient degree to prevent an observer from seeing letters traced on a blackened glass, and illuminated through transparency by the source of light to be examined.

Displacement of the prisms involves that of a graduated rule in front of an index. The prisms are placed in a box, each of the two opposite large sides of which is perforated with a central opening—one forming an eye-piece, and the other provided with two tubes. One of these tubes is fixed, and furnished at the end screwed on the box with a positive lens of 16 dioptries; while the second, which can slide in the other, terminates on the lens side in the blackened glass on which the letters are traced. The latter, therefore, represent an object which can be brought into the focal plane of the lens or on either side, so that the observer, whatever may be the state of his ocular refraction, can see the object clearly.

In using the instrument, the operator stands at a certain distance from the lamp containing the source of light, and then, looking at it through the photometer (after having suitably reduced the thickness of the smoked prisms, and moved the tube having the letters on it to the point where the adjustment gives the clearest view of these letters), gradually increases the thickness of the absorbing glass, and finally stops at the point where the luminous power transmitted is too small to make the letters visible. He then reads the division of the scale opposite the index. This gives him, either directly or by the aid of a table previously drawn up for each apparatus, the illuminating power, in carcels, of the source of light under test.

During the six months ended June 30, there were issues of new capital to the amount of £116,205,939, compared with £222,920,323 in the corresponding period of last year. In the amounts named, £31,000 was issued in connection with gas and water supply projects this year, against £70,190 in 1910.

DESTRUCTIVE DISTILLATION OF WASTE WOOD.

At a recent Meeting of the New York Section of the Society of Chemical Industry, a paper on "Utilizing Waste Wood by Destructive Distillation," prepared by Messrs. J. & J. C. Lawrence, was submitted. The text of the paper was given in a recent number of the "Journal" of the Society; and from it the following particulars are taken.

According to the statistics of the United States Forest Service, based on a figure of 65·16 per cent. waste given by Frankforter in the "Journal of Industrial and Engineering Chemistry," there were in 1907 150 million tons of wood wasted, the greater part of which could, by utilization, have been saved. The authors confined themselves to only one phase of the question—that of utilization by destructive distillation; and they limited themselves further by dealing only with those products obtainable from hard woods, principally oak. The immediate products obtained by destructively distilling oak are well known—viz., pyroligneous acid liquor containing acetic acid and methyl alcohol; tars and oils; charcoal; and uncondensed gases. Some of these yield other substances of commercial importance on further treatment. The acid liquor may be neutralized by milk of lime after freeing it from tarry matter; and the alcohol or crude wood spirit is then distilled off. The wood spirit may then be rectified further if deemed necessary. The tars can also be redistilled and the more valuable creosote oils obtained. The gas is (or may be) used for heating the retorts or ovens during a part of the distillation. The charcoal, after cooling, is ready for market without further treatment.

The authors took as an example of commercial utilization the wood wasted in a small lumber mill over a period of a few months, for which they had accurate figures from personal observation. The mill cut 125,000 feet of hardwood lumber. Using Frankforter's figures, they found that there was wasted in stumps, slabs, limbs, &c., wood to the amount of 883,700 lbs. Almost all of this could have been used for distillation, and would have yielded products as follows:—

Tar	30,488 lbs.
Charcoal.	274,919 "
Alcohol	9,544 "
Acetate of lime	42,948 "

From statistics furnished by the United States Census Bureau for 1909, these would have the following values:—

Tar, at 8 c. per gallon	\$250
Charcoal, at 6 c. per bushel.	825
Alcohol, at 24 c. per gallon	1865
Acetate, at 1·5 c. per pound.	644
Total	\$3584

In a small commercial plant of about ten cords capacity per day, this would have taken less than three weeks to work up. These small figures were taken by the authors, contrary to the usual custom of speaking in sums far above ordinary comprehension, to indicate approximately the great field of saving in natural resources which the chemist and the chemical engineer can effect.

As a matter of interest, they submitted (below) an analysis of a sample of the gas taken from one of the distillations, and they called attention to the high calorific value of this gas for a "wood gas."

	Per Cent. Vol.
Heavy hydrocarbons	8·16
Marsh gas	12·32
Carbon dioxide	31·45
Carbon monoxide	35·08
Hydrogen	10·94
Nitrogen	2·05
	100·00
Calorific value	11,493 B.Th.U. per lb.

SULPHUR QUESTION IN THE UNITED STATES.

We learn from "Progressive Age" that while expert sanitarians and bacteriologists are upsetting some of the orthodox notions about the harmfulness of sewer gas, the chemists have not been idle in settling some matters that are within their province; one of these being the supposed danger from sulphur in illuminating gas. Several states and cities in America have laws to the effect that gas shall not contain more than a certain amount—generally, 20 to 30 grains—of sulphur per 100 cubic feet. A series of experiments reported by Mr. F. E. Gallagher, of Boston, shows that the supposed danger is greatly exaggerated, and that the restrictive laws do not rest on any rational basis of fact. In the air of a gas-lighted room, the sulphur appears as sulphur dioxide; and these experimental results indicate that the quantity of this in gas-lighted rooms is wholly negligible as regards comfort and health. Further experiments bearing upon this problem gave the following results.

- 1.—In no case, even under the most restricted conditions of ventilation, did the burning of gas give rise to noticeable odours of sulphur gases.
- 2.—With the doors and windows sealed, and the ventilation restricted as much as possible, the air of the room changed 1·8 times per hour. When the ventilation was rendered favourable

- for regular living conditions, the rate of change of air was several times greater than the figure just given.
- 3.—As regards the vitiation of air by carbon dioxide, it was found that one man actively exercising had about the same effect as gas burning at the rate of 5 cubic feet per hour.
- 4.—Paper on the walls and ceiling only moderately reduced the effectiveness of the plaster in the absorption of sulphur gases.
- 5.—Sulphur gases formed on the combustion of illuminating gas are removed from the air of rooms in three ways—viz., by the changing air in the ordinary course of ventilation, by condensation along with water vapours on the cold walls and windows, and through absorption by the alkaline constituents of the walls and ceilings.
- 6.—As the sulphur content of a room increases markedly, the rate of reaction between the plaster and the sulphur gases becomes greater; thereby effecting a proportionally more rapid removal of the sulphur gases.
- 7.—Calculations of the sulphur dioxide content of the air of rooms from the sulphur introduced by the inflowing gas are wholly unreliable if they fail to take account of the different ways in which sulphur dioxide escapes from a room.

Coal Gas for Train Lighting.

It will be remembered that not long since some special articles appeared in our columns, by a lighting expert connected with one of the railway companies, on the subject of railway carriage lighting by gas. A "Railway Officer" has also now contributed an article to the Engineering Supplement of "The Times" on the same subject; and, in the latter part of the article, he discusses, as did also our contributor, the economy and value of coal gas for this purpose—the incandescent burner having made the use of rich oil gas quite unnecessary. It is admitted that the latter has a higher calorific value and that less is required (say, 0·6 cubic foot per hour as against 0·9 to 1 cubic foot of coal gas); but the difference in price—coal gas at 2s. 6d. to 3s. per 1000 cubic feet as against oil gas at about 10s. or more—leaves room for a very substantial saving which has not been made hitherto by British railways, apparently either through ignorance or the force of tradition. Now, however, they would appear fully alive to the matter, and a change-over may be anticipated shortly. In France, the Etat (late Ouest) Railway has already discarded oil gas for coal gas, and it is stated that the Nord Company are proposing to follow suit. In this country, the trains of the North London and the Isle of Wight Railways are lighted by coal gas; while larger lines, such as the London and North-Western, and the London, Brighton, and South Coast, have had trains fitted and running for some time for experimental purposes. While differences of opinion exist at the present moment in railway circles concerning the desirability of using gas in any form for carriage illumination, it must be admitted that modern incandescent gas lighting, if employed with proper precautions—and particularly if coal gas is used—is trustworthy and satisfactory, besides being economical.

Early Gas-Lighted Railway Tunnel.—The anniversary of the opening of the London and Brighton Railway seventy years ago last Wednesday week was the subject of an interesting article in the Engineering Supplement to "The Times" that day. Those of our readers who have journeyed by rail to the "Queen of Southern Watering-Places" will remember the tunnel they pass through just before reaching Redhill. It comes after a cutting about 100 feet deep, and nearly perpendicular; and these two features of the line were regarded as marvels at the time of the opening. Though it was only rather more than a mile long, in order to alleviate the fears of the passengers the tunnel was "well white-washed throughout and lighted by gas." This illumination, we are told, "induced a feeling of confidence and cheerfulness," while to the engine-driver it was "of the utmost moment, enabling him to see the road almost as well as in broad day—so well, indeed, that any obstruction existing, which otherwise would not be observed, will by him be perceived and guarded against." The run through the tunnel occupied only about two minutes, so great was the hurry to get out.

Recent Wills.—Major Edward Coleman, formerly of the Honourable Artillery Company, and a Director of the Mitcham and Wimbledon Gas Company, who died on the 9th ult., left estate of the gross value of £123,618, of which the net personalty has been sworn at £110,909. Lord Edward Spencer-Churchill, who was a Director of the City of St. Petersburg New Water-Works Company, Limited, left estate of the gross value of £49,928. Sir Nathan Bodington, LL.D., Vice-Chancellor of the University of Leeds, who died on the 12th of May, aged 62, left estate of the gross value of £6895, of which £5627 is net personalty. The late Mr. W. J. Jenkins left estate of the gross value of £11,930, of which the net personalty has been sworn at £11,845. Mr. James John Frederick Stevens, of Holmhurst, Erith Road, Belvedere, Chairman of the West Kent Gas Company and of the Mitcham and Wimbledon Gas Company, who died on the 14th ult., as recorded in the "JOURNAL," left estate of the gross value of £156,525, of which the net personalty has been sworn at £152,734. Deceased left £10,000 to the Roman Catholic Bishop of Southwark, towards the endowment of St. George's Cathedral, and also his Holmhurst estate at Belvedere, for charitable purposes, such as a home for aged or infirm priests, a training college, or a convalescent home.

REGISTER OF PATENTS.

Automatically Operating Gas-Burners.

ROBSON, G., of Regent's Park, N.W.

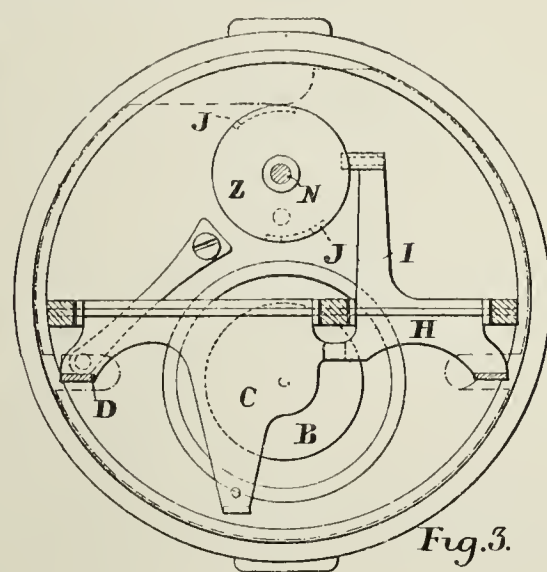
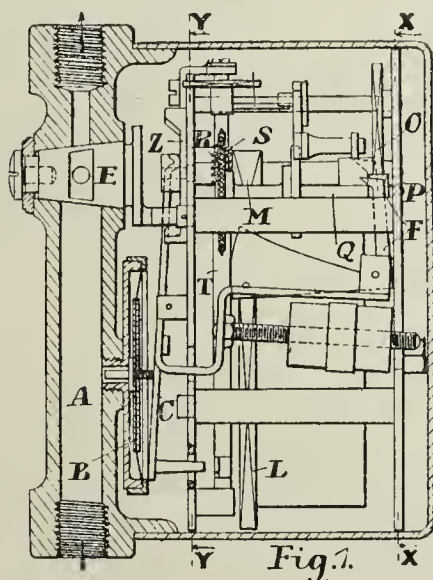
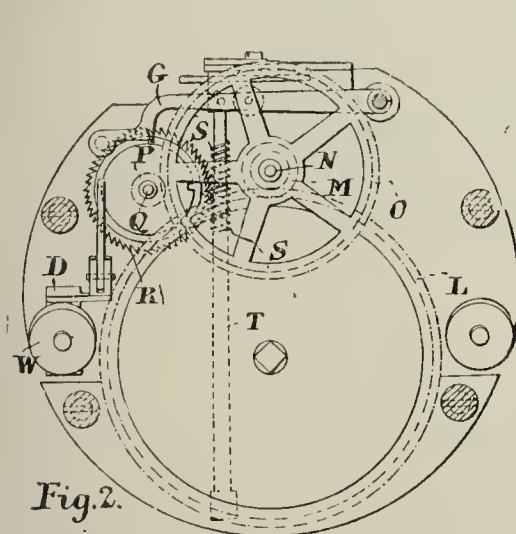
No. 15,741; June 30, 1910.

This invention relates to apparatus, controllable from a single point or station, for automatically operating gas-burners, of the type wherein the movement of an expansible device under the pressure existing in the main controls the gas-cock operating motor through the medium of two overlapping weights, one of which may be rendered inactive when required to vary the load. Apparatus of the class referred to is described in patents No. 7434 of 1909, and No. 14,681 of 1910.

The specifications of these earlier patents describe apparatus in which a diaphragm, by an intentional rise of pressure in the gas-main, expands against a system of weighted levers to unlock or release a clockwork motor, which, in its turn, actuates a gas-valve. This lever mechanism comprises a pair of weighted levers—one being a main lever carrying a pawl for releasing the clockwork motor, and the other being an auxiliary lever normally overlapping and bearing upon the main lever, but adapted to be freed therefrom or rendered inactive by means of a cam, the effect of which is that the apparatus lights at a pressure which is relatively higher than that for extinguishing. When the cycle of

operations is completed, both weights are returned to duty—causing the diaphragm to fully contract and bringing the pawl back to its engaging position; so that if the pressure in the gas-main is increased, the diaphragm expands and raises the pawl to release the mechanism for another cycle.

The apparatus thus described—which was adapted to work either with an increase of pressure followed by a subsequent decrease (as in No. 7434 of 1909) or by an increase in pressure only (as in No. 14,681 of 1910)—the range between the unlocking pressure and the actuating pressure in one case and that between the engaging pressure and the actuating pressure in the other case, is adapted to be constant. But it has been found in practice that it may not always be convenient to use apparatus working as described. For instance, in some districts it is undesirable that the pawl should be left in engagement between the time of extinguishing and that of the following ignition. When in practice, owing to the use of gas-stoves, the pressure in the mains is considerably increased during the day for cooking or heating purposes, if the pawl is left in engagement, the rise of pressure might be such that the apparatus would be started when not desired. It is the principal object therefore of the present invention to so adapt the apparatus by means of certain removable and interchangeable parts or devices that it can be quickly and simply adjusted to meet the local conditions prevailing in any particular district where the lighter is to be used; the result being that the device is "rendered very effective and flexible in its capacity for application."



Robson's Automatic Gas-Burner Lighter.

Fig. 1 is a side elevation (partly in section) of an automatic gas lighting and extinguishing apparatus operating by a rise and a subsequent decrease of pressure, for use with devices according to the present invention. Fig. 2 is a transverse section on the line X—X (looking in the direction of the arrow) and showing in detail only those parts necessary. Fig. 3 is a section on the line Y—Y.

To first give a brief general description of the apparatus, and then to describe the application of the invention thereto, it may be mentioned that the gas in the supply main A is adapted to normally press upon the diaphragm B, and when the pressure is raised, the expanding diaphragm (by its centre pin) actuates a two-armed lever C D. The arm C carries a projecting pin, and the end of the arm D carries a pawl F, which, when raised by the diaphragm, raises a lever G, which controls the starting and stopping of a clockwork motor. The arm D also carries an adjustable weight. The motor comprises a barrel K carrying a spur wheel L in mesh with a pinion M on a shaft N. This shaft also carries a spur wheel O in mesh with a pinion P on a shaft Q, which drives a toothed wheel R engaging with a worm S on an escapement shaft T. This shaft, at its upper end, has a projecting pin U adapted to be stopped in its rotational movement by coming into contact with a projection on the lever G, while at its lower end it is fitted with a projection adapted to engage the pin on C. The end of the lever G is broadened, and has a tooth adapted to engage with a notch in a disc mounted on the shaft Q. Thus when the pawl F rises (owing to an increased pressure behind the diaphragm) it will raise the controlling lever G, and unlock the clockwork motor by removing the projection from the path of pin U.

The clockwork motor now commences to work, but is stopped immediately afterwards, owing to the pin engaging the projection on the escapement shaft T. When a succeeding decrease of pressure occurs in the main, the diaphragm recedes, withdraws the pin, and the clockwork motor is free to perform its work. During this operation, the tooth of the lever G rides on the smooth periphery of the disc, and the shaft N, by means of a disc Z thereon carrying a crank pin, actuates the gas-cock E controlling the passage of gas to the burner.

In order that extinguishing may take place at a relatively lower pressure, the lever C has a projection which overlaps a similar projection on a lever H. This lever is fitted with an arm I having a bent end resting against the disc Z. The arrangement is such that, when lighting is to be effected, both weights, by the overlapping parts of the levers C and H, act against the diaphragm, so that their combined pressure has to be overcome in order to effect lighting. When lighting is effected, the consequent movement of the disc Z brings one of two cams J thereon under the end of the arm I, and separates the overlapping parts, whereby what may be called the loose weight V no longer bears against the diaphragm, so that extinguishing is effected against the pressure of what may be called the fixed weight W only.

This apparatus, which works with a rise of pressure and a subsequent decrease of pressure (the cycle described in patent No. 7434 of 1909), may be very easily converted into apparatus working with a rise of pressure only (the cycle described in patent No. 14,681 of 1910) by removing the pin on the arm C and the projection on the shaft T.

In carrying the present invention into effect so that with the apparatus described lighting and extinguishing will be effected at the same pressure, the cam disc Z is replaced by a plain disc whereby the loose weight V will not be periodically prevented from acting on the diaphragm, but that both weights V and W will always act thereon; the pawl being automatically engaged after lighting or extinguishing. For example, No. 2 apparatus is engaged at 30-10ths pressure and operates at 35-10ths.

Preparation of Ammonium Sulphite or Sulphate from Gases.

BURKHEISER, K., of Aachen, Prussia.

No. 15,877; July 2, 1910. Date claimed under International Convention, July 2, 1909.

In the specification of his patent No. 21,763 of 1908,* the inventor explains that by causing the sulphur compounds contained in gas to react, after oxidation, with the ammonia of the gas, ammonium sulphite or sulphate is directly produced; and this, having regard to the subsequent utilization of the gases, is confined in most cases to the separate oxidation of the sulphuretted hydrogen without simultaneously acting upon the other constituents of the gas. Whereas this isolated treatment of the sulphuretted hydrogen by leading the gases over an oxygen-transferring mass can be attained, he proceeds to point out, there is available in some works a natural oxidizing operation which is provided by the combustion of the entire gas containing sulphuretted hydrogen, which combustion is carried out on the spot. In the working of coking plants, for example, where the distillation gas is burnt partly in the furnaces and partly under steam-boilers, sulphurous acid is contained in the waste heat in amount proportioned to the original sulphuretted hydrogen content. Even although the oxidation of the sulphuretted hydrogen by transference of oxygen takes place in a manner which is absolutely without objection, and is, as mentioned, a condition in the manufacture of illuminating gas, special apparatus and a particular working of it are necessary for the purpose.

In the process according to this invention for the preparation of ammonia sulphite or ammonia sulphate, the products of combustion of distillation gas from coke-ovens and the like containing the sulphurous acid are brought into contact with washing liquor previously rendered alkaline by the absorption of ammonia from the distillation gas; the alkaline liquor absorbing the sulphurous acid and the same liquor being then again conducted into contact with the distillation gas containing ammonia to be again rendered alkaline, and, after depositing the salt, being again brought into contact with the products of combustion. The constantly circulating washing liquor thus forms, at different stages in its circulation, an agent for the reaction of the two bodies given up to it, and obviates the mixture of the gases of distillation and combustion; the sulphate or sulphite of ammonia formed being continuously removed from the washing liquid.

To prepare useful condensing liquors for more efficiently collecting

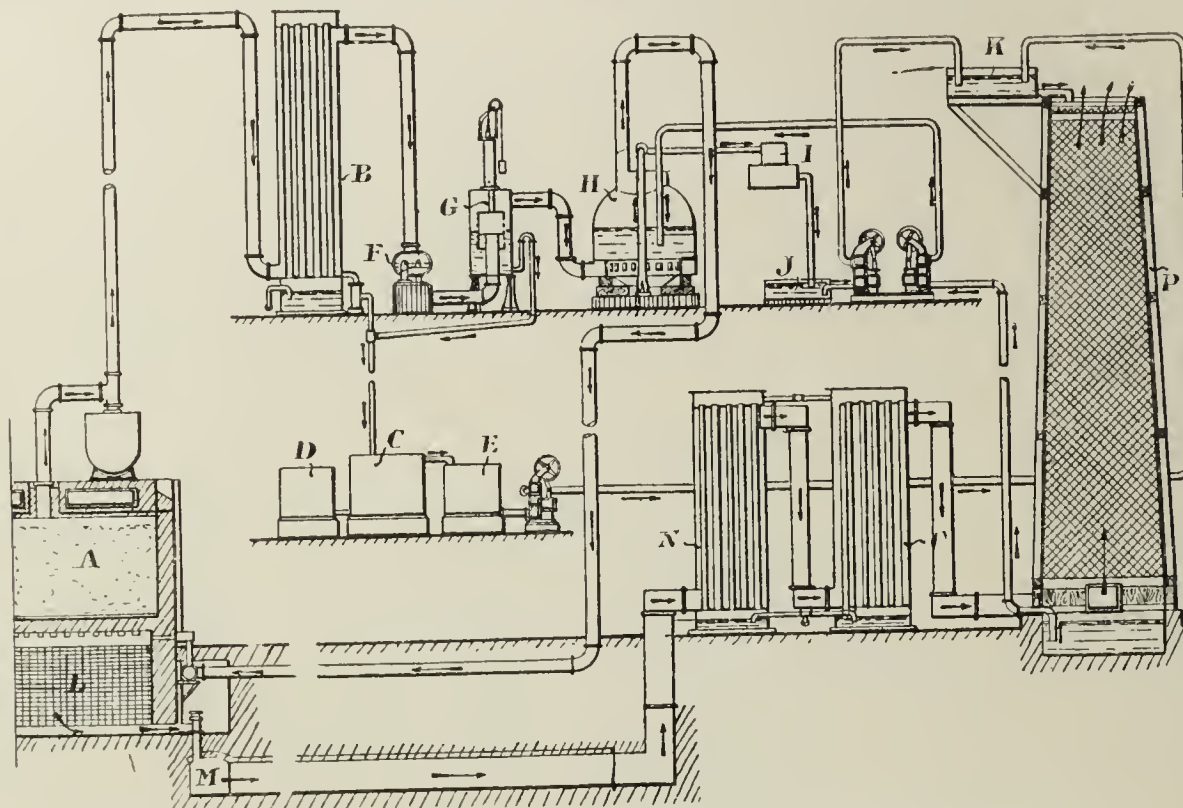
* See "JOURNAL," Vol. CVIII., p. 477.

ammonia evolved from coke-ovens, it has been heretofore proposed to use the waste product resulting from the combustion of the gases and utilize it to supersaturate impure or purified ammoniacal liquors to thereby convert the ammonia therein into an acid salt of ammonia (bisulphite of ammonia) which it is suggested was to be used for condensing purposes in collecting the ammonia from coke-oven gases.

It has been proposed, in the preparation of coal and like gas, to pass sulphurous acid gas into ammoniacal gas liquor in a purifier until acid,

and to pass this liquor to and from this purifier and a second purifier into which the crude coal gas is passed; the resulting liquor being drawn off when of any desired strength, and fresh liquor or water added—if desired, continuously.

According to the present invention, however, the products of combustion from coke-oven or like distillation gas containing sulphurous acid are employed; the ammonium sulphite or sulphate being precipitated as a solid salt, as before stated.



Burkheiser's Apparatus for the Preparation of Ammonium Sulphite or Sulphate from Gases.

The illustration shows in section a plant suitable for carrying out the process according to the present invention.

The gas evolved in the retorts A and collected in the hydraulic main is first cooled down in coolers B. The condensed liquid thrown down in this operation passes into tanks C, where it separates according to its specific gravity into tar and ammoniacal liquor of which the first passes over into the tar-tank D, and the latter into the liquor-tank E. The gas is now forced by the exhauster F into the tar-separator G, which is likewise connected to the tank C, and so flows completely freed from tar and in a fine state of subdivision into and through the saturating box H, which is filled with acid liquor. The ammonia salt precipitated here is lifted out by a jet exhauster and dried by the centrifugal drier I. The alkaline mother liquor runs away into the trough J, and thence to the tank K. The gas now passes back to the furnace A, where it serves for heating in the known way. The waste heat passing through the heat economizer L into the passage M, and to which is added the products of combustion of the part of the distillation gas which is burnt under the steam-boilers, is brought to a suitable temperature in the coolers N O, and then traverses the scrubber tower P, which is built after the manner of a chimney cooler, and where it is scrubbed with the liquid from the tank K. To the liquor which collects here is added the gas liquor from the tank E. This gas liquor may, however, be forced to a distilling column in the usual way, and the waste vapours again supplied to the distillation gas coming from the retorts. As the liquor in the tank K must be alkaline in any case, the addition of gas liquor is of no consequence here, and the dilution of the liquor at this point is also of no importance.

In this method of working, the following reactions take place: The sulphurous acid produced in the combustion of the sulphuretted hydrogen of the distillation gas is contained in a high state of dilution in the products of combustion of the latter, which consist principally of carbonic acid, water vapour, and nitrogen. Now as the liquor, which is rendered alkaline in the saturator H by the ammonia of the gas, is utilized to irrigate the washer P, and whereas the liquor which is re-acidified in this tower is passed back to the saturator, the washing-out of the sulphurous acid, as mentioned, is accomplished in spite of the accompanying gas ballast; and, furthermore, the reaction with the ammonia is brought about without mixing the gases themselves.

In addition to the task of the washing liquid (namely, that of bringing about the reaction between the ammonia and the acid and simultaneously fixing the place where the salt is obtained), it also permits the kind of salt to be influenced—that is to say, whether NH_4SO_3 or NH_4SO_4 is to be formed. The mass of liquid possesses a compensating and accumulative action in that, should momentary lack of one body occur, it nevertheless holds back the other. In the case therefore of temporary lack of acid, the escape of the uniformly incoming ammonia will be prevented, and *vice versa*.

For this conversion into a salt, the new process has also, *per se*, it is said, a special value. In the ordinary process for obtaining ammonia, there is introduced into the process, together with the acid, the water necessary for the formation of the salt, as well as constantly a definite quantity of water of dilution. As now in practical working other additional quantities of water (such as rinsing water for the centrifugal salt drier) are also added, care must be taken that the quantities of water not used up in the process are continuously carried off, as they would otherwise cause the salt formed to be dissolved up. In methods worked above the normal boiling point of water, this is accomplished

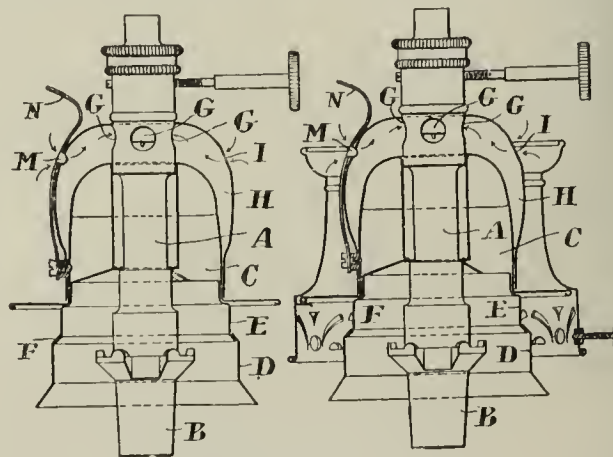
by evaporation; in those methods which are worked below it, by volatilization (superheating of the gases). Now in the present process, the acid is introduced in a gaseous state, and therefore completely anhydrous; and the washing liquid once added is always used again. The quantity of additional water can, therefore, be easily so proportioned that it corresponds to the quantity of water used up in the process. A solid salt can thus be obtained by these means without any special measures, and directly; and there is no restriction of any kind as to the favourable temperature for the separation of the tar. In other respects, even where there is a great introduction of additional water, the considerable quantity of heat contained in the products of combustion enables water to be volatilized from the liquor—the products of combustion being only cooled down to near their dew point. They are then capable of volatilizing water and carrying it away with them, because they become saturated therewith.

Inverted Incandescent Gas-Lamps.

HUBERS, J.; a communication from Julius Pintsch, Aktiengesellschaft, of Berlin.

No. 20,083; Aug. 29, 1910.

This invention relates to inverted incandescent gas-lamps in which no glass cylinder is provided and in which the chimney surrounding the bunsen tube is divided into two parts, of which the lower is movable.



A Pintsch Inverted Gas-Burner.

The illustrations show a longitudinal section in the lamp without and with an outer casing.

The bunsen tube A, provided with the nozzle B, carries a ring C and further a ring E as an extension. On the ring E, which is provided at its lower end with an outwardly extending conical flange, a ring D is slidably mounted, and carries an inwardly extending conical flange F, which, in the lower position of the ring, rests against the flange of the fixed ring. Thus the ring D, when the lamp is in its working position, automatically falls into the lower position (shown), and the length of the ring is such that it forms, when in its working position, together

with the rings C and E, a chimney "producing an increased draught." For mounting the mantle holder, the ring D can be pushed upwards on the ring E, so that it does not hinder the insertion of the holder, and will fall back automatically into its lower position after the holder has been inserted.

In the construction of the lamp shown, the bunsen tube is provided in the usual manner with openings G for the admission of air. For protecting these openings from the burnt gases, side chambers H are provided which extend from the ring C and at their upper end enclose the openings G. Into these chambers the air enters through openings I (below the openings G), which can be regulated by a shield M carried by a lever N. The side chambers, which, as stated, close off the openings G from the burnt gases, form pockets H, into which any dust entering with the air through the openings falls and can be removed afterwards.

Gas-Burners for Brazing and for Gas-Heated Furnaces.

ALLDAY, E., and NICHOLSON, A., of Birmingham.
No. 18,234; Aug. 2, 1910.

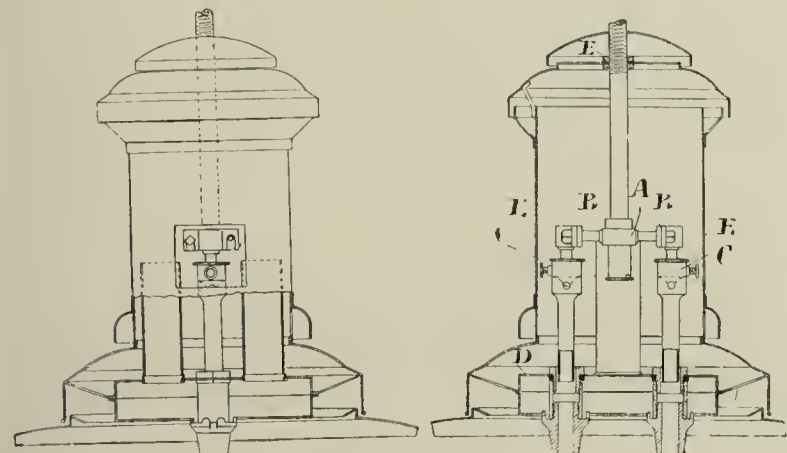
These improvements in high-pressure gas-burners for brazing purposes and all other purposes for which blow-pipe burners are ordinarily employed consist essentially in the combination with a high-pressure gas-burner of a secondary (or bye-pass) low-pressure gas-burner with means for varying at will the volume of gas passing through the high-pressure burner without reducing the pressure of the gas. In combination with high-pressure gas-burners of this kind, the patentees provide means for automatically shutting off the supply of gas to the high-pressure burner immediately the same is put down or loosed; the flame of the low-pressure burner being maintained and ensuring the re-lighting of the high-pressure burner when operated for re-use. There are also means for limiting the motion of a control lever or the like and of thereby determining the maximum flame to be produced by the burner.

Inverted Incandescent Gas-Lamps.

EHRICH AND GRAETZ, of Berlin.

No. 30,087; Dec. 28, 1910. Date claimed under International Convention, May 2, 1910.

These improvements relate to inverted incandescent gas-lamps particularly for external lighting.



A New Graetzin Lamp.

The gas-pipe has attached to it the distributing body A, which opens into a number of flanged branches B, with a series of elbow-formed flanged connections leading to the nozzles C arranged vertically below. To the latter are screwed the mixing-tubes, the lower ends of which are freely movable in glands secured to an intermediate crown D in the lamp casing. The invention consists in that the flanges are not simply provided with holes for the screws to pass through, but with slots which open downwardly. It is therefore possible, after loosening the screws, to draw the flanges upwardly, together with the nozzles and mixing-tubes carried thereby, and in this manner to remove them from their position. This is also rendered possible by providing openings at corresponding positions in the wall of the casing normally closed by plates, a rotatable hit-and-miss slide, or the like (not shown).

Access to the interior of the lamp is had through the openings, and the mixing-tubes can be taken out through these openings after loosening the connections from the gas supply branches. It is thus possible to remove dirt retained in the burner and examine the nozzle without the necessity of dismantling the lamp and without removing the mantles from their position. The openings also serve for the purpose of gaining access to the regulating screw of the nozzle, so as to regulate the air for the burner.

Gas-Calorimeters.

MACKLOW-SMITH, A., of Queen Anne's Chambers, Westminster.
No. 25,336; Nov. 1, 1910.

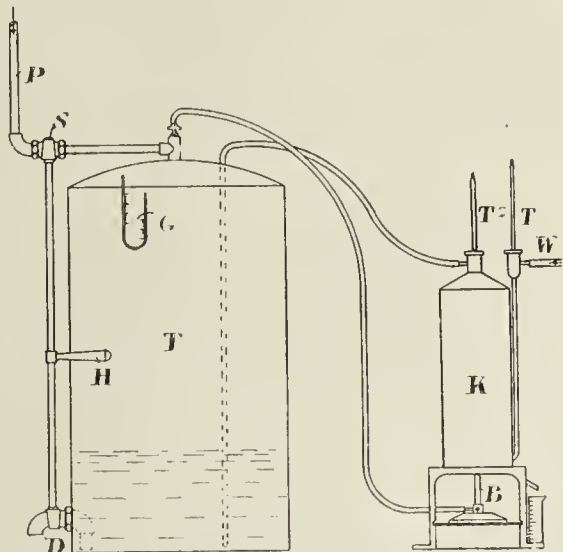
This invention has for its object to provide a means to obtain the calorific value of a gas by passing water through an ordinary calorimeter into a closed vessel containing the gas, thereby displacing an equal volume of the gas, which is burnt in the calorimeter in the usual way. The advantage obtained is said to be that neither the gas nor the water need be measured; the calorific value being obtained by

multiplying the rise of temperature of the water as it passes through the calorimeter by a constant, because

$$\text{Calorific Value} = \frac{\left\{ \begin{array}{c} \text{Rise in Temperature} \\ \text{of Water} \end{array} \right\} \times \left\{ \begin{array}{c} \text{Volume of} \\ \text{Water} \end{array} \right\} \times \left\{ \begin{array}{c} \text{Density of} \\ \text{Water} \end{array} \right\}}{\text{Volume of Gas} \times \left\{ \begin{array}{c} \text{Density of} \\ \text{Gas} \end{array} \right\}}$$

Since the volume of the gas displaced equals the volume of the water,

Calorific Value = Rise of Temperature \times A Constant.



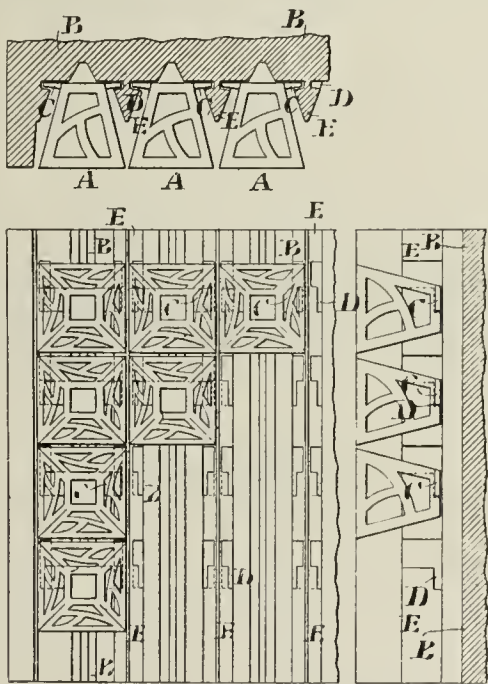
Macklow-Smith's Gas-Calorimeter.

The apparatus comprises a closed tank T, to which the gas to be tested is supplied through a pipe P provided with a cock S. The upper part of the tank is fitted with a pipe leading to an ordinary bunsen burner B, in which the gas is burnt in the calorimeter K. Water enters the calorimeter at W and passes to the tank T, there displacing an equal volume of gas at any desired pressure, which is measured by means of a pressure-gauge G. When the tank is full, the drain cock D is opened by means of the lever H, which will also open at the same time the gas-cock S, thereby allowing a fresh sample of gas to enter the tank as the water passes away. When the tank is full of gas, both cocks S and D are closed, and the temperature of the water noted as it enters and leaves the calorimeter by thermometers T1 and T2 or other means.

Gas-Fires.

CARPENTER, C. C., of Old Kent Road, S.E.
No. 25,849; Nov. 7, 1910.

This invention refers to gas-fires of the kind in which the flame from atmospheric gas-burners is used for heating fire-clay structures arranged in front of a vertical or slightly inclined fire-clay backing retained within a metallic or other suitable case or framing. The object of the invention is to secure increased efficiency in such fires "by providing a special form of fire-clay structure attached to the fire-clay backing in a position suitable for the flames to play upon."



Carpenter's Gas-Fire "Pyramids."

The illustration shows front, side, and plan views of a fragment of fire-backing with the fire-clay structures embodying the invention fitted thereto in one of the ways claimed.

The fire-clay structures A are in the form of hollow truncated pyramids. They are built up of lattice or open basket-work, so that the flames from the burners pass freely through them transversely. They are attached to the fire-clay backing B by their smaller ends, so that they present a hollow pyramidal interior towards the apartment which the fire is intended to warm. The form of attachment shown consists of wings or lugs C, which enter notches D in ribs E on the backing B.

The backing may, however, be furnished with hooks upon which the structures A may be hung by means of holes in their smaller ends.

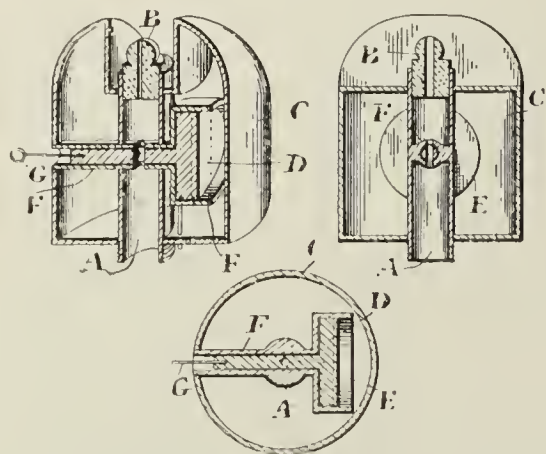
The flames from the burners (which are as usual in such fires and are not shown) pass upwards through, as well as around, the structures A, and "make them very hot internally as well as externally, and the internal surfaces, being pyramidal, are therefore able to transmit by radiation considerable heat to their surroundings."

Automatic Cut-Offs for Gas-Burners.

KELLEY, J. H., of Moose Jaw, Saskatchewan, Canada.

No. 29,453; Dec. 19, 1910.

This automatic cut-off device extends alongside, and in close proximity to, the burner flame, and controls a passage leading to the burner—maintaining it open by the expansion of the gas in the chamber as long as the burner is alight, but automatically closing it if the flame is extinguished.



Kelley's Automatic Cut-Off for Gas-Burners.

The burner-tube A is surrounded by a gas-tight chamber C, constructed of thin metal, and cylindrical in form; the upper part of the chamber being provided with wings which project slightly above the burner B on opposite sides. The air in the wings will thus be heated by the burner, and yet the wings will not substantially obscure even the non-luminous part of the flame. Upon the flame being put out, the air sealed in the chamber C contracts, and means are provided (operated by this contraction) for shutting off the passage-way through the burner. These means comprise a plunger D mounted to reciprocate within a cylinder E, one end of which opens within the air-chamber C, and the opposite end of the cylinder being connected to a sleeve F, which extends transversely across the burner-tube and fills it—the sleeve opening through one side of the chamber C.

The plunger is provided with a stem which fits the sleeve; and the sleeve and stem are provided with ports adapted to register with each other when the plunger is in the innermost position (as shown). All the gas passing through the burner-tube must flow through the ports; and when they are out of registration with each other, no flow of gas can take place. Upon contraction of the air in the chamber C, the piston will be drawn to the position shown in dotted lines, which will bring the ports out of registration and prevent the flow of gas.

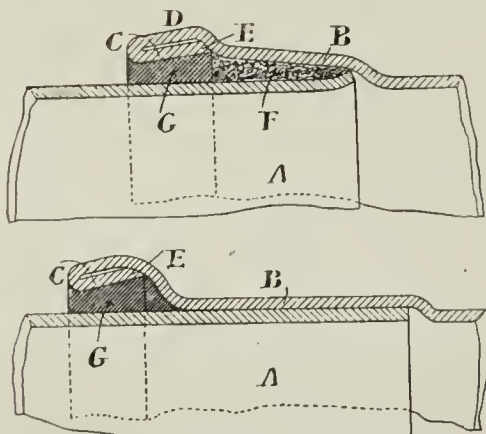
In lighting the burner, it is necessary to move the plunger to the innermost position, and retain it in this position for a few seconds until the air or gas in the chamber C becomes heated sufficiently to keep the plunger in the innermost position. To enable this to be done, an operating handle G protrudes beyond the outside of the chamber C.

Faucet-End for Pipes and Tubes.

STEWARTS AND LLOYDS, LIMITED, and STEWART, J. G., of Coatbridge.

No. 3189; Feb. 11, 1911.

The object of this invention is to strengthen the sockets or faucet-ends of steel and wrought iron pipes, by making them somewhat longer than usual—the part constituting the extra length being folded back or doubled over inwardly upon the socket so as to give a double thickness round the rim, and thus strengthen the socket and enable it to resist damage in transport and the heavy strain when caulking the usual lead joint.



Stewarts and Lloyds' Faucet-Ends for Pipes.

The illustration shows spigot and faucet joints in section—a joint of the flexible type and one of the rigid type.

A is the spigot end of the one pipe and B the faucet end of the other

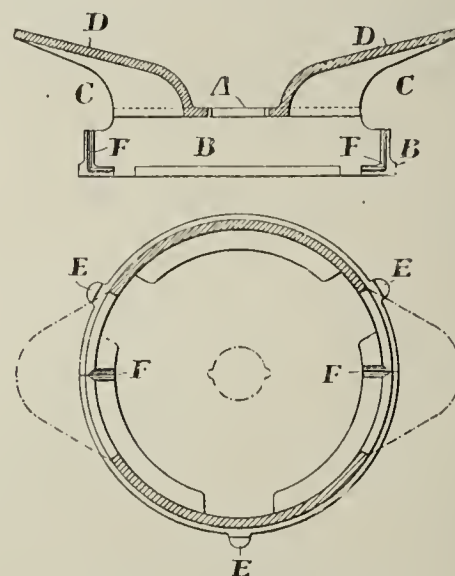
pipe. As will be seen, the faucet is made with an extension C, which is folded or doubled over inwardly upon the body of the faucet so as to constitute a deep rim of double material—the part C being more or less flat and preferably parallel to the part D. The part C is preferably made with a bevelled edge at E, so as to lie closely against the body of the faucet. The double rim C D is inwardly inclined; the internal diameter of the socket being greater at the end of the part C than at the socket mouth—a formation tending to hold the packing in position. F represents packing of jute or similar material, and G packing of lead or cement.

Gas-Lamps.

CHANDLER, D., of Old Kent Road, S.E.

No. 4919; Feb. 27, 1911.

This invention refers particularly to inverted incandescent gas-lamps which employ a top made of porcelain, earthenware, or the like furnished with a depending flange for supporting the lamp globe or shade. In such lamp tops it is found, the patentee asserts, that the flange expands unequally with the rest under the heat of the flame, and consequently the flange is liable to split—the fraction extending in unexpected directions and generally completely destroying the utility of the whole structure. Having ineffectually attempted to prevent the cracking and splitting in various ways, he has "conceived the idea of regulating and controlling it so that the split, when it takes place, shall assume the form only of a slight crack or cracks in an unimportant position." Accordingly, in course of manufacture he weakens the flange in one or more places, so that, when the heating-up of the lamp top takes place, the flange gives way at the weak places only, "which are so situated that they do not prejudice or injuriously affect the utility of the structure."



Chandler's Porcelain Lamp Top.

He illustrates his invention as shown. A is the top part of the lamp top and B the flange. The top part is flat, with a pair of apertures C covered by ears D to provide an exit for the heat. The flange, provided with hooks E, notches, slots, or the like, and which performs all the offices of a gallery, is weakened by reducing its thickness by means of grooves F. The whole structure is moulded and baked in the ordinary way, and during the operation it will retain its proper form.

To complete the treatment of the structure for use it is heated unequally, so that the expansion of the top part A and flange B is unequal. The result is that there are formed at the weakened places fine cracks, which "permit of irregular expansion in use and render the structure immune from destructive fracture when heated by the flame of the lamp in ordinary use."

APPLICATIONS FOR LETTERS PATENT.

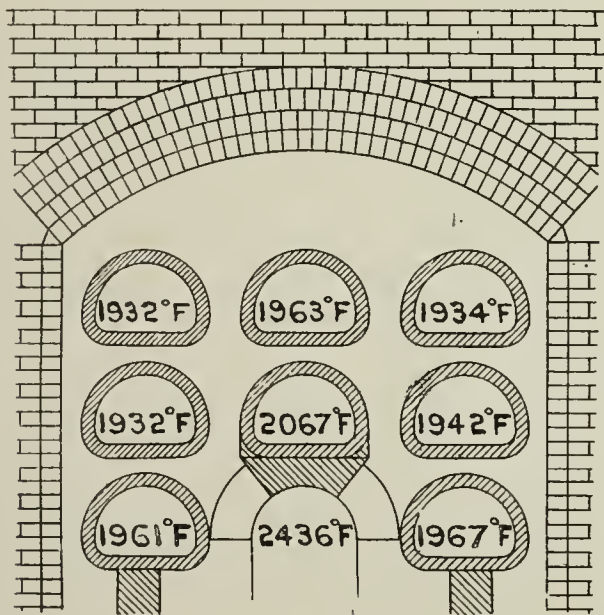
- 15,964.—ROYSTON, E. R., "Methods of treating materials." A communication from the General Reduction Gas and Bye-Products Company. July 10.
- 15,969.—MALLET, P. A., "Gasification of caking coal in closed generators." July 10.
- 16,027.—GREEN, H. J., "Gas-producers." July 11.
- 16,028.—HOLLIS, M. S., "Stop-cocks." July 11.
- 16,041.—REYNOLDS, A., "Regenerating furnaces." July 11.
- 16,147.—LAFITTE, J., "Diffusion of light." July 12.
- 16,148.—LAFITTE, J., "Increasing the efficiency of a source of light." July 12.
- 16,168.—CHADWICK, J. B., and HOLLINSHEAD, P., "Working gas-producers." July 12.
- 16,177.—BONE, W. A., WILSON, J. W., DOUGLAS, C., and ZORTMAN, I. H., "Producing heat by the combustion of gas." July 13.
- 16,193.—CORNER, J. T., "Fluid-tight joints." July 13.
- 16,213.—CUTHBERTSON, C. J., "Air-gas apparatus." July 13.
- 16,250.—PACE, P. C., "Manufacture of air gas." July 14.
- 16,296.—DIEREN, T. VAN., "Gas-lighting apparatus." July 14.
- 16,311.—CLARKE, H., and CAMPBELL, J. A., "Closure devices or cover-plates for retorts." July 14.
- 16,341.—CHRISTIE, J., and CLEMENT, J. P., "Gas-ovens." July 15.
- 16,344.—PARSONS, W., "Geysers." July 15.
- 16,373.—PICTET, R. P., "Process of manufacturing a mixed gas." July 15.
- 16,381.—CLARKE, H., and CAMPBELL, J. A., "Retorts for the destructive distillation of coal." July 15.
- 16,384.—RESCHOTZKOWSKI, G., "Troughs for scurfing gas-retorts." July 15.

CORRESPONDENCE.

[We are not responsible for opinions expressed by Correspondents.]

Controlling the Heat of Retorts.

SIR,—We notice that in the issue of the "JOURNAL" for July 4, p. 41, a patent is described taken out by M. Pierre Jacques, whereby heats on the retorts throughout their length are controlled by means of dampers situated at the top of the setting. We wish to draw attention to patent No. 14,637 taken out in the year 1906 by our Mr. R. M. Brooke, in which patent (for which we are the sole agents), the stay-walls of the setting are extended downwards through the regenerator—dividing the setting and regenerator up into separate compartments or sections, each section being provided with a separate damper at the bottom of the regenerator for controlling the heat on the retorts throughout their length. These dampers, being at the bottom of the regenerator in a comparatively cool position, are not liable to fuse or stick, as must be the case with M. Pierre Jacques' arrangement.



In proof of our claim to superior control—not only in regard to adjustments over the length of retorts, but also of the several temperatures throughout the setting—we submit a diagram of a setting of eight on Brooke's principle, with the average temperatures recently taken over several weeks' working after the retorts had been in constant use for more than twelve months.

Elland, July 21, 1911.

ROBERT DEMPSTER AND SONS, LTD.,
J. W. BROADHEAD, Managing Director.

Testing Hot-Water Appliances.

SIR,—*Apropos* of the meetings of the inspectors and members of the staffs of the London Gas Companies at these works in connection with the testing of apparatus for hot-water supply, we should like it to be generally known that an open invitation exists to the engineers, inspectors, assistants, and others connected with gas undertakings throughout the country; and arrangements can be made for anyone interested to pay a visit of inspection and carry out tests according as the time may permit.

The extensive manner in which this matter has been taken up makes it impossible for us to write to companies individually; and we should therefore be obliged if you will publish this letter.

THOMAS POTTERTON.

Cavendish Works, Balham, S.W., July 22, 1911.

Use of High-Pressure Gas for Industrial Purposes.

SIR,—There appeared in your last issue a letter from Mr. E. W. Smith, written in reply to some of the criticisms of his recent paper on the "Uses of High-Pressure Gas." On comparing that paper with his letter, I notice that Mr. Smith has made several important admissions which serve to show that I was justified in condemning some of his former claims as being extravagant. He has negatived some of his original statements, and now says that he has been misunderstood, owing to the results of his experiments being published without sufficient explanation. This is surely a somewhat scathing criticism of the value of his own paper.

With regard to his gold-melting experiments, I append, side by side, the following quotations taken (1) from his original paper and (2) from his recent letter.

(1)

"A series of tests have recently been carried out . . . One of the objects was to determine the relative costs of melting gold in 100 oz. lots, with coke, air-blast and gas, and high-pressure gas."

(2)

"My object in publishing the results of a certain number of comparative experiments in the paper was by no means to show what a high-pressure appliance could do compared with the best types of other appliances, but to show what a high-pressure appliance could do compared with the appliances and methods most generally employed in the application under consideration for the time being. That is what one has to contend with when advocating the use of any system."

In my previous letter, I pointed out that the results given by Mr. Smith implied that for gold melting, high-pressure gas was six times as efficient as low-pressure gas worked in conjunction with an air-blast. I commented on this, and said that I failed to see how high-pressure gas could be much more efficient than low-pressure gas and an air-blast properly used. Mr. Smith now admits that in Birmingham they obtain quite as good results by means of low-pressure gas and air-blast as with high-pressure gas, so far as temperature and fuel efficiencies are concerned.

It appears that the blast used in conjunction with the low-pressure gas in the tests under consideration was obtained by the use of a foot bellows, the work of pedalling being done by a boy who is paid at the rate of 4½d. per hour—3s. per day of eight hours is surely a very good rate of pay for a boy doing this type of work. Mr. Smith knew that this was a highly inefficient process, and yet he did not take the trouble to explain in his original paper that this was the application of low-pressure gas and air-blast that he had under consideration when making his comparison.

In the case of the coke test which he described, the thermal efficiency is ridiculously low. The cost of fuel is given as 3d., as against ½d. in the case of high-pressure gas. And assuming the cost of coke to be 15s. per ton, his figures imply that his high-pressure system has over ten times the thermal efficiency of a coke-fired furnace; or, taking the cost of fuel as the basis for comparison, the high-pressure system is six times as efficient as a coke-fired furnace. In his letter, Mr. Smith tells a very different story; for there he says "brass can be melted by means of coke in a certain special kind of furnace at a cost which prohibits all competition from gas, on fuel costs alone." I see no reason why the same should not hold in gold melting; so that if a proper furnace were used, coke would prove to be the least costly fuel—a conclusion which one would not arrive at on reading the summary of the tests published in the original paper.

The quotation given above from Mr. Smith's original paper is quite definite. The results of the three tests were published side by side; and if one refers to the early part of the paper (a portion of the paper Mr. Smith himself is so fond of referring to), it will be found that he there states that "the main object in experimental work on gas-heated appliances is to attain the highest efficiency." So that on reading the paper the impression given is that truly comparative tests have been carried out, and that from the fuel point of view better results are to be obtained with high-pressure gas than can be expected with either coke or low-pressure gas and air-blast. Now, according to Mr. Smith's letter, air-blast and low-pressure gas are quite as efficient as high-pressure gas; and from the point of view of fuel cost coke is better than either. So that it is to be hoped he will see the advisability of altering the wording of this portion of his paper before it appears in the "Transactions" of the Institution, and so avoid all possibility of his meaning being misunderstood.

Mr. Smith complains that I have been severe in my criticism of his paper, and that I am apparently labouring under a misapprehension as to his attitude towards the subject of high-pressure gas. If, after reading his Glasgow paper, I did not properly understand his attitude, I have been put right by the quotation from his letter which I give above—quotation No. 2. The paragraph winds up with the remark, "That is what one has to contend with when advocating the use of any system." So I conclude that Mr. Smith did not wish his paper to be regarded as a scientific communication, but that his intention in reading it was (to quote him again) "not so much to teach, as to place before the Institution a little of the experience gained in connection with the high-pressure gas laboratory. . . .—experience gained apparently as to what one has to do when advocating the use of any particular system."

I pointed out that the percentage of the available heat that was transferred to the gold in these experiments was very small. Mr. Smith agrees with me, but adopts the line of argument that, after all, fuel efficiency is of relatively small importance in this case. I have no doubt that his remark applies to the aluminium melter; but the present discussion is on the subject of occasional gold-melting by jewellers. Taking the data given on this subject, the labour charges appear to me to be too heavy. In the case of the high-pressure furnace, surely it is not necessary for a man to stand watching the furnace during the operation? It will take but a small time to start-up, and will require very little attention; so that the actual time that a man need give to it would be small, and fuel costs would certainly be of primary importance. In the case where a foot-bellows is employed, it would be necessary to have a boy for pedalling. But if he was sufficiently useful to be paid at the rate of 18s. per week, then he ought to be quite capable of controlling the melting, without the necessity of employing an additional man at the rate of 9d. per hour for this purpose. If, as Mr. Smith postulates, it is really necessary to have a man at 9d. per hour to watch the melting, then I venture to think that the jeweller who uses the low-pressure gas supply would be quite justified in expecting the man to work the foot-bellows also. The difference between the cost of melting the gold by this inefficient process and by means of high-pressure gas would then be 2½d.—that is the difference in the cost of gas given by Mr. Smith. I would also like to remind him that he remarked in his original paper that much dissatisfaction had been expressed, by the jewellers themselves, with gas-heated appliances, owing to their bad design and wasteful consumption. It is evident that, however much may be said to the contrary, the jeweller keeps his eye on the gas bill.

The next point in Mr. Smith's original paper that I discussed was his iron-pot test. On referring to the paper, it will be found that he prefaces all account of these experiments with the following statement: "Another field in which high-pressure gas has not only an advantage over low-pressure gas, but in many cases over coal and coke, is in the heating of liquids." He then goes on to say that, although an increased efficiency had been expected, the increase obtained was surprising. The tests themselves are labelled "Comparative Tests;" and the whole thing is described in a grandiloquent manner. The letter now explains what was meant—the heating of water in the outer shell of a glue-pot. Why was Mr. Smith not more candid in his original paper? Here, again, I venture to think that he has expressed himself in a misleading manner. One now understands the 47.5 per cent. efficiency obtained

with the low-pressure gas supply; and it is to be hoped that Mr. Smith will clearly indicate in his paper that he is here discussing glue-pots.

But as he was considering this application of gaseous heating, why did he trouble to lag the pots, and why attempt to cut-down heat losses? The average man when using a glue-pot does not take this trouble. No doubt these tests are of value to the gentleman who used the large number of glue-pots, but as comparative tests of the efficiency of high and low pressure gas when used for water heating, they are worthless. These are the tests which have been cited in support of the remark that the heating of liquids is a field in which high-pressure gas has an advantage over low-pressure gas. I can assure Mr. Smith I entirely agree with him that the tests are of no academic utility; but I should like to remind him that tests of any real industrial value are of necessity of academic value. With the high-pressure gas, he obtained 92 per cent. efficiency. I am curious to obtain further information concerning this; and in my previous letter I asked for details of the methods adopted for cutting-down heat losses in each case. In addition, I asked for information concerning the weight and size of the iron pot. I should be obliged if Mr. Smith would supply this information. I also asked Mr. Smith the following question: Why, since he intended these tests to be parallel, was the rate at which he burnt the gas in the high-pressure experiment considerably higher than that in the case of the low-pressure experiment? I fail to see any answer to this in Mr. Smith's letter.

Finally, with regard to the points raised about the statements made in his reply to the discussion on the paper at the Institution meeting. I note that he has accepted, without comment, my correction of his remark about the radiation from flames, and that he has made the necessary addition to correct his statement concerning the variation of the temperature with the size of a flame. But with regard to his phrase "initial temperature of combustion," while stating it to be ambiguous, he makes no attempt to explain what he means by it, but, avoiding the point at issue, makes some general remarks, and finally winds up with the phrase "the better the mixture of gas and air before combustion takes place the higher will the flame temperature be." The correctness of this statement is entirely dependent upon one's conception of flame temperature, and will be accepted by the majority on the assumption that by flame temperature is meant the average temperature throughout the flame. This phrase is very different from the one Mr. Smith used in the first instance. At Glasgow, he said "the better the mixture of gas and air the higher the initial temperature of combustion." Will Mr. Smith say definitely what he regards this phrase as meaning, and, at the same time, state what grounds he had for making such a statement? I am of the opinion that Mr. Smith's letter has put an entirely different complexion on the comparative tests which he published, and has shown them up in their true light.

HAROLD HARTLEY.

10, Eldon Place, Leeds, July 19, 1911.

Corrosion of Service-Pipes.

SIR,—With one exception, there is nothing in Mr. M'Leod's letter, in your last issue, calling for further comment. I am content to leave the main subject with my letter of the 6th inst. (*ante*, p. 112). The question has become simply one of definition; and Mr. M'Leod's own definition supports my position. In the final sentence of his last week's letter, however, he says he "did not define acidiferous subsoil in the way stated by Mr. Hole." The definition was a double-barrelled one. An acidiferous subsoil is this or that, or I suppose both. I give the definition in full: An acidiferous subsoil is "a subsoil which is in itself, or contains in itself, substances which are acid in character, and which will give an acid reaction when partially dissolved in water." The italics are mine, and form the alternative which I adopted. You will see that there is no misquotation whatever.

WALTER HOLE.

Leeds, July 19, 1911.

PARLIAMENTARY INTELLIGENCE.

HOUSE OF LORDS.

METROPOLITAN WATER BOARD (NEW WORKS) BILL.

After the third reading of this Bill on Tuesday,

The DUKE of NORTHUMBERLAND moved to insert a new clause providing that, "if any operations of the Board for the purposes of, or in connection with, the construction of any reservoir by this Act authorized has caused any diminution of the supply of water from any well, borehole, pond, pool, spring, stream, or watering-place, or other source of supply existing at the date of the passing of this Act within the Administrative County of Middlesex, and within a radius of two miles from the site of any such reservoir," the Board should repay to the owner all costs and expenses reasonably incurred in obtaining an additional supply. He said the Water Board proposed to make two very large reservoirs in Middlesex. It was intended to dig a ditch round the reservoirs down to the London clay, which in some places was 110 feet below the surface; and the length of the ditch would be about five miles. The effect of the operations of the Board would, it was apprehended, deplete all the wells in the surrounding district, which was full of small owners and occupiers who had these wells; and the distress for water would in consequence be very great. He quoted from the evidence of the Engineer of the Board to show that the danger was a real one, and that the loss could be made good at small cost.

The EARL of KINTORE, the Chairman of the Joint Committee who considered the Bill, expressed a hope that their Lordships would not agree to the new clause. He pointed out that the Bill contained provisions of great public interest, that the Joint Committee had devoted some time to the inquiry, and that the decisions arrived at were practically unanimous and generally accepted by the parties affected. A clause similar to the one proposed had been pressed on the Committee

by the Middlesex County Council; but as the Bill related to surface or river water, the Committee thought it would be improper to allow compensation before a thorough inquiry was held. He hoped the Local Government Board would soon institute such an inquiry.

Viscount HALDANE said the question at issue did not, strictly speaking, arise out of a Public Bill; but it was of such far-reaching importance, and affected so many rights, that it well deserved the attention it had received. He felt that the Joint Committee had done the best that could be done in circumstances in which action was absolutely necessary. He did not think the clause suggested could be supported either on the ground of law or in the face of the recommendations of the Joint Committee. If these were departed from, he felt that they would be making a precedent, and throwing this class of legislation into a state of uncertainty.

Lord NEWTON suggested that the question might be amicably settled if a pledge given by the Engineer to the Board were carried out, and a supply of water equal to that of which they were deprived were given to those who were prejudicially affected.

Lord MACDONNELL, the Chairman of the Joint Committee on the Protection of Water Supplies Bill, gave an account of the conclusions of the Committee, and said it was a matter of extreme importance that the question should be further and fully inquired into.

The MARQUIS of SALISBURY said in Hertfordshire they had suffered enormously. It was not proposed that the making of large water reservoirs should be prevented. The only point was whether it was just or unjust for the Water Board to give compensation for any injury their works inflicted. The injury was universally admitted; and the only reply was that they should wait for the appointment of an important Commission who had not yet been nominated, who might sit for years, and whose finding might, after a considerable interval, be followed by legislation. Meanwhile, all people affected must go on suffering.

The EARL of DONOUGHMORE (Chairman of Committees) thought it was frankly admitted that there were no exact precedents to the case submitted. It might or might not be desirable to give general protection; but those who had gone into the matter most closely felt that there was not enough information on which to make up their minds. In view of all the facts, and considering that the clause was one asking for protection for people who had not thought it worth while themselves to come and ask for it, he should regret any decision going behind that of the Joint Committee who considered the Bill.

Lord ALVERSTONE remarked that what seemed to be overlooked in the argument of the noble earl was that what was asked for was not protection for the abstraction of water when the works were made, but while they were being carried out. He was satisfied that there were many precedents in Private Bills for compensation being allowed where wells were temporarily interfered with during the construction of works, and that the clause could not be resisted upon the ground that there was anything in principle against it.

Viscount ST. ALDWYN suggested the adjournment of the debate, in order that the Water Board might confer with the noble duke and those who were supporting him, with a view to seeing whether some clause could not be framed which would extend the same compensation as was given by the Bill to Lord Fitzhardinge to cases where it could be definitely shown that the same kind of injury might be done temporarily. To raise this point, he moved the adjournment of the debate.

Viscount HALDANE said the course just suggested was not one which could be disposed of quickly. As he understood, this Bill pressed; and, though he did not like the noble duke's clause, he would rather take the Bill with it than risk the loss of it by entering upon the inquiry which the noble viscount had suggested.

The motion for the adjournment of the debate having, by leave of the House, been withdrawn, a division was taken, and the clause was rejected by a majority of 31.

The following further progress has been made with Bills:—

Bill brought from the Commons, read the first time, and referred to the Examiners: St. Helens Corporation Bill.

Bills reported: Belfast Corporation Bill, Gas and Water Orders Confirmation Bills (Guisborough Water Order and Unopposed Orders), Gas and Water Orders Confirmation Bills (Nos. 2 and 4), Local Government Provisional Orders (Gas) Bill, Local Government Provisional Order (Gas) Bill (No. 2).

Bills read the third time and passed: Gas and Water Orders Confirmation Bill, Gas Orders Confirmation Bills (Nos. 2 and 4), Metropolitan Water Board (New Works) Bill.

The Margam Urban District Council Bill and the Rotherham Corporation Bill have been referred to a Select Committee, consisting of Lord Lamington (Chairman), the Earl of Eldon, Lord Digby, Lord Wynford, and Lord Brabourne; and they commenced sitting yesterday.

HOUSE OF COMMONS.

The following further progress has been made with Bills:—

Bills brought from the Lords, read the first time, and referred to the Examiners: Gas Orders Confirmation Bills (Nos. 2 and 4), Gas and Water Orders Confirmation Bill, Metropolitan Water Board (New Works) Bill.

Bills read the third time and passed: Chester Water Bill [Lords], St. Helens Corporation Bill.

The Merthyr Tydfil Corporation Water Bill [Lords] and the Swansea Gas Bill [Lords] have been referred to a Select Committee, consisting of Sir Edwin Cornwall (Chairman), Sir Edward Beauchamp, Mr. Page Croft, and Mr. Ronald M'Neill; to commence sitting to-day.

Gas Workers' Agitation at Douglas.—The employees in the works of the Douglas Gas Company, as well as the lamplighters, some days ago presented to the Directors a demand for increased wages. The retort-house hands asked for 5s. per eight-hour shift, as against the 4s. 6d. now paid; and the yardmen, for 4s. a day, in place of 3s. 6d. The lamplighters requested that their wages should be increased to 23s. 4d. per week.

LEGAL INTELLIGENCE.

THE ALLEGED MISUSE OF GAS AT FALKIRK.

In the Falkirk Sheriff Court on Monday of last week, before Sheriff Substitute MOFFATT, Bailie Henry Russell was summoned under the charge which was announced three weeks ago, when the previous complaint was found by the High Court to be irrelevant—viz., that, having within the premises known as the Crown Brass Works, Falkirk, belonging to and occupied by him, a service of gas manufactured by the complainants under provisions of the Falkirk Corporation Gas Acts, 1894 to 1910, for which he was liable to pay to the complainants at the rate of 2s. 9d. per 1000 cubic feet for the gas used by him for ordinary lighting purposes, and at the rate of 2s. 4d. per 1000 cubic feet for the gas used by him for power purposes, and having, without the complainants' authority, and at some date to the complainants unknown, connected a pipe with the main outlet pipe from the power meter situated within his premises, he did, on Wednesday, Jan. 11, 1910, fraudulently use for lighting purposes gas so supplied by the complainants for power purposes, contrary to section 38 of the Gas-Works Clauses Act, 1871.

Mr. W. J. GIBSON, on behalf of the accused, at once objected to the relevancy of the complaint on two grounds—first, that an offence was not set forth within the meaning of the section libelled, and, second, that the complaint was lacking in specification, in respect that it did not state on what ground, and whether under Statute or by agreement, the respondent was liable in the differential rates. The gas supplied, it was argued, had passed through the meter, and was therefore the property of the respondent, and not the property of the undertakers. It did not matter to the undertakers, so far as the section was concerned, what was done with the gas, so long as it was paid for. There might be a breach of contract, if a man used gas for one purpose which was supplied for another. But that was a civil matter, and not one for a penal prosecution. The meter was an automatic device for delivering the commodity. It was an instrument which stood between the undertakers and the respondent, which gave delivery to the respondent on the one hand, and which ascertained the price for the undertakers on the other. The words of the Statute ought to have been rigidly adhered to in the charge. It was important, under his second objection, that the respondent should know under what resolution or other authority the complainants had imposed differential rates, as, in the event of the respondent proving that such authority was inept, the charge would not lie.

Mr. H. P. BLACK, for the Corporation, argued that if the contentions of his friend were sound, there could not possibly be an offence under the section libelled. The sting of the complaint was that the respondent had got gas for certain purposes at a cheap rate, and had applied it for another purpose for which he would have been charged a higher price; and that this constituted fraudulent use within the meaning of the section. The use could not be ascertained till it was seen to what purpose the gas was actually put after it had left the meter. The fraudulent use only arose after the gas had passed the meter. Section 13 of the Gas Act of 1910, referred to in the body of the complaint, clearly gave the complainants power to impose differential rates.

The SHERIFF asked what was the difference between ordinary lighting and private lighting.

Mr. BLACK replied that the terms, in his view, were synonymous, but there was confusion among the Statutes, in some of which the phrase was "ordinary lighting," while in others it was "private lighting."

The SHERIFF took time to consider his decision upon the questions which had been raised in the discussion.

Gas Workmen's Bonus not Attachable.

At the Edmonton County Court last Friday, his Honour Judge Wheeler, K.C., heard a summons issued by Messrs. Rogers, of Edmonton, who asked for an order to attach money alleged to be due from the Enfield Gas Company to one of their workmen named Whithead, against whom plaintiffs had obtained judgment for £2 17s. 3d. It was stated for them that Whithead had a sum of £8 to come from the Gas Company. Mr. C. W. Offord, the Secretary of the Company, said they maintained that this money was wages, and therefore was not attachable. The Company had instituted a scheme under which, if the price of gas was reduced, they allowed the men a certain percentage on their usual wages, and this was payable once a year. It had nothing to do with the profit, but was a reward for services. His Honour declined to make the order.

Return of Overpaid Water-Rate.

At the Lambeth County Court last Friday, a case of exceptional importance to the public came before his Honour Judge Parry. The Electric Palaces, Limited, of Atlantic Road, Brixton, sued the Metropolitan Water Board for the recovery of £31 in respect of overpaid water-rate. The defence put forward was that, by the Public Authorities Protection Act, the Board were not liable to have claims brought against them after the lapse of a period of six months. Giving judgment for the amount claimed, with costs, his Honour said the case raised an interesting and important point as to the Local Authorities Protection Act; the question being whether the Water Board, having been paid this money in error, could keep it. The Board put forward the technical defence that they were protected by the Act. But he held that the Act calculated the date from which the six months' limitation should apply from the time the money had been paid; and, as the claim was made within six months after payment, the Board should return the money.

Provision of Water Supply on Each Floor.

At the Old Street Police Court, last Thursday, Mr. John Cooper, the owner of a number of tenement houses in Crondall Street, Hoxton, appeared in answer to summonses taken out on behalf of the Borough

Council of Shoreditch for failing to provide an adequate supply of water to the premises. It was stated by Mr. Ray, the Solicitor to the Council, that on the 15th of March last an order was made on the defendant by the sitting Magistrate, Mr. Biron, to provide a water supply to rooms above the ground floor; and a penalty of 21s. and costs was imposed. Since then nothing had been done in regard to the supply for three houses until the present summons had been served; and, in consequence, it was asked that a penalty for non-compliance with the order should be imposed. Evidence having been given that there was but one water supply for the whole house in each of the cases mentioned (and that in a back yard), Mr. Cluer said it was unreasonable for a man not to provide a proper water supply for each floor. Penalties of 20s. were imposed in all cases, with two guineas costs in respect of one house, and 30s. costs on each of the others.

Liability for Damage to Lamp-Posts.

At Brierley Hill, on Monday last week, adjourned actions brought against Mr. Zachariah Cartwright, farmer, of Himley, for accidentally breaking two electric lamp-posts at Wordsley, in respect of each of which £5 was claimed as damages, were brought up for the Magistrates' decision. At the previous hearing, Mr. G. F. James (the Clerk to the Kingswinford Rural District Council) stated that in January last, as Mr. Cartwright was about to step into his gig, the horse bolted and knocked down a lamp-post. It continued its career and knocked down a second lamp-post. The claimants contended that the defendant was liable to the extent of £5 damage for each lamp broken. The defence of Mr. Taylor (Messrs. Willcock and Taylor, of Wolverhampton) was that, according to the Gas-Works Clauses Act, 1847, under which the summonses were issued, the power of the Justices was limited to £5 damages in respect of any one accident, and that as both lamps were broken during one occurrence, £5 was the maximum that could be awarded. No negligence was attributed to Mr. Cartwright, who expressed willingness to pay for all damage legally claimable. The Magistrates' Clerk (Mr. Wickham King) stated that since the adjournment the parties had agreed that there was only power under the Statute to impose one sum of £5 for one accident, and not £5 per lamp. This being so, they asked for the summonses to be withdrawn; and the Bench agreed to this course.

Abstracting Water from a Hydrant.—At the Epsom Petty Sessions, two men named Taylor and Skilton, in the employ of the Dorking Brick-Works Company, were each fined 10s. and cost, for being concerned together in "stealing, taking, and carrying away" water of the value of 2d., the property of the Leatherhead and District Water Company. The water was taken from a hydrant in the road, to supply the requirements of an engine which was being driven on the highway.

Colne Valley Water Company.—At the half-yearly general meeting of this Company on the 1st prox., the Directors will report a profit of £15,239 for the six months ended the 30th ult. The balance of the dividend and interest account, after paying the interest on the debenture and preference stocks, and transferring £1000 to the contingency fund account, is £17,570. Out of this the Directors recommend the payment of the full statutory dividends at the rate of 10 and 7 per cent. per annum on the several classes of ordinary stocks, and in addition a payment of 1 per cent. (actual) on account of back-dividends on the "A," "B," and "C" stocks; leaving £4219 to be carried forward. For the corresponding period of 1910, the amount carried forward, after transferring £500 to the contingency fund account, and paying full statutory and 1 per cent. (actual) back-dividends, was £4268.

Charge of Stealing Gas.—Mrs. Eliza Hawkins, of Mitcham, was charged before the Croydon County Magistrates last week with being concerned with her husband, William Hawkins (who was not in custody), in stealing a quantity of gas the property of the Mitcham and Wimbledon Gas Company. The evidence showed that the service and supply pipes of the meter were disconnected, and a temporary lead pipe had been fixed so that the gas did not go through the meter. Suspicions were aroused on account of the small quantity of gas apparently consumed; and an inspector who paid a surprise visit was told he could not see the meter, as it was locked in the coal cellar, and the husband had the key. After waiting for the husband's return, he forced the cellar door, and found the bye-pass arrangement in use. Accused was remanded: a warrant being issued for the husband's arrest.

The Explosion at the Effingham Street Gas-Works.—There has been a pleasing sequel to the fatal washer explosion at the Effingham Street works of the Sheffield United Gaslight Company, as recorded in the "JOURNAL" for the 4th inst. (p. 59). At the time of the accident, a fitter named Rhodes displayed conspicuous bravery in the rescue of the man Foster, who had been working under him, and who unhappily subsequently succumbed to his injuries; and for this noble act, he has been handed a handsome cheque and two written resolutions of thanks. In making the presentation, Mr. J. W. Morrison, the Chief Engineer to the Company, remarked that the Board were always pleased to recognize such splendid deeds of bravery as that which Rhodes had performed. Rhodes, who was enthusiastically cheered by the employees, thanked the Company and the men for their appreciation of his conduct.

Price of Gas at Rochdale.—It was stated at the recent quarterly meeting of the Rochdale Merchants' and Tradesmen's Association, that the Gas and Electricity Committee of the Corporation had that day decided to reduce the flat-rate for electricity for lighting purposes from 4½d. to 4d. per unit, and will at an early date consider the question of reducing the price of gas. Mr. Watson suggested that the Association should pass a resolution urging upon the Committee the desirability of the charges for gas being lowered. Extraordinary profits, he said, were being made at the gas-works, and it was time consumers had some relief. Mr. G. L. W. Foulds, the President, said that gas consumers should certainly be assisted, now that a reduction had been made in the price of electricity. The Secretary was instructed to write to the Committee and call attention to the fact that the price charged for gas was too high, especially in the case of tradesmen and large consumers, and urge them to deal with it immediately.

MISCELLANEOUS NEWS.

THE GAS PUBLICITY SCHEME.

Manchester Gas Committee and the Proposal.

The Gas Committee of the Manchester Corporation will consider at next Friday's meeting the question of contributing to the scheme of the Publicity and Special Purposes Committee of the Institution of Gas Engineers. With the notice convening the meeting, Mr. F. A. Price, the Superintendent of the Gas Department, has enclosed a copy of the "Memorandum" issued in connection with the scheme, and already published in the "JOURNAL," there being an added paragraph to the effect that the contribution proposed is on the basis of 2s. 6d. per million cubic feet of gas made.

Our Manchester Correspondent says that the question has been unofficially discussed by leading members of the Gas Committee on several occasions during the past three months; and the general opinion is that, in the event of certain guarantees being forthcoming, Manchester will fall into line, and agree to the 2s. 6d. basis. As this will mean a yearly contribution of upwards of £700 for Manchester, certain members of the Committee seek for more definite assurances that they, with other corporations in the North, will have adequate representation on the spending authority under the scheme, and they hold that some stipulation should be made as to the period of years over which the subscription on the 2s. 6d. basis shall be continued. It will be remembered that in the neighbouring borough of Salford the Town Council at their last meeting, as reported in the "JOURNAL" for the 11th inst. (p. 122), approved the recommendation of the Gas Committee that the Corporation should become contributors to the scheme on the basis named.

SALFORD CORPORATION GAS DEPARTMENT.

The Past Year's Working.

The Chairman of the Gas Committee of the Salford Corporation (Mr. F. S. Phillips) has presented to the Town Council their report for the year ended the 31st of March. They express their pleasure in recording that the usual growth in the number of consumers was maintained during the period named. The sales of gas have also shown an increase equal to 0.99 per cent. The demand for gas appliances generally has been satisfactory. The works and plant (under the supervision of Mr. W. W. Woodward, the Engineer and Manager) have been maintained in a thoroughly efficient condition. One of the gasholders at the Bloom Street works has been reconstructed; and it will be necessary to undertake the renewal of another gasholder at these works during the next twelve months. The coal and cannel carbonized during the past year amounted to 163,488 tons, and the quantity of gas made to 1,685,506,000 cubic feet, of an average illuminating power equal to 19.50 standard candles; the parliamentary standard being 18 candles within the borough, and 17 candles as tested in the out-districts. The total receipts realized from residuals show a considerable increase compared with last year. On March 31, 1911, all the rights, powers, and privileges of the Corporation with respect to the supply of gas in the urban district of Little Hulton, together with the mains, pipes, meters, cookers, and other apparatus belonging to the Corporation, laid or fixed in the district, were transferred to the Urban District Council of Little Hulton, in accordance with the terms of the agreement made on March 14, 1910, between the Corporation and the District Council.

The accounts show that the net revenue from the sale of gas was £179,566; residuals produced £57,779; and the total receipts were £239,703. The expenditure on manufacture was £126,972; on distribution, £15,175; on management, £8056; and the total expenses were £171,197—leaving a balance of £68,506 to go to the profit and loss account. After meeting interest and redemption charges and allowing £17,828 for depreciation, there was a balance of £15,750 transferred to the district fund account.

WARRINGTON CORPORATION GAS UNDERTAKING.

Engineer's Annual Report.

The Gas Engineer to the Warrington Corporation (Mr. W. S. Haddock) has presented to the Gas Committee his report for the past financial year. He states that the buildings and plant have been kept in a good state of repair. On the expenditure side of the accounts there was an increased cost of more than £600 for mains and ironwork, due to the purchase of more pipes at a higher price. The extra outlay on coal and cannel was owing to the use of 1800 tons more; while the increased receipts from coke, tar, and sulphate of ammonia were due to having produced larger quantities, which were sold at a slightly higher price. The receipts from gas were very disappointing. Though the output had increased by upwards of 5 million cubic feet, the receipts were £349 down, owing to the reduction in price. The unaccounted-for gas was very much increased, but was largely owing to the reading of the meters having been taken in some cases more than a month earlier than last year. Mr. Haddock said the price of fuel would be slightly lower next year; but probably the residual products would not yield quite so much, owing to a slight fall in some of them. The increased make of gas was 15,450,100 cubic feet, or 3.5 per cent. upon last year's production.

The report recently came before the Council, and was approved.

The upsetting of a tar-boiler at Milton Regis, Kent, while road-tarring was in progress, caused a big blaze in the neighbourhood of the gas-works. The fire, however, was successfully extinguished by the aid of sand.

BURTON-ON-TRENT GAS UNDERTAKING.

The Cost of the Illumination of the Town Hall.

At the last Meeting of the Burton-on-Trent Town Council, the Gas and Electricity Committee submitted their report. In the course of it, they stated that they had entered into contracts with Messrs. Parkinson and W. & B. Cowan, Limited (Parkinson Branch), for a 100,000 cubic feet per hour station meter, a 24-inch district governor, and a 15-inch safety governor; with the Bryan Donkin Company, Limited, for the necessary valves; and with Mr. Hodges, of Burton-on-Trent, for a new station meter and governor house. In the unavoidable absence of Alderman Lowe (Chairman of the Committee), the adoption of the report was moved by Mr. Wardle. In doing so, he said there had been a material increase in the output of gas. More than half of the extra 3½ millions sent out during June was due to the Town Hall illuminations [see *ante*, p. 30]. With regard to the Burton undertaking, the Bill containing the Corporation's Provisional Order had been before the Examiner in the House of Lords, and there was no opposition. It had, therefore, to be sent forward for first reading. Mr. Wardle went on to refer to Mr. P. Holmes Hunt's paper read recently before the Institution of Gas Engineers. He said the author dealt with various systems of retorts, and incidentally remarked that "those fine installations at Burton-on-Trent and Sheffield are perhaps the leading examples of horizontal retorts erected specially for working with heavy charges." With regard to the purchase of coal, it might be of interest to state that the Committee had completed the purchase of 32,000 tons, and obtained reductions of from 4d. to 6d. on last year's prices; the average figure for this year being 10s. 5½d. per ton. Mr. Turner seconded the motion. Mr. Birch congratulated Mr. Ramsden (the Assistant-Manager) and his staff on the magnificent display of illuminations at the Town Hall during Coronation week, and asked if it was possible to ascertain the actual cost. Mr. Wardle said the quantity of gas consumed was 2 million cubic feet, at a cost of £100. Then the outlay as regards the work entailed was somewhere about £300. The report was adopted.

REDUCTION IN PRICE AT OSSETT.

The minutes submitted by the Gas Committee at the last monthly meeting of the Ossett Town Council contained a recommendation that, as from the 1st inst., the price of gas should be reduced 3d. per 1000 cubic feet to all consumers.

Mr. H. ROBINSON, the Chairman of the Gas Committee, in moving the adoption of the minutes, remarked that he prophesied a month ago that they would be likely to save a matter of £150 on the coal contracts; and this had been effected without any trouble. The resolution reducing the price of gas to 2s. 6d. per 1000 cubic feet, he was sure, would be pleasing to the majority of the consumers. He wanted to assure Ossett ratepayers and their neighbours, the Horbury Council, that they had taken the first opportunity—judging from several standpoints, they had anticipated their first opportunity, and had done the deed before the opportunity came—of making this concession; and they would not require any pressing, or any indication or direction from any authority, to make another concession when the way opened out to them. The Corporation were reducing the price of gas 10 per cent., making 20 per cent. during the last three years. This would absorb in twelve months £1400, or more; and, as they knew, it spoiled his pet scheme of filling up the reserve fund. He had the honour to begin the reserve fund in the interest of the Ossett ratepayers, and wanted to complete it during the next year. This was now to be put off a trifle longer—perhaps one or two years. Out of the £1400, they would distribute among the Ossett ratepayers about £750, which more than equalled a 3½d. rate on the rateable value. They could only make permanent this concession, and give further concessions, according as the consumers remained loyal to them, as they had done in the past.

Mr. H. NETTLETON seconded, and said that if the proposed reduction in price meant the equivalent of a 3d. rate to Ossett, the Horbury people would get a 4d. rate, or probably more, out of it; so that, if they were reducing Ossett's rates, they were reducing Horbury's as well. There was no doubt there were members on the Council who would reduce the price of gas at every possible opportunity. He would; and the reserve fund would not be filled up in one year, as far as he was concerned.

The MAYOR (Mr. T. W. Bentley) agreed that it was a matter to congratulate themselves about that they had been able to reduce the price of gas; but he did not quite like the tone of the Chairman's remarks. Mr. Robinson seemed rather to resent, perhaps not in words, but in spirit, the action of the Horbury Council in venturing to suggest that a reduction might take place; but they would have all felt that the Horbury Council were remiss in their duty if they had not caused a letter to be addressed to the Gas Committee asking for a reduction, because, according to a statement previously made by Mr. Robinson, they were going to make such a handsome profit that he practically held out an invitation to Horbury and everybody else to ask for a reduction in the price. Mr. Nettleton practically said to Horbury: "Hands off. As soon as we can reduce the price of gas, we will." He did not think they ought to look at it in this way. Horbury, if not actually partners in the matter, had an interest in it; and when they saw that a great profit was being made in any one year, they understood what was meant by it going to the reserve fund. They were told that, when the reserve fund got to £5000, the interest must of necessity go to the district rate—not that it "may," but that it "shall." Now, Horbury people had their eyes open, as well as Ossett people, and naturally they wanted gas at the lowest possible price. Mr. Robinson referred to the reduction as something in the shape of a concession in regard to rating. Personally, he disassociated the gas business altogether from the rates. It was no relief from a rating point of view, but simply because they could afford to do it. They were producing gas at very much less cost than formerly, as proved by the last balance-sheet; and the Council, in selling it at the lowest possible price, were only doing their duty to the consumers. As long

as they stood in their present relationship with Horbury, they could not expect to be in the same position as townships owning gas-works entirely to themselves. He meant to say that they could not expect to take great profits and hand them over in relief of the rates. Horbury had an interest in the works in the sense that they would not be satisfied to allow the price of gas to remain at a particular level, in order to allow the Ossett ratepayer to benefit by direct contribution from gas profits. He did not think that they ought to complain very much about this, because those who read municipal literature knew that Parliament had set its face more or less against creating profits in corporation trading departments in order to relieve the rates, and in several Local Acts clauses had been inserted which prevented profits from being handed over to the rates. They must sell the article produced at the lowest possible price. He was pleased Mr. Robinson had fallen in with the idea that they were doing the right thing in reducing the price of gas; and he hoped he would be able, while Chairman, to see the reserve fund full. Then he trusted that they would be in a position to make further reductions, rather than attempt to create ill-feeling between the two townships by distributing profits out of a commodity like gas.

Mr. AUDSLEY moved, as an amendment, that the reduction should take effect on Oct. 1, instead of July 1; his view being that they would be running things rather close if the price was lowered at the earlier date. He argued that with gas at 2s. 6d., Ossett would be selling the cheapest gas in the district, notwithstanding that there were boroughs with much larger populations and consumption. It would be the worst thing they could do, to reduce the price and have to increase it again. By deferring the reduction until October, they would be saving a few hundred pounds, in order to tide over what he considered would be a tight corner for the next two years. Next year (1912-13), he considered would be tighter than this year, because there were certain things that the Manager (Mr. A. E. Mottram) had set his mind not to do this year, which would have to be done the following year. If the reduction was postponed until October, it would give the management a little more freedom, and it would not make a great deal of difference to the consumers, because the lighting season did not commence, for mills, &c., until then.

The amendment was not seconded. In closing the discussion, Mr. ROBINSON said there was nothing to be alarmed about. They were not on the rocks; and they were not near the rocks. Neither the Manager nor the Committee was in a tight corner. There was a time coming when the neighbouring Council would be drawing something, and Ossett would be having to take something out of the rates to meet the case.

The minutes were adopted.

GAS V. ELECTRICITY FOR POWER.

Views of a Practical Engineer.

The "Manchester Courier" last Friday contained an interesting article on "Electric-Motors for Small Power Users," by a practical engineer. In the course of his opening remarks, the writer points out that when power is developed by means of a steam-engine, it is much more expensive to produce than by either gas or oil engines; while with regard to these two motors, the oil-engine gives considerably more trouble than the gas-engine, and is seldom used where gas can be bought at anything like a reasonable figure. He then proceeds to compare gas and electric engines, taking gas at 2s. 9d. per 1000 cubic feet and electricity at 1½d. per unit; and he shows that the former has a most decided advantage in the matter of cost. He furnishes the following particulars of a test lately made by a firm in the Manchester district who were considering the displacement of a gas-engine by a motor supplied with current by the Corporation.

The gas-engine was one of 11 B.H.P., and ran, on an average, 60 hours per week. Careful records were taken of the consumption of the gas, oil, and cost of attention for one month; and in the meantime cables were laid and an electric-motor installed in such a position that the driving-belt to the main shaft could be readily transferred from the gas-engine to the motor, or *vice versa*. The works were then driven for a month by means of the motor, and careful records again taken; and it was found that when all the results had been carefully tabulated the cost of running by motor was more than twice that of the gas-engine. There were some advantages appertaining to the motor driving, but these were considerably overbalanced by the extra cost. The same experience has been met with by many other firms; and the writer says it may be declared with certainty that where power is required continuously the gas-engine is by far the cheapest machine to adopt. Coming to the cases where the power is only used at intervals, he finds very decided advantages in the use of the electric motor. One of the greatest of them lies in the ease with which the machines can be put to work. He says no previous preparation is required, and no assistance is necessary to start the motor; whereas with the gas-engine much trouble is often experienced in starting-up, and sometimes there is no one about to help to pull round the engine for starting purposes.* Besides this, the less space occupied by the motor is often of great advantage in small works.

Coming to the cost of electricity, the writer gives the following as the annual rent charged by one of the large electric power stations:

½ B.H.P.	£1 10 0	5 B.H.P.	£5 0 0
1 "	2 0 0	7 "	6 0 0
3 "	3 0 0	10 "	7 0 0
4 "	4 0 0		

These charges must, he says, be added to the cost per unit of electricity used in proportion to the number of hours worked. For instance, taking a case where a mortar-mill is being worked for an aggregate of 30 hours per week, taking a power of 10 B.H.P., the cost per unit of electricity will probably work out at 1d. per brake-horse-power; and

* The writer has evidently not come across the simple self-starters now applied to gas-engines which obviate all waste of time and labour in starting-up.—ED. J.G.L.

taking the number of weeks worked per annum as 50, or a total of 50 by 30, equal to 1500 hours per annum, the cost will be 1500 B.H.P. hours at 1d., equal to £62 10s., plus £7 10s. hire rent, or a total of £70, or £1 8s. per week. Again, in the case of a small joiner's shop or cabinet-making works, in which the motor is required to drive a maximum power of 6 B.H.P., which may be needed at very irregular intervals, the total number of hours worked is difficult to estimate. But taking an actual case, the following was the cost spread over the year: Hire of motor, £6; cost of current per quarter, £2 7s. 6d.—total per quarter, £3 17s. 6d. This shows that the power must have been used for about 20 hours per week.

The writer takes another actual case of a small printing works using a 1 B.H.P. motor where the motor hire is £2 per annum and the cost for electricity 30s. per quarter; the total cost per quarter being £2. This shows that the machines have run about 40 hours per week. In this case, he says, a small gas-engine would have run at a less cost; but the extra attention required would more than balance the difference by the saving in workmen's time.

PROPOSED MINISTRY OF LABOUR.

A Bill has been introduced by Mr. Lansbury, with the support of other Labour members, to establish a Ministry of Labour, "for the better organization of the labour market, for the prevention of unemployment, to regulate, and in certain cases prohibit, child labour, and to establish a general minimum wage for adult workers."

The proposed new Minister is to be appointed by, and hold office during the pleasure of, His Majesty the King; and he is to take the oath of allegiance and also the official oath. He is to be capable of being elected to, and of sitting in, the House of Commons, and his proposed salary is £5000 per annum. He may appoint a Secretary, Assistant-Secretary, and such other officers and servants as he, with the sanction of the Treasury, may determine. For the purpose of supervision and control, and of securing efficient and uniform treatment, he is to have all the powers and duties of the Local Government Board, the Board of Trade, or any other Government Department relating to, or concerned in, the prevention of destitution among, or the relief of, the able-bodied poor, including workmen in distress from unemployment, and vagrants. Clause 2 of the Bill specifies as follows:

In order, as far as may be practicable, to maintain at an approximately uniform level the national aggregate demand for labour, the Minister for Labour, acting in consultation with Departmental Committees to be appointed in respect of the several branches of the public service ordering works or services, shall from time to time advise the Treasury in what respects, with due regard to the efficiency of the various services, such works or services may be either delayed or hastened in order to regularize the demand for employment as between the different seasons of the year and as between the good and bad years of a trade cycle.

The new Minister is to be *ex officio* a Development Commissioner and a member of the Road Board. He is to organize his department into six or such other number of divisions as he may determine, for each of which one of the Assistant-Secretaries is to usually act. The divisions at the outset are to be: The National Labour Exchange; the Trade Insurance Division; the Industrial Regulation Division; the Statistical Division; the Emigration and Immigration Division; and the Maintenance and Training Division.

There are to be transferred to the Minister all the property, powers, rights, liabilities, and duties invested in, or imposed upon, the Board of Trade by the Labour Exchanges Act, 1909, and by certain sections of the Merchant Shipping Act, 1894; and he is to establish and maintain a National Labour Exchange, with such branches and divisions as he may think fit. He is to make, and from time to time amend, orders for the regulation of that Exchange, and the branches, officers, and advisory local committees thereof, so as to enable it, as far as may be possible, "to afford facilities for persons seeking situations by informing them what situations are vacant and in what towns, and by obtaining information concerning vacancies from employers of labour in all parts of the country; to ascertain what demands are occurring or likely to occur for particular kinds of labour, and to afford facilities to enable persons to keep in continuous employment by informing them in advance of such demands for labour; and to secure, by the arrangement of occupations, as far as possible, continuous employment throughout the year for all persons employed."

There are to be transferred to the Minister all the powers and duties of the Board of Trade relating to the regulation of the hours and conditions of labour conferred upon them by the following Acts: Boilers Explosion Acts, 1882 and 1900; Railway Regulation Act, 1893; Merchant Shipping Act, 1894 (sections 246 to 250); Notice of Accidents Act, 1894; Conciliation Act, 1896; Railways Employment Act, 1900; Trade Boards Act, 1909; Labour Exchanges Act, 1909; likewise all the powers and duties of a Secretary of State relating to the regulation of the hours and conditions of labour conferred upon him by the Factory and Workshop Acts, 1901 to 1907; the Coal Mines Regulation Acts, 1887 to 1908; the Shop Hours Acts, 1892 to 1899; the Truck Acts, 1837 and 1887; and the Aliens Act, 1905 (except section 3).

Part II. of the Bill deals with the prohibition of juvenile labour, and Part III. with the minimum wage. With regard to the latter, it is specified that the powers and duties of the Board of Trade under the Trade Boards Act, 1909, transferred to the new Minister, shall extend, without Provisional Order, to all employments in which, in his opinion, the minimum rate of wages (whether time or piece rate), ascertained as in that Act provided, does not exceed 30s. per week for every person who is 21 years of age or over; and every such employment is to be deemed to be included in the schedule to the Trade Boards Act, 1909.

It is proposed that the Act shall come into operation on Jan. 1, 1912.

In the abstract of accounts of the Borough of Doncaster, which has just been issued, the profits on the gas-works for the year to March 31 show a reduction as compared with the previous year—the figures being £4695, against £6158. The loss on the water-works, at £3105, is nearly £200 less than in 1909-10.

METROPOLITAN WATER BOARD.

Quality and Price of Water.

At the Meeting of the Metropolitan Water Board last Friday week, the annual report of the Director of Water Examination (Dr. A. C. Houston), containing detailed information relating to the chemical and bacteriological examination of the water supplied to London in the twelve months ended the 31st of March, was submitted as an appendix to the report of the Water Examination Committee.

In the course of his report, Dr. Houston stated that chemically the raw Thames (except as regards the ammoniacal and albuminoid nitrogen tests), Lea, and New River (except as regards colour) waters yielded better results in the year covered than in 1909-10. Generally speaking, the filtered waters, as judged by the albuminoid nitrogen, permanganate, and colour tests, were better in 1910-11 than in 1909-10. Bacteriologically the raw waters contained fewer bacteria last year, as compared with 1909-10. The bacteria growing in agar and bile-salt agar at 37° C. were also fewer during the period under review. The *B. coli* results were also less unsatisfactory. As regards the filtered waters, the results were very similar in 1910-11 to those of 1909-10. Dr. Houston offers the following remarks on the water as finally delivered to the consumers :—

Six years' work on the London Water Question has convinced me that to a progressively increasing extent the Water Board are seeking to secure the reasonable, if not absolute, "safety" of the Metropolitan Water Supply. The loss of the unrestricted right to abstract 130 million gallons, fixing the minimum flow at 170 million gallons, and including the gravel water in the flow of the river, are, however, factors which, if carried into effect, militate against the abstraction, under all conditions, of the best water for storage purposes. This opinion will carry the more weight since I have been, and still remain, a somewhat merciless critic of any imperfections in the processes of water purification. As a counsel of perfection, I still feel bound to advocate the choice of an initially pure source of water supply. Nevertheless, my own results and experiments do seem to indicate clearly that the evil effects even of an impure source can be largely, if not entirely, annulled by adequate storage and efficient filtration.

Dr. Houston urges that the prospective security of London, as regards its water supply, should not be based, or only to a limited extent, on past comparative immunity from water-borne diseases. He says the aim now should be to abstract raw river water as judiciously as possible, to store it for as long a period as can be done, and to filter it as perfectly as is reasonably practicable. His final opinion is that the "quality policy" of the Metropolitan Water Board should be directed towards securing an "epidemiologically sterile" water—i.e., a water containing none of the microbes associated with water-borne epidemic disease—antecedent to filtration by storage (sedimentation, devitalization, and equalization), aided, if needs be, by occasional employment of supplementary processes of water purification.

Mr. C. E. Fox, the Chairman of the Committee, in moving the adoption of their report, said the Board had 7 million consumers, and yet only six or seven severe complaints had been received each month.

The whole of London should know the great care that was taken in the examination of its water supply. The Board had a large staff of competent scientists whose excellent work could not fail to establish a feeling of security.

The report was adopted.

Mr. Fitzroy Doll raised the question of the Board's charges for water. He proposed that the Appeal and Amendment Committee should be instructed to bring up a report upon the working of the Charges Act, and to suggest such amendments as would have the effect of remedying the inequalities of the Act which are the cause of so much discontent. He said the Board were facing a deficit, and as business men they should meet it. The only way to do this was to amend the Charges Act in such a way that they would cease to be the "most unpopular public body in the whole of the British Empire." The first cause of their unpopularity was that their charges were unjust, and particularly to the central portions of London. The result was that the Board were experiencing great loss through the sinking of numerous wells, one of which in Holborn would mean a difference of £1500 a year.

Mr. A. H. Tozer, the Chairman of the Finance Committee, could not agree that the Board's charges, generally speaking, were unjust; and he thought it would be a misfortune if the Board passed a resolution which by implication would give consumers cause for much discontent. A large number had had their rates materially reduced in consequence of the Charges Act. The Board had nothing to do with the altering of the Act; but he thought it would be an advantage if the Committee, in their inquiries, ascertained if it were possible to capture some of those friends of Mr. Doll who sank wells, and who had all the advantages of a water supply (with a consequent reduction of their fire insurance premiums) and escaped free.

After further discussion, the resolution was lost by 15 votes to 7.

LIVERPOOL CORPORATION WATER SUPPLY.

Annual Report of the Engineer-in-Chief.

We have received from the Engineer-in-Chief of the Water Department of the Liverpool Corporation (Mr. Joseph Parry, M.Inst.C.E.) a copy of his twelfth annual report, covering the year ended the 31st of December last. He states that the principal event was the completion of the head works at Lake Vyrnwy, by the diversion into the reservoir of the Rivers Cownwy and Marchnant. Particulars of these works have already been given in the "JOURNAL." On the 16th of March, 1910, His Royal Highness the Prince of Wales, now His Majesty King George V., visited the lake, turned on to the Marchnant supply, and unveiled a tablet recording the completion of the entire undertaking so far as regards the works at and around Lake Vyrnwy. As explained by Mr. Parry in former reports, the scheme, as originally designed, was estimated to provide, even in periods of extreme drought, an average daily supply for Liverpool of 40 million gallons, in addition to the compensation water to the river, amounting to 13½ million

GAS COMPANIES' STOCK AND SHARE LIST.

Referred to on p. 223.

Issue.	Share.	When ex-Dividend.	Dividend or Dividend & Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.	Issue.	Share.	When ex-Dividend.	Dividend or Dividend & Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.
£			p.c.				£ s. d.	£			p.c.				£ s. d.
1,551,868	Stk.	Apl. 12	5	Alliance & Dublin Ord.	82-85	..	5 17 8	4,940,000	Stk.	May 12	9	Imperial Continental	183-185	-½	4 17 3
374,000	Stk.	July 14	4	Do. 4 p.c. Deb.	93-95*	..	4 4 3	1,235,000	Stk.	Feb. 10	3½	Do. 3½ p.c. Deb. Red.	92-94	..	3 14 6
200,000	5	May 12	7	Bombay, Ltd.	64-6½	..	5 3 8	200,242	Stk.	Mar. 10	6	Lea Bridge Ord. 5 p.c.	120-122	..	4 18 4
40,000	5		7	Do. New, £4 paid.	54-5½	..	4 17 5	561,000	Stk.	Feb. 24	10	Liverpool United A.	215-217	..	4 12 2
50,000	10	Feb. 24	15	Bourne-) 10 p.c.	28½-29½	..	5 1 8	718,100	"	"	7	Do. B.	163-165	..	4 4 10
311,810	10	"	7	mouth Gas) B 7 p.c.	16½-16¾	..	1 3 0	306,083	"	June 30	4	Do. Deb. Stk.	102-104	..	3 16 11
75,000	10	"	6	and Water) Pref. 6 p.c.	14½-15	..	1 0 0	75,000	5	June 15	6	Malta & Mediterranean	43-4½	..	6 3 1
380,000	Stk.	"	12½	Brentford Consolidated	257-262	..	4 15 5	560,000	100	Apl. 1	5	Met. of) 5 p.c. Deb.	100-102	..	4 18 0
330,000	"	"	9½	Do. New	200-210	..	4 10 6	250,000	100	"	4½	Melbourne) 4½ p.c. Deb.	100-102	..	4 8 3
50,000	"	"	5	Do. 5 p.c. Pref.	122-124	..	1 0 8	541,920	20	May 31	3½	Monte Video, Ltd.	12½-13½	..	5 5 8
206,250	"	June 15	4	Do. 4 p.c. Deb.	97-99	..	1 0 10	1,775,892	Stk.	Feb. 24	4½	Newcastle & Gateshead Con.	103½-104½	..	4 3 9
220,000	Stk.	Mar. 10	11	Brighton & Hove Orig.	217-220	..	5 0 0	529,705	Stk.	June 30	3½	Do. 3½ p.c. Deb.	87-89	..	3 18 8
246,320	"	"	8	Do. A Ord. Stk.	157-160	..	5 0 0	55,940	10	Mar. 10	7	North Middlesex 7 p.c.	15-16	..	4 7 6
490,000	"	Apl. 12	11½	British	41½-45½	..	5 3 5	300,000	Stk.	Apl. 27	8	Oriental, Ltd.	137-139	..	5 15 1
120,000	Stk.	June 30	4	Do. 4 p.c. Deb. Stk.	94-96	..	4 3 4	60,000	5	Apl. 12	8	Ottoman, Ltd.	63-7½	..	5 10 4
109,000	"	Feb. 10	6	Bromley, A 5 p.c.	116-118	..	5 1 8	31,800	53	Feb. 24	13	Portsea Island A.	135-140	..	4 18 4
165,700	"	"	4½	Do. B 3½ p.c.	87-89	..	5 1 2	60,000	50	"	13	Do. B.	—	..	—
82,278	"	"	5½	Do. C 5 p.c.	106-108	..	5 1 10	100,000	50	"	12	Do. C	120-125	..	4 16 0
55,000	"	June 30	3½	Do. 3½ p.c. Deb.	82-84	..	4 3 4	114,800	50	"	10	Do. D and E.	—	..	—
250,000	Stk.	"	4	Buenos Ayres 4 p.c. Deb.	95-97	..	4 2 6	398,490	5	May 31	8	Primitiva Ord.	73-7½	..	5 3 3
100,000	10	"	—	Cape Town & Dis., Ltd.	2-3	..	—	796,980	5	June 30	5	Do. 5 p.c. Pref.	54-5½	..	4 10 11
100,000	10	"	—	Do. 4½ p.c. Pref.	4-5	..	—	488,900	100	June 1	4	Do. 4 p.c. Deb.	97-99	..	4 0 10
50,000	50	Nov. 2	6	Do. 6 p.c. 1st Mort.	—	..	—	312,650	Stk.	June 30	4	River Plate 4 p.c. Deb.	95-97	..	4 2 6
100,000	Stk.	June 30	4½	Do. 4½ p.c. Deb. Stk.	80-83	..	5 8 5	250,000	10	Mar. 24	9	San Paulo, Ltd.	21½-22½	..	4 0 0
157,150	Stk.	Feb. 24	5	Chester 5 p.c. Ord.	109-111	..	4 10 1	115,000	10	"	6	Do. 6 p.c. Pref.	12-12½	..	4 16 0
1,513,280	Stk.	"	5/9/4	Commercial 4 p.c. Stk.	114-116	..	4 14 3	125,000	50	July 1	5	Do. 5 p.c. Deb.	49½-50½	+½	4 19 0
560,000	"	"	5½	Do. 3½ p.c. do.	108-110	..	4 16 11	135,000	Stk.	Mar. 24	10	Sheffield A.	236-238	..	4 4 0
475,000	"	June 15	3	Do. 3 p.c. Deb. Stk.	75½-77½	..	3 17 5	209,984	"	"	10	Do. B.	236-238	..	4 4 0
800,000	Stk.	May 31	4	Continental Union, Ltd.	91-94	-1	4 5 1	523,500	"	"	10	Do. C	236-238	..	4 4 0
200,000	"	"	7	Do. 7 p.c. Pref.	135-137	..	5 2 2	70,000	10	June 15	7	South African	83-9½	..	7 7 4
492,270	Stk.	"	5½	Derby Con. Stk.	122-124	..	4 8 9	6,429,895	Stk.	Feb. 10	5/9/4	South Met., 4 p.c. Ord.	119-121	..	4 10 3
55,000	"	"	4	Do. Deb. Stk.	104-105	..	3 16 2	1,895,445	"	July 14	3	Do. 3 p.c. Deb.	783-80½*	..	3 14 6
148,995	"	Apl. 12	5	East Hull 5 p.c. Ord.	—	..	—	209,820	Stk.	Mar. 10	8	South Shields Con. Stk.	151-156	..	5 2 7
840,150	10	Jan. 27	10	European, Ltd.	19-20	..	5 0 0	605,000	Stk.	Feb. 24	5½	S'th Suburb'n Ord. 5 p.c.	119-121	..	4 13 6
16,179,445	Stk.	Feb. 24	4/14/8	Gas-) 4 p.c. Ord.	107-108	+½	4 7 8	60,000	"	"	5	Do. 5 p.c. Pref.	118-120	..	4 3 4
2,600,000	"	"	3½	light) 3½ p.c. max.	85-87	..	4 0 6	117,058	"	July 14	5	Do. 5 p.c. Deb. Stk.	121-123*	..	4 1 4
4,062,235	"	"	4	and) 4 p.c. Con. Pref.	103-105	..	3 16 2	502,310	Stk.	May 12	5	Southampton Ord.	107-109	-2	4 11 9
4,531,705	"	June 15	3	Coke) 3 p.c. Con. Deb.	78½-80½	..	3 14 6	120,000	Stk.	Feb. 10	7½	Tottenham A 5 p.c.	147-150	..	4 15 0
258,740	Stk.	Mar. 10	5	Hastings & St. L. 3½ p.c.	95-97	..	5 3 1	483,940	"	"	5½	and) B 3½ p.c.	116½-118½	..	4 15 0
82,500	"	"	6½	Do. do. 5 p.c.	—	..	—	149,470	"	June 15	4	Edmonton) 4 p.c. Deb.	96-98	..	4 1 8
70,000	10	Apl. 27	11	Hongkong & China, Ltd.	17½-18	..	6 2 2	182,380	10	June 15	8	Tuscan, Ltd.	83-94	..	8 13 0
131,000	Stk.	Mar. 10	7½	Ilford A and C	147-150	..	4 18 4	149,900	10	July 1	5	Do. 5 p.c. Deb. Red.	96-98	..	5 2 0
65,780	"	"	5½	Do. B	119-122	..	4 16 3	236,476	Stk.	Feb. 24	5	Tynemouth, 5 p.c. max.	115-117	..	4 5 6
65,500	"	June 30	4	Do. 4 p.c. Deb.	94-96	..	4 3 4	255,636	Stk.	Feb. 24	6½	Wands-) B 3½ p.c.	141-143	..	4 14 5
								85,766	"	June 30	3	worth) 3 p.c. Deb. Stk.	71-73	..	4 2 2

Prices marked * are "Ex. div."

| Next dividend will be at this rate.

gallons per day. He says it is satisfactory to know that these expectations have been more than realized. The rainfall has exceeded the first calculations; and the storage provided by the Corporation in the lake having been on an unusually liberal scale, there will be considerably more water available than was foretold.

Closely connected with the question of the amount of water available is that of the financial position of the undertaking, which is the next matter dealt with by the Engineer. He shows that the total income of the undertaking (excluding the Chorley works) for the past year was £360,115. The payments during the same period included the following amounts, which are in the nature of fixed charges, and are quite independent of the working expenses over which the Committee have control: For interest on capital borrowed, £205,279; expenses of stock, £3471; sinking funds set aside under the provisions of the Water Acts, £35,749; rates and taxes, £39,351—making a total of £283,850, and leaving a net balance of £76,265 for working expenses. The last amount is equal to 1½d. per 1000 gallons on the quantity of water distributed. The chief sources of revenue are: The fixed water-rate of 6d. in the pound; the domestic water-rents; the supplies by meter for trade purposes; and the supplies to ships. The maximum domestic water-rents, the water-rate, and the charges for shipping supplies are all fixed by Parliament, and cannot be exceeded without further statutory powers. The supplies for all other purposes are subject to agreement; and the scales from time to time adopted for trade and miscellaneous purposes have been so arranged as to distribute equitably the amount to be raised between all classes of consumers, domestic and trade, making due allowance for the quantities consumed and the conditions of distribution.

The total expenditure on revenue account last year (excluding Chorley) was £359,640; and the total water supplied during the year (exclusive of Chorley) was 11,836,305,000 gallons. The average cost of water for the year was, therefore, 7.29d. per 1000 gallons. The trade consumer, whose supply is measured through meter at 6d. per 1000 gallons, pays less than the average cost price; but Mr. Parry points out that when his contribution to the water-rate is taken into account, his position in relation to the revenue of the water undertaking is approximately the same as that of the domestic consumer. How few people, he says, realize the extraordinary cheapness of the water supply. Collected at its upland source in vast reservoirs, filtered through an elaborate system of filter-beds, conveyed by aqueducts across the country for a distance (in the case of the Vyrnwy water) of 75 miles, it is delivered to consumers in the city for less than 1½d. per ton. Any loss of revenue brought about by selling water for trade purposes at a lower rate would have to be made good by the domestic consumers, unless the reduction in price had the effect of inducing a sufficiently increased consumption to counterbalance the loss. These considerations have led the Committee at various times to consider proposals based on offering lower rates to trade consumers if, in so doing, existing revenue could be maintained.

During the past year, the average quantity of water supplied per day

from the works of the Corporation was 33,164,000 gallons, and the estimated population supplied was 1,132,446. The corresponding figures for the year 1909 were: Daily consumption of water, 32,995,000 gallons; population, 1,119,933. There was, therefore, an average increase of consumption in 1910 over 1909 of 169,000 gallons per day. The maximum quantity consumed in any one day was 40,172,000 gallons in the winter season and 35,324,000 gallons in summer. The minimum daily consumption in winter was 20,132,000 gallons, and in summer 20,270,000 gallons. Besides these variations in the quantities consumed per day, provision has to be made for the fluctuating demands from hour to hour.

The total volume of water distributed during the year amounted to 12,071,683,000 gallons. This was obtained from the several sources of supply as follows: Vyrnwy, 6,509,426,000 gallons; Rivington, 4,523,352,000 gallons; wells, 1,027,299,000 gallons; and salt water, 1,606,000 gallons.

The total length of new mains laid last year in the city and suburbs was 11,787 yards; and the number of fire-hydrants fixed was 102—making the total number of hydrants in the compulsory area 15,955.

BIRKENHEAD CORPORATION WATER SUPPLY.

The New Scheme.

The preliminary work in connection with the new water supply for the Birkenhead Corporation, which involves the building of a large masonry dam across the River Alwen (a tributary of the Dee), and of a pipe-line to convey the water from the reservoir thus formed to Birkenhead, where a large service reservoir will be constructed at Cross Hill, is now being started; and, in view of this fact, the following particulars of the scheme were recently given in the Engineering Supplement to "The Times."

The dam will be situated in the parish of Cerrig-y-Druidion, in Denbighshire, at a point about 2½ miles north of the village. It will be 458 feet in length, and 92 ft. 6 in. above the bed of the stream; and it will create a reservoir fully three miles long, with a total capacity of 3000 million gallons and a top-water area of 375 acres. It is expected that the foundations for the dam will be taken to a maximum depth of 100 feet. The drainage area is about 6313 acres. Owing to the fact that at one end of the dam the surface of the ground is slightly below the level which will be reached by the crest, the dam will be continued for a length of about 450 feet by an earthen embankment with a puddle core. The height of this embankment will be about 10 feet, and the depth of the trench about 30 feet.

The dam will be constructed on a curve of 500 feet radius, and will be composed of mass concrete, except that the face on the water side,

This

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Gothic Works, BIRMINGHAM;

SHOW-ROOMS: 25, Princes St., Oxford Circus, W.; 136, Renfield St.,
GLASGOW; 56, Broad St., BIRMINGHAM; 83, Old Market St., BRISTOL;
13, Whitworth St., West, MANCHESTER; 333, Queen St., MELBOURNE;
and 12, Cunningham Lane, Pitts St., SYDNEY, N.S.W.

which is vertical, will be lined with concrete blocks, and that on the down-stream side with squared rubble masonry. The widest part at the base will be 86 feet. The crest of the dam will terminate on a curve from the down-stream side; but the width within 2 feet or 3 feet below the crest is roughly 9 ft. 9 in. At a level of 7 ft. 6 in. above the crest, the dam will be surmounted by a roadway, about 10 feet in width, supported on a series of buttresses, 6 feet wide, with sixteen spans each 20 feet long. In the centre of the dam there will be an ornamental square tower extending to a height of 33 feet above the roadway, and built with an arch on each of the four sides; the roadway passing through two of these arches under the tower. The overflow will take place only on the south side of the tower, and for this purpose a concrete and masonry channel, leading to the bed of the river, is to be constructed.

The valve-shaft, 12 feet in diameter, will be immediately underneath the tower, and in it will be placed a 28-inch pipe with intakes at two levels. The compensation water will be drawn from a 42-inch scour pipe passing through a culvert and valve-house at the foot of the dam, and will lead to the usual basin on the down-stream side of the dam for measurement. The head of water above the compensation basin will be utilized to drive a small hydro-electric plant for the generation of electricity for lighting and power purposes connected with the head works of the supply.

It will be necessary to provide a protecting wall at various parts along the edge of the reservoir at high-water level for a total distance of about five miles. Two miles above the dam a small footbridge with embanked approaches will be built, in order to maintain an existing right-of-way. The abutments for this bridge will be constructed in masonry; but the superstructure will be built of concrete reinforced with steel bars, and the parapets will be employed as girders. The span of this bridge will be 59 feet; and as it is intended only for foot traffic, the width will be 3 ft. 9 in. inside the parapets.

An important part of the work in connection with the reservoir is the removal of about 1,500,000 cubic yards of peat and soil in order to overcome the risk of contamination. It is hoped to utilize a portion of this material as fuel for power purposes in connection with the construction of the dam; but the method to be adopted for the disposal of the bulk of it has not yet been finally decided. In addition to this excavation work, it is expected that the building of the dam will necessitate the removal of 18,000 cubic yards of material, and that the construction work will require about 35,000 cubic yards of concrete. The Contractors for the undertaking, so far as concerns the dam and the reservoir, are Messrs. Robert M'Alpine and Sons, and the contract time for its completion is four years from January last.

The pipe-line leading to Birkenhead will be about 43 miles in length, and it will vary between 20 and 30 inches in diameter, calculated to give an average daily supply of 7 million gallons. The water will flow entirely by gravity, as the high-water level of the reservoir will be about 1190 feet above the sea; and in order to relieve the pressure, the pipe will be broken at six points along the route by four tanks, a

short tunnel, and a service reservoir. Filter-beds will be provided close to the reservoir. With the exception of the small tunnel which will be situated at Bwlch, and the crossing of the River Dee either by sinking the pipe or by making a tunnel, there is practically nothing of special interest in the construction of the pipe-line.

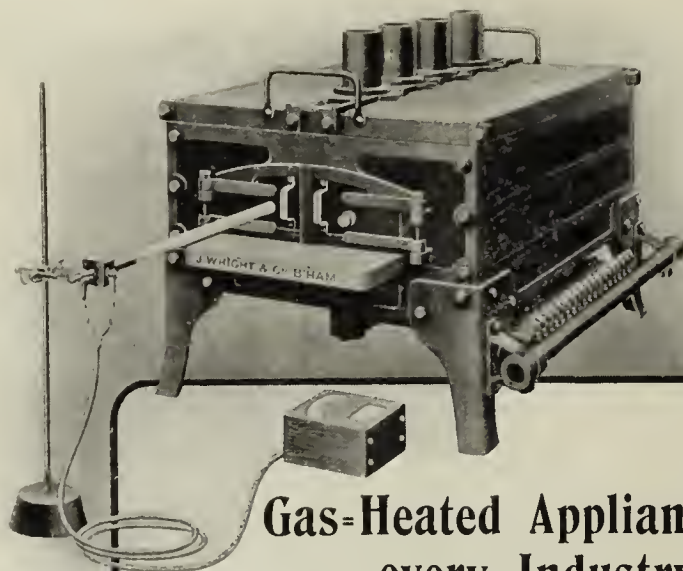
The preliminary estimate of the cost of the work is £1,340,000; but this figure includes the provision of a second reservoir which may ultimately become necessary in the neighbourhood of the present one, and also a second pipe-line, additional filters, and service reservoir.

NOTES FROM SCOTLAND.

From Our Own Correspondent.

Saturday.

This has been a busy week in Edinburgh, and indeed in Scotland; all the great ones in the land having been assembled in the capital to do homage to the Sovereign of the Realm. The city looked very pretty in her garb of decoration, though there have not been wanting some who expressed the cherished belief that as the lily needs no painting, so the "grey Metropolis of the North" requires no adventitious aid in the shape of bunting to enhance her beauty. People are welcome to differ upon this subject, and their differences will not concern us. It is another matter when illumination is taken account of. If the attempt be made to improve upon the natural beauties of Edinburgh, there is no form of beautifying which can at all compare, in effectiveness, with illumination; and there is no place within the United Kingdom which can at all compare with Edinburgh when illuminated. On this occasion, illumination was all but neglected. The circumstance would not have bestirred me to write this note were it not for the fact that the opportunity which was presented of showing what could be done by gas was, it may be said truly, lost. The Gas Commissioners had upon the front of their office in Waterloo Place a very pretty design, which was greatly admired by those who saw it; but it was seen by only a fraction of the crowds who thronged the streets. The Commissioners also showed a dozen gas-flares on the top of the large gasholder at Granton; but at that distant point the illumination was not so striking as it would have been if it had been nearer to the spectators. Messrs. J. M'Kelvie and Co., coal merchants, had several of the same species of flares on the roof of their office in Rutland Square, and these showed to great advantage. In one respect, in particular, they greatly excelled other forms of illumination, in the mobile, active form of the lighting, which told upon the vision and the imagination favourably, in contrast with the dead, fixed-point appearance which illuminated devices have in which electricity is the lighting agent. It is to be regretted that the Gas Commissioners did not do something in the way of showing what could be done by means of high-pressure gas lighting. Such an illumination, considering the many influential people who were about from all quarters, would have been



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one of the most effective publicity purposes which could well be conceived. Yet it was not taken advantage of.

In his annual report to the Corporation of Falkirk, Mr. W. Wilson, the Gas Engineer and Manager, states that the quantity of gas manufactured during the year amounted to 199,100,000 cubic feet—an increase, when compared with the previous year, of 2,730,000 cubic feet. The gas sent out amounted to 198,880,000 cubic feet—an increase of 2,091,300 cubic feet, equal to 1.06 per cent. The gas accounted for amounted to 173,410,800—an increase of 1,430,000 cubic feet. Gas unaccounted for amounted to 25,689,200 cubic feet, which was equal to 12.89 per cent., as compared with 12.42 per cent. in the year preceding. There were 21,632 tons of coal carbonized, as compared with 21,380 tons. The average yield of gas per ton of coal carbonized was 9204, as compared with 9184 cubic feet. The coke and breeze made, exclusive of that which was used for heating retorts and firing boilers, was 12,572 tons, as compared with 12,231 tons. This was equal to 11.62 cwt. per ton of coal carbonized, against 11.44 cwt. in the year previous. The tar and liquor made amounted to 1,016,676 gallons—an increase of 99,316 gallons, and was equal to 46.99 gallons per ton of coal carbonized. For purification there were used 60 tons of lime and 261 tons of oxide of iron, as compared with 604 tons of lime in the preceding year, when lime only was used. Of benzol, 15,372 gallons were employed, as compared with 32,912 gallons. During the year, there was an increase of 830 cookers in use; the total number now being 2976. There were 73 new services connected, and 67 old ones renewed. There was a decrease of 169 in ordinary consumers, and an increase of 304 prepayment consumers—a net increase of 135. The total number of consumers at May 15 last was 9570, consisting of 4611 ordinary and 4959 prepayment. There were no extensions of mains during the year; but 520 yards were renewed or enlarged.

The gas-works at Gatehouse, on the shores of the Solway Firth (an unlisted undertaking), are for sale. The shareholders have resolved to dispose of them as a going concern; and, it is said, "in order to simplify the transaction, the Gas Manager has received notice that his services will not be required after three months from date."

Mr. J. Dickson, who a little more than a year ago was appointed Engineer and Manager of the Forfar Corporation Gas-Works, has done excellent work since he went there. The report which he has submitted to the Corporation is a record of successful working, both in the works and in finance. He states that the year ending May 15, 1910, closed with a credit balance of £56, which was carried into the contingent fund, in addition to the statutory sum of not less than 2½ per cent. of the annual gross revenue. The disposal of the balance in this way left the financial year just ended to start without an accrued balance being brought into the account. It was pleasing to note that all the items on the income side of revenue showed increase over the estimates. The sale of gas was estimated to produce £5878; the actual sale had amounted to £6391—an increase of £513. Coke sales showed an increase of £19, tar and liquor sales of £54, furnishings sold during the year of £114, and stove hires of £12 over the estimates. The price of

gas to ordinary consumers was the same as in the previous year; but a reduction of 3d. per 1000 cubic feet was made to prepayment consumers, and the result of this was manifest in the total sale of gas to that class of consumers having risen from 999,400 cubic feet to 1,947,700 cubic feet—almost double the consumption. Coke prices rose slightly, and the average price received over the year was 9s. 5.37d. The market for tar and liquor also improved, and the average price per 100 gallons was 5s. 3.82d. The total income was £8435—an increase of £712 over the estimate, and of £747 over the income of the previous year. The total expenditure was £6534—a decrease of £48 upon the estimate, and of £106 upon the previous year. Better carbonizing results and a reduction in the price of coal resulted in an extra income of £572 from the sale of gas being obtained from a reduced expenditure of £213 on coal—the actual expenditure thereon being £64 under the estimate. Purification cost £22 more, on account of new parcels of oxide of iron being bought; but this had been more than compensated for in the lessened number of changes of purifiers. The cost of labour amounted to £980, as compared with £991 the previous year. The stove account was higher than in any previous year; but he considered this one of the most satisfactory features of the accounts. The total income, inclusive of gas, 3s. 1.75d., coke and tar, 10.74d., and furnishings and stove hires, 1.33d., was equal to 4s. 1.82d. per 1000 cubic feet of gas sold, and the total expenditure to 3s. 2.59d. The gross profit was £1900—equal to 11.23d. per 1000 cubic feet of gas sold. Annuities, interest, sinking, and contingent fund charges amounted to £1075—equal to 6.36d.; and the net profit—£825—equalled 4.87d. per 1000 cubic feet sold. It was gratifying to be able to report an increased make of gas of 3,397,800 cubic feet, and an increased sale of 3,600,700 cubic feet. Coal carbonized to produce 45,507,300 cubic feet of gas amounted to 4908 tons—an increase of only nine tons; the make of gas per ton of coal having risen from 8596 to 9272 cubic feet. Coke sold amounted to 2653 tons—equal to 10.81 cwt. per ton of coal carbonized. The total quantity of tar and liquor sold amounted to 240,770 gallons—equivalent to 49.05 gallons per ton of coal carbonized. The percentage of gas lost dropped from 12.1 to 10.7; but the latter figure did not fairly represent gas unaccounted for, as the gas used on the works had now for the first time been registered, as a result of which 3,996,000 cubic feet fell to be added to gas accounted for, bringing the figure down to 9.84 per cent. Contracts for the supply of coal for this year have been entered into at a cost of 9d. per ton less than last year's price, representing a saving on the current year's working of about £190. The erection of sulphate of ammonia plant is nearing completion; and a start will be made with it early in August. The accounts, it may here be remarked, have not yet been considered by the Town Council.

The Kinghorn Gas Company have reduced the price of gas from 5s. to 4s. 7d. per 1000 cubic feet.

At the annual meeting of the Montrose Gaslight Company, the report of Mr. A. Mackay, the Manager, stated that the Company had made satisfactory progress throughout the year. The quantity of gas made

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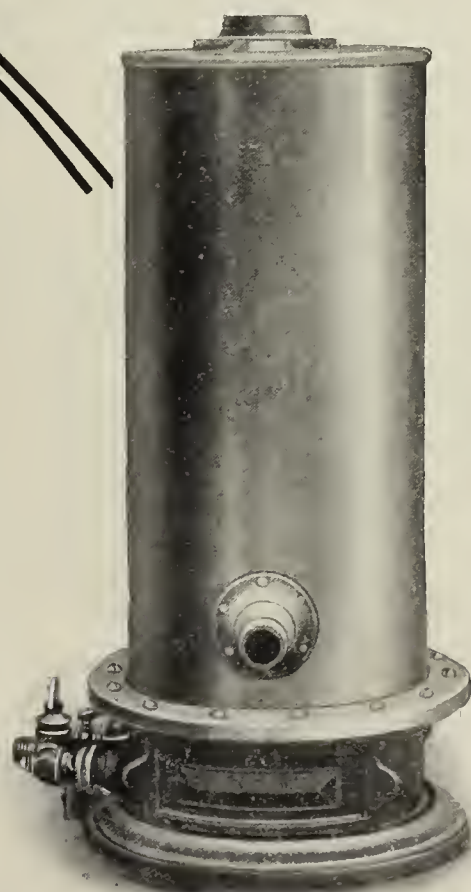
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was 32,910,000 cubic feet, and the amount sold showed an increase of 215,000 cubic feet, as compared with the previous year. The balance-sheet showed a profit of £1270, after deductions had been made for depreciation. A dividend at the rate of £2 12s. 6d. was declared; and the Chairman intimated that, so far as could be seen, the Board would be able to make a reduction in the price of gas.

The Brechin Gas Company, Limited, held their annual meeting on Friday, presided over by Mr. James Guthrie, J.P., who, in moving the adoption of the report of the Directors, said that the Company was never in a better position than it was now. The capital account had been reduced by £400. They were very favourably placed in regard to their coal contracts for the year, and they therefore thought that they could afford to reduce the price of gas by 2d. per 1000 cubic feet, as well as to pay a higher dividend. With regard to the proposed purchase of the gas-works, some were favourable to the purchase, and others were against it. Of course, they were open to consider an offer. This was only business. The report was adopted, and the proposed reduction in the price of gas and the declaration of a dividend of 8½ per cent. were agreed to.

Last night, a special meeting was held of the Aberdeen branch of the Gas Workers' and General Labourers' Union, at which a circular from the General Labourers' National Council was submitted, the burden of which was that there was a feeling that the unions of lesser skilled workmen should be brought together in one amalgamated union. The Aberdeen branch unanimously resolved to support amalgamation. Probably the branch consists of only a few men, and, except upon paper, their support of anything will be of little consequence; so the consumers of gas in Aberdeen, it may safely be assumed, should be able, notwithstanding this portentous resolution, to continue to "sleep o' nights."

CURRENT SALES OF GAS PRODUCTS.

[For Table of "Tar Products Prices," see p. 254.]

Sulphate of Ammonia.

LIVERPOOL, July 22.

There has been a strong tone in the market throughout the week, and although practically no quotable increase in values for near delivery has to be recorded, manufacturers have not found any difficulty in disposing of their present output at very full prices. Other large consuming countries than the United States have been showing more interest than has lately been the case, and the closing quotations are well maintained at £13 12s. 6d. per ton f.o.b. Hull, £13 13s. 9d. per ton f.o.b. Liverpool, and £13 15s. per ton f.o.b. Leith. The forward position has been even firmer than that for early shipment, and £13 17s. 6d. per ton f.o.b. Leith is said to have been paid right through from the present month to June next year, while producers generally are now asking £14 per ton for any further quantity.

Nitrate of Soda.

The situation of this article remains unchanged, and 10s. per cwt. for ordinary and 10s. 3d. for refined quality are still the prices required on spot.

LONDON, July 24.

Tar Products.

Markets still continue firm, although there is not a great volume of new business. Pitch shows an upward tendency, and distillers on the whole are very firm in their ideas. Benzols are quiet but steady, and makers still continue to ask high prices. Solvent naphtha is quiet, and business is difficult to negotiate. Heavy naphtha is in fair demand, and the price keeps very steady. There is a fairly good demand for creosote, and one or two fair sized contracts have recently been placed. Crude carbolic acid is in continual inquiry, and distillers are, in most cases, asking high prices.

The average values during the week were: Tar, 19s. 3d. to 22s. 3d., ex works. Pitch, London, 38s. 6d. to 39s.; east coast, 38s. to 38s. 6d.; west coast, Manchester, 37s. 6d. to 38s., Liverpool, 38s. to 38s. 6d., Clyde, 38s. to 38s. 3d. Benzol, 90 per cent., casks included, London, 9d. to 9½d.; North, 9d.; 50-90 per cent., casks included, London, 8½d. to 9½d.; North, 8½d. to 9d. Toluol, casks included, London, 9½d. to 10d.; North, 9½d. to 9½d. Crude naphtha, in bulk, London, 4d. to 4½d.; North, 3½d. to 3½d.; solvent naphtha, casks included, London, 11d. to 11½d.; North, 10d. to 10½d.; heavy naphtha, casks included, London, 11½d. to 1s. 0½d.; North, 10d. to 10½d. Creosote, in bulk, London, 2½d. to 2½d.; North, 1½d. to 2d. Heavy oils, in bulk, 2½d. Carbolic acid, 60 per cent., casks included, east coast, 1s. 11d.; west coast, 1s. 10d. Naphthalene, £4 10s. to £8 10s.; salts, 40s. to 42s. 6d., bags included. Anthracene, "A" quality, 1½d. per unit, packages included and delivered.

Sulphate of Ammonia.

There has been renewed activity in the market during the past week, and large quantities have been sold at improved prices. The one outstanding feature is the amount which is being sold for delivery right up to the end of June next. Actual Beckton as quoted to-day is £13 10s. to £13 12s. 6d., outside London makes on Beckton terms £13 10s., Leith £13 17s. 6d. to £13 18s. 9d., Hull, £13 13s. 9d. to £13 15s., Liverpool £13 17s. 6d., and Middlesbrough £13 13s. 9d. For the forward position, 1s. 3d. to 2s. 6d. premium is asked.

Messrs. John Russell and Co., Limited, of the Alma Tube Works, Walsall, have forwarded a copy of a new general catalogue of tubes and fittings which they have just issued; and they draw attention to the noteworthy fact that the publishing of this book marks the centenary of their existence as a firm of tube makers. The catalogue (which is of a handy size) contains full particulars of all kinds of tubes and fittings in wrought iron and steel; and, in addition, there are included a number of interesting and valuable tables and data which are likely to prove useful to gas and water engineers.

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COAL TRADE REPORTS.

Northern Coal Trade.

The coal trade in the North-east has been in some measure influenced by the labour unrest and the prospects of a stoppage in Northumberland. Best steam coals are in consequence higher at about 11s. 6d. to 11s. 9d. per ton f.o.b.; but these are nominal prices, as there is so little coal free for early sale. Second-class steams are from 9s. 3d. to 9s. 6d. per ton; and steam smalls from 5s. to 6s. per ton. There is a full output of steam coals, which is well taken up, especially for export; some steamers having apparently been diverted from Wales to this district. In the gas coal trade, the demand is very full for this season, and the tendency of prices is generally firm. Second-class Durham coals are 9s. 3d. to 9s. 6d. per ton f.o.b., best Durhams are well taken-up, and are quoted from 10s. 3d. to 10s. 4½d., and "special Wears" are from about 10s. 9d. to 10s. 10½d. There have been sales of gas coals in cargoes for Genoa at about 16s. 3d. and 16s. 6d. per ton, according to quality, delivered at the port named; and there have been one or two contracts fixed for delivery over the rest of this year, at somewhat similar prices, if quality be considered. Other contracts for next year are in the market; but the coalowners seem to desire higher prices, as the cost of production is increasing. The coke trade is steadier. Good gas coke is a little more plentiful, and is quoted at about 14s. 3d. per ton f.o.b., but with some variation, according to the position of the gas-works in regard to contracts.

Scotch Coal Trade.

There is no market to record, on account of last week having been the holiday week in the west of Scotland. The shipments recorded amounted to 329,102 tons—an increase upon the previous week of 4077 tons; but a decrease upon the corresponding week of 16,810 tons. For the year to date, the total shipments have been 8,592,613 tons—a decrease upon the corresponding period of 29,324 tons.

Fylde Water-Works Jubilee.—Mr. C. Arthur, the Secretary to the Fylde Water Board, has, in commemoration of the jubilee of the undertaking, written and published a volume on its history. When the Fylde Water-Works were first contemplated, there were less than 3000 houses to provide for—viz., 776 in Blackpool, 660 in Kirkham, 542 in Fleetwood, and 391 in Lytham and St. Anne's-on-the-Sea. A scheme formulated in 1853 had to be dropped for lack of pecuniary support. But the next was more successful; and on July 22, 1861, the Royal Assent was given to the Fylde Water-Works Act. The first reservoir was constructed at Grizedale, near Garstang; and in 1899 the undertaking was acquired by the Local Authorities of Blackpool, Fleetwood, Lytham, and St. Anne's—the purchase price being £765,455. Originally mains were laid to provide a supply of 750,000 gallons of water per day. The daily consumption is now about 6 millions; and such has been the increase of late that, as mentioned last week, the Board are seeking for a fresh source of supply.

Shanklin Water Supply.—The new water-works at Chillerton (Isle of Wight) for the supply of Shanklin were informally opened last Wednesday. One of the engines is specially intended to pump water through the Shanklin mains; the estimated quantity being 25,000 gallons per hour. The new scheme will relieve for a time the anxieties of the residents of Shanklin as to their water supply.

Incandescent Gas Lighting in Cardiff.—Mr. W. Harpur, the City Engineer, has reported to the Cardiff Tramways and Electricity Committee that the total cost of the conversion by his department of 1160 gas-lamps from flat-flame burners to the incandescent system was £1956, which was about £500 less than the Gas Company's tender, and £150 lower than his own estimate. The work had been carried out well, and in good time. The Committee expressed satisfaction with the result, and granted Mr. Irwin, the Superintendent of Street Lighting, who had had charge of the work, an honorarium.

Costs of Opposing the Standard Burner Bills.—At a meeting of the Exeter City Council last Wednesday, the Town Clerk (Mr. H. Lloyd Parry) submitted two bills of costs from the Council's Parliamentary Agents in respect of the Standard Burner Bill—one for £39 10s. 8d. in connection with the opposition to the Bill before the House of Lords, and the other for £38 14s. 9d., the opposition before the House of Commons. The Agents had been induced, upon representations made to them, to accept £40 in payment of the total amount of £78 5s. 5d. It was explained that the Bill for the Council apportionment of the joint costs had not yet come to hand.

Electric Main Extensions at Hastings.—In the course of a Local Government Board inquiry held at Hastings a few days ago by Mr. H. Shelford Bidwell, M.Inst.C.E., opportunity was taken by the Corporation to apply for authority to borrow money for the extension of their electric light mains. It appears that no public advertisement of this was made; the notice given being in respect of sewerage work, private street improvements, and a concrete groyne. This is an ingenious way of raising more money. However, in the course of the inquiry the fact came out that the deficit on the electricity undertaking is being reduced, and it is hoped to be cleared off this year.

Aldershot Gas, Water, and District Lighting Company.—At the next half-yearly meeting of this Company, the Directors will report that the total revenue in the six months ended the 30th of June was £32,505, and the expenditure £23,013; leaving a surplus of £9492. After providing for dividend on the consolidated preference stock and interest on mortgage and debentures, the Directors recommend dividends for the half year at the rates of £6 1s. per cent. per annum on the "A" stock, £4 11s. per cent. per annum on the "B" stock (these rates being in accordance with the sliding-scale), and £5 per cent. per annum on the "C" consolidated stock—all less income-tax. Exclusive of works and War Department supplies, the sales of gas increased 10·54 per cent. The revenue from water was higher, and the market for residuals improved. Generally, the half-year's results were satisfactory. At the close of the business at the ordinary meeting, the shareholders will be asked to authorize an issue of additional capital.

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Local Authorities and the Acquisition of Water.—The text has been published of a Bill introduced by Mr. Herbert Lewis, and supported by the President of the Local Government Board, to enable the Board, by Provisional Order, to give powers to local authorities for the purpose of the acquisition of water. The Bill stipulates that provision shall be made by every Provisional Order for compensation being given in respect of the abstraction of water under the Order. The compensation is to be given, if practicable, by means of the supply of a flow of water; and, if not so practicable, in such manner, either by means of a payment of money or otherwise, as the Order directs. A Provisional Order may provide for all matters which appear to the Board necessary or proper for bringing into operation and giving full effect to the Order.

Among the new registrations is the Tintwistle Water-Works Company (1911), Limited. It is limited by guarantee.

The National Gas-Engine Company, Limited, of Ashton-under-Lyne, has just been re-registered with a capital of £1,000,000, in £1 shares, of which 400,000 are 5 per cent. cumulative preference.

The annual outing of the Wolverhampton Gas Company Fittings Department took place last Saturday week; the destination being Portsmouth. The party were entertained at dinner by the Directors and Engineer of the Company. After the loyal toast, the Chairman (Mr. A. Coombe) proposed "Success to the Gas Company," coupled with the name of Mr. P. G. Winstanley, the Engineer; and this was heartily received.

The Directors of the Tottenham and Edmonton Gas Company, after placing £2000 to the renewal fund and £1000 to the insurance fund, recommend payment for the past half year of the full statutory dividends of 7½ per cent. per annum on the "A" stock, and 5½ per cent. per annum on the "B" stock; carrying forward £28,648. A year ago the dividends were at the rate of 7 and 5½ per cent. respectively, and the carry-forward was £23,154.

WANTED, FOR SALE, CONTRACTS, &c., ADVERTISEMENTS IN THIS WEEK'S "JOURNAL."

Appointments Vacant.

TRAVELLER (TOOLS, &c.). Taylor and Bryden, Billiter Street, E.C.
TRAVELLERS (MANTLES). 535, e/o T. B. Brown's Advertising Offices.
COLLECTOR (WATER). Applications to Mr. B. D. Holroyd, 6, Great Winchester Street, E.C.
GENERAL FOREMAN. No. 5428. Applications by July 27.
SHOW-ROOM ATTENDANT. No. 5432.
METER REPAIRER. Derby Gas Company.
RETORT SETTER AND BUILDER. Box 2903, Burton's, Aldwych.
STOKER. No. 5426.
STOKER. Ynyscynhaiarn Urban District Council. Applications by Aug. 1.

Appointments Wanted.

MANAGER. No. 5430.
POSITION OF TRUST. (Gas Undertaking or Gas Appliances Works.) No. 5431.

Plant, &c., for Disposal.

COMPLETE SULPHATE OF AMMONIA PLANT, &c. (Park Chemical Company, in Liquidation). By Auction. Particulars of the Auctioneer, 21, Mawdsley Street, Bolton.

Plant &c., for Disposal Continued.

CONDENSER. Sutton Gas Company.
LAMPS. West Bromwich Gas-Works.
METERS. No. 5421.
TAR-WORKS. No. 5427.

Gas-Works Wanted (Purchase or Lease).

No. 5429.

Patents, Licences, &c.
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Meetings.

BRENTFORD GAS COMPANY. St. Ermin's Hotel. Aug. 2. Twelve o'clock.
BROMLEY AND CRAYS GAS COMPANY. Bell Hotel, Bromley. Aug. 3. Six o'clock.
GASLIGHT AND COKE COMPANY. Offices. Aug. 4. Twelve o'clock.
HORLEY GAS COMPANY. Offices. Aug. 10. 3.30 o'clock.
SOUTH SUBURBAN GAS COMPANY. Works. Aug. 4. 2.30 o'clock.
TOTTENHAM GAS COMPANY. Works. Aug. 5. Three o'clock.

Stocks and Shares.

HARPENDEN DISTRICT GAS COMPANY. Applications by Aug. 5.
HORLEY GAS COMPANY. By Tender.

TENDERS FOR

Coal and Cannel.

HEBDEN BRIDGE AND MYTHOLMROYD GAS BOARD. Tenders by Aug. 5.
SHEFFIELD UNITED GASLIGHT COMPANY. Tenders by Aug. 1.
STRATFORD-ON-AVON GAS COMMITTEE. Tenders by Aug. 12.

Oxide.

MIDDLETON CORPORATION. Tenders by Aug. 5.

TAR PRODUCTS PRICES.

Representative manufacturers give the following as fair current values for the week ending July 22. Prices are net, and they include the usual packages and delivery f.o.b., f.a.s., or f.o.r., as customary.

Article.	Basis.	London.	North-East Coast.	East Coast, Yorks.	West Coast,		Glasgow.
					Liverpool.	Manechester.	
Tar, crude	per ton	28/- 30/-	20/- 24/-	24/-	20/- 22/-	20/- 22/-	—
Pitch	"	40/-	37/6	39/-	39/3	38/3	38/-
Benzol, 90%	per gallon	—	-9 3/4	-9	-9 1/4	-9 1/4	-9 3/4
Benzol, 50-90%	"	—	-10	-9 1/2	-8 3/4	-8 3/4	—
Toluol, 90%	"	—	-10	-10	-10	-10	-10
Crude naphtha, 30%	"	—	-4	-4	-3 1/2	-3 1/2	—
Light oil, 50%	"	—	-3 1/2	-3 1/2	-3 1/2	-3 1/2	—
Solvent naphtha, 90-160	"	—	-10	-10	-10	-10	-11
Heavy naphtha, 90-190	"	—	-11	-11 1/2	-11 1/2	-11 1/2	-11
Creosote in bulk	"	-2 5/8	-2	-2	-2 1/16	-2 1/16	-1 7/8
Heavy oils.	"	—	-2 1/2	-2 1/4	-2 5/8	-2 3/4	-2 1/4
Carbolic Acid, 60's.	"	—	1/10 1/2	1/11	1/9	1/9 1/2	1/11
Naphthalene, crude drained salts	per ton	—	43/9	41/3	47/6	47/6 50/-	—
" pressed	"	—	60/-	63/-	60/-	60/- 72/6	—
" whizzed.	"	—	—	—	65/- 72/6	60/- 75/-	60/-
Anthracene	per unit	-1/2	-1 1/2	-1 1/2	-1 1/4	-1 1/4	—

A Handsome F'Cap Volume giving a complete account of the

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Applications, in candidates' own Handwriting, endorsed "Gas Stoker," stating Age and experience, &c., and accompanied by not more than Two recent Testimonials to be sent to me not later than Aug. 1, 1911.
JNO. JONES, Clerk.
Town Hall, Portmadoc,
July 11, 1911.

WANTED, a Thoroughly Competent
METER REPAIRER, one used to Ordinary Dry and Prepayment Meters.
Apply, stating Age, Experience, and Wages required, to the MANAGER, Derby Gaslight and Coke Company, Friar Gate, DERBY.

WANTED, a General Foreman for
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WANTED, a Collector for a small
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Apply, by letter, stating Experience, Age, and Salary required, to TAYLOR AND BRYDEN, 18, Billiter Street, LONDON, E.C.

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Address No. 5427, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

THE Corporation of West Bromwich
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THE Corporation of Middleton invite
TENDERS for the Supply of about 100 Tons of BOG ORE.
Further Particulars to be obtained from Mr. C. F. Broadhead, Gas Engineer, Middleton.
Tenders, addressed to the Chairman of the Gas Committee, and endorsed "Bog Ore," must be Delivered at my Office not later than Aug. 5, 1911.
FREDERICK ENTWISTLE, Town Clerk.

STRATFORD-ON-AVON CORPORATION. (GAS DEPARTMENT.)

THE Gas Committee invite Tenders
for the Supply of 6000 Tons of Good Screened GAS COALS or NUTS for Delivery during Twelve Months ending Sept. 30, 1912.
Forms of Tender and other Particulars can be obtained upon Application to the Engineer and Manager.
Tenders to be sent in (and will be accepted only on the Form supplied) not later than Aug. 12, 1911.
The lowest or any Tender not necessarily accepted.
J. S. CRANMER,
Engineer and Manager.
July 21, 1911.

TENDERS FOR COAL.

THE Directors of the Sheffield United
Gaslight Company invite TENDERS for about 250,000 Tons of GAS NUTS and SLACK for delivery during the Eleven Months ending June 30, 1912.
Tenders (Forms of which can be had on Application) must be addressed to Mr. Hanbury Thomas, Managing-Director, and delivered not later than the first post on Tuesday, the 1st day of August next.
The Directors reserve the right to take the whole or any portion of the quantity offered, and do not bind themselves to accept the lowest or any Tender.
WM. HAMBY,
Secretary.
Commercial Street, Sheffield.
July 13, 1911.

HEBDEN BRIDGE AND MYTHOLMROYD GAS BOARD.

THE above Gas Board are prepared to
receive TENDERS for the Supply of Screened GAS COAL, to be Delivered at the Gas-Works, Crow Nest, Hebdon Bridge, for Twelve Months from the 1st of September, 1911.
The Probable Quantity will be from 6000 to 8000 Tons; but the Gas Board reserve the right to increase or decrease the quantity named.
Further Particulars and Form of Tender to be obtained from Mr. E. J. Wellens, Engineer and Manager, Gas Offices, Carlton Street, Hebdon Bridge.
Sealed Tenders, endorsed "Tender for Coal," to be addressed to the Chairman of the Gas Board and Delivered at these offices not later than noon on Monday, Aug. 5, 1911.
RICHARD CRABTREE,
Clerk to the Gas Board.
Gas Offices, Carlton Street,
Hebdon Bridge, July 21, 1911.

THE GASLIGHT AND COKE COMPANY.

NOTICE is Hereby Given, that a
HALF-YEARLY ORDINARY GENERAL MEETING of the Proprietors of this Company will be held at this Office on Friday, the 4th day of August next, at Twelve o'clock (noon) precisely, to Transact the usual Business, including the Declaration of a Dividend for the Half Year ending on the 30th day of June last.

By order,
HENRY RAYNER, Secretary.
Chief Office: Horseferry Road,
Westminster, S.W., July 18, 1911.

BRENTFORD GAS COMPANY.

NOTICE is Hereby Given, that a Half-
YEARLY ORDINARY GENERAL MEETING of the Proprietors will be held at St. Ermin's Hotel, Caxton Street, Westminster, on Wednesday, the 2nd of August next, at Twelve o'clock (noon), to Transact the usual Business, including the declaration of a Dividend for the half year ending the 30th of June last.
The Dividends to be declared will be paid to the holders of Preference and Ordinary Stocks registered as Stockholders on the 8th of July, when the TRANSFER BOOKS of the Company were CLOSED.

By order,
WILLIAM MANN,
Secretary.
Office, Brentford,
July 17, 1911.

SOUTH SUBURBAN GAS COMPANY.

NOTICE is Hereby Given, that the
ORDINARY HALF-YEARLY GENERAL MEETING of the Proprietors of this Company will be held in the "Livesey Memorial Hall," at the Works of the Company, Lower Sydenham, S.E., on Friday, the 4th day of August, 1911, at 2.30 o'clock in the afternoon precisely, to receive the Report of the Directors and Statement of Accounts for the Half Year ended June 30 last; to declare a Dividend for the same period; and for General Purposes.
The TRANSFER BOOKS WILL BE CLOSED from the 21st day of July to the 4th of August, both days inclusive.

By order of the Board,
CHARLES M. OHREN,
Secretary.
Offices and Works,
Lower Sydenham, S.E.,
July 17, 1911.

BROMLEY AND CRAYS GAS COMPANY.

NOTICE is Hereby Given, that the
ORDINARY HALF-YEARLY GENERAL MEETING of this Company will be held on Thursday, the 3rd day of August, 1911, at Six o'clock p.m. precisely, at the "Bell" Hotel, Bromley, Kent, to receive the Report of the Directors; the Balance-Sheet certified by the Auditors; to declare a Dividend; and to Transact generally the Business of a General Meeting.
The TRANSFER BOOKS WILL BE CLOSED from the 19th of July to the 3rd of August, 1911, both days inclusive.

By order of the Board,
HENRY W. AMOS,
Secretary.
Offices: 156, High Street,
Bromley, Kent, July 19, 1911.

TOTTENHAM AND EDMONTON GASLIGHT AND COKE COMPANY.

NOTICE is Hereby Given, that the
ANNUAL ORDINARY GENERAL MEETING of the Proprietors of this Company will be held at the Gas-Works, Willoughby Lane, Tottenham, on Saturday, the 5th day of August next, at Three o'clock in the afternoon precisely, to receive the Report of the Directors and Statement of Accounts for the Half Year ending June 30, 1911; to declare Dividends; to elect Two Directors and an Auditor for the ensuing Year; and to transact General Business.
The TRANSFER BOOKS for the "A" and "B" CONSOLIDATED STOCKS WILL BE CLOSED from July 29 to Aug. 5, both days inclusive; and the Dividends will be posted on the 11th of August to the holders of Stock registered at the date of the closing.

By order of the Board,
E. TOPLEY,
Secretary.
Chief Offices of the Company,
High Road, Tottenham, N.,
July 19, 1911.

HORLEY DISTRICT GAS COMPANY.

NOTICE is Hereby Given, that the
ORDINARY HALF-YEARLY GENERAL MEETING of the Proprietors of this Company will be held at the Company's Offices, Horley, Surrey, on Thursday, the 10th day of August, 1911, at Half past Three o'clock precisely in the Afternoon, to receive the Directors' Report and Statement of Accounts for the Half Year ended 30th of June, 1911; to declare a Dividend for the same period; and to transact the General Business of the Company.
The TRANSFER BOOKS of the Company WILL BE CLOSED from the 27th of July inst., to the 18th of August next, both days inclusive.

By order of the Board,
R. SEYMOUR TOBEY,
Secretary.
Gas Offices, Station Road,
Horley, Surrey, July 13, 1911.

HARPENDEN DISTRICT GAS COMPANY.

ISSUE OF £2000 FOUR PER CENT. MORTGAGE DEBENTURES AT PAR.

THE Directors of the Harpenden
District Gas Company are prepared to receive APPLICATIONS for £2000 Four Per Cent. MORTGAGE DEBENTURES forming part of £8000 authorized to be borrowed under the powers of the Harpenden District Gas Act, 1901.

The amount now borrowed under the powers of the said Act is £4300; and the present issue of £2000 will make a total of £6300 secured by Mortgage on the undertaking of the Company.

The total issued Share Capital of the Company now amounts to £23,000, divided into two classes of Shares; and recent dividends have been paid at the rates 10½ per Cent. and 27 11s. 6d. per Cent. per Annum respectively on the two classes of Share. The present issue of Debentures is therefore amply secured.

Applications should be made by letter, addressed to the Secretary, before Aug. 5, 1911, and need not be accompanied by a remittance. The Debentures will bear interest from date of payment.

By order,
(Signed) FRED. W. TAYLOR,
Secretary.
Offices: Wheathampstead Road,
Harpenden.

SALES BY AUCTION OF GAS AND WATER STOCKS AND SHARES.

MESSRS. A. & W. RICHARDS beg to notify that their SALES BY AUCTION OF NEW CAPITAL ISSUED UNDER PARLIAMENTARY POWERS, and of STOCKS and SHARES belonging to EXECUTORS and other PRIVATE OWNERS in LONDON, SUBURBAN, and PROVINCIAL GAS and WATER COMPANIES, take place PERIODICALLY at the Mart, TOKENHOUSE YARD, E.C.

Terms for Issuing New Capital, and also for including other Gas and Water Stocks and Shares in these Periodical Sales, will be forwarded on Application to MESSRS. A. & W. RICHARDS, at 18, FINSBURY CIRCUS, E.C.

HORLEY DISTRICT GAS COMPANY.

SALE BY TENDER OF £4400 FOUR PER CENT. DEBENTURE STOCK,

AND

£1440 ADDITIONAL "B" CAPITAL STOCK.
MINIMUM PRICE, £100 PER £100 STOCK.
(IN PURSUANCE OF THE HORLEY DISTRICT GAS ACT, 1901.)

NOTICE is Hereby Given, that it is the intention of the Directors of this Company to OFFER FOR SALE BY TENDER a balance of £4400 FOUR PER CENT. DEBENTURE STOCK and also £1440 additional "B" CAPITAL STOCK, to be paid up in full on or before the 31st day of August next, such Stock being a portion of the additional capital authorized to be raised by resolution passed at an Extraordinary General Meeting of the Proprietors, held on the 12th day of September, 1901, under powers of the above-mentioned Act.

Particulars and Conditions may be obtained on Application to the undersigned.

By order of the Board,
R. SEYMOUR TOBEY,
Secretary.

Gas Offices, Station Road, Horley,
Surrey, July 13, 1911.

MANCHESTER.

To Corporations, Gas-Works, Sulphate of Ammonia Makers, Brokers, and others.

THE PARK CHEMICAL COMPANY, LIMITED
(IN VOLUNTARY LIQUIDATION).

Trafford Park (near Westinghouse Works), Manchester.

EDWIN HASLAM, F.A.I., has received Instructions from Mr. James Carter (Liquidator herein) to SELL BY AUCTION, on Wednesday, Aug. 2, 1911, on the above premises—

The whole of the PLANT CAPABLE OF PRODUCING 2 TONS OF SULPHATE OF AMMONIA per Twenty Four-Hours, comprising: Wilton's patent Still with Twelve ordinary or bubbling sections (3 ft. internal diameter by 8 in. deep), Lining Section, Patent Spent Liquor Valve, Pressure Box, Lime-Mixing Chamber (4 ft. by 2 ft. diameter), Lime Tank (3 ft. 6 in. by 2 ft. 6 in. by 2 ft.), Wilton's Round Open Saturator (4 ft. diameter), Pitchpine Draining Table (5 ft. by 7 ft.), and Lead Covering, Stores (22 ft. by 10 ft.), Mother-Liquor Well (3 ft. by 3 ft. by 3 ft.), and Injector, 2-Ton Acid Tank, Cast-Iron Vertical Liquor Heater, with seventeen 3 in. Internal Tubes, Cast-Iron Multitubular Condenser, Catch Box, Reducing Valve, &c., by the Chemical Engineering Company (London), together with Cornish Steam Boiler (18 ft. by 5 ft. 6 in.), Wrought-Iron Chimney, Three Iron Gas-Liquor Storage Tanks (20 tons, 25 tons, and 30 tons capacity), Five Pumps; also the

TIMBER-BUILT SULPHATE-HOUSE, BOILER-SHED, ACID-STORE SHED, &c., &c.

N.B.—The above Plant and Premises, which were erected in 1910, will, in the first instance, be offered in one Lot, and if not so disposed of will be sold piecemeal and without reserve.

Sale to commence at Two o'clock p.m.
On View Monday and Tuesday, the 31st of July and the 1st of August, 1911, from Ten to Four o'clock, or any day previous by appointment.

CATALOGUES may be had four days prior to Sale, from the AUCTIONEER, "The Albany," 21, Maudsley Street, BOLTON (Tel. 754), or Mr. JAMES CARTER, Chartered Accountant, 14, Wood Street, BOLTON (Tel. 857).

THE Proprietors of the Patents No. 7188 of 1901, for "IMPROVEMENTS IN OR RELATING TO ACETYLENE GAS LAMPS OR GENERATORS;" No. 11,612 of 1902, for "ACETYLENE GAS-LAMP FOR TABLE USE;" No. 23,629 of 1903, for "IMPROVEMENTS IN ACETYLENE GAS GENERATORS;" and No. 10,185 of 1905, for "IMPROVEMENTS IN ACETYLENE GAS GENERATORS," are desirous of entering into Arrangements, by way of LICENCE and otherwise, on reasonable Terms, for the purpose of EXPLOITING the same and ensuring their full Development and Practical Working in this Country.

All Communications should be addressed in the first instance to HASELTINE, LAKE, & Co., Chartered Patent Agents and Consulting Engineers, 7 and 8, Southampton Buildings, Chancery Lane, LONDON, W.C.

THE Proprietor of the Patent No. 19,799 of 1907, for "IMPROVEMENTS RELATING TO GENERATORS FOR ACETYLENE GAS OR THE LIKE," is desirous of entering into arrangements, by way of LICENCE and otherwise, on Reasonable Terms, for the purpose of EXPLOITING the same and ensuring its Full Development and Practical Working in this Country.

All Communications should be addressed in the first instance to HASELTINE, LAKE, & Co., Chartered Patent Agents and Consulting Engineers, 7 & 8, Southampton Buildings, Chancery Lane, LONDON, W.C.

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Sperm Value 878·85 lbs. per ton.

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Manufacture and keep in Stock at their Works (also large Stock in London)

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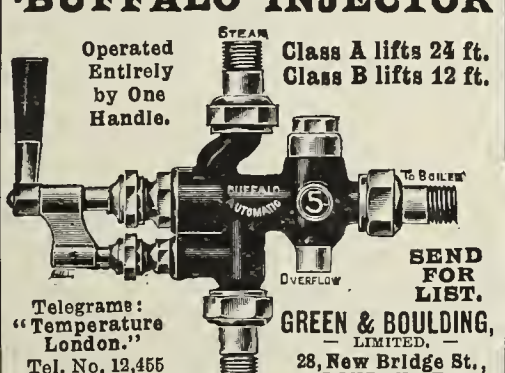
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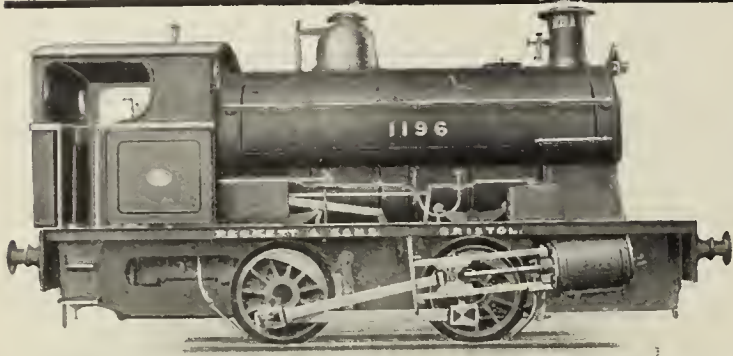
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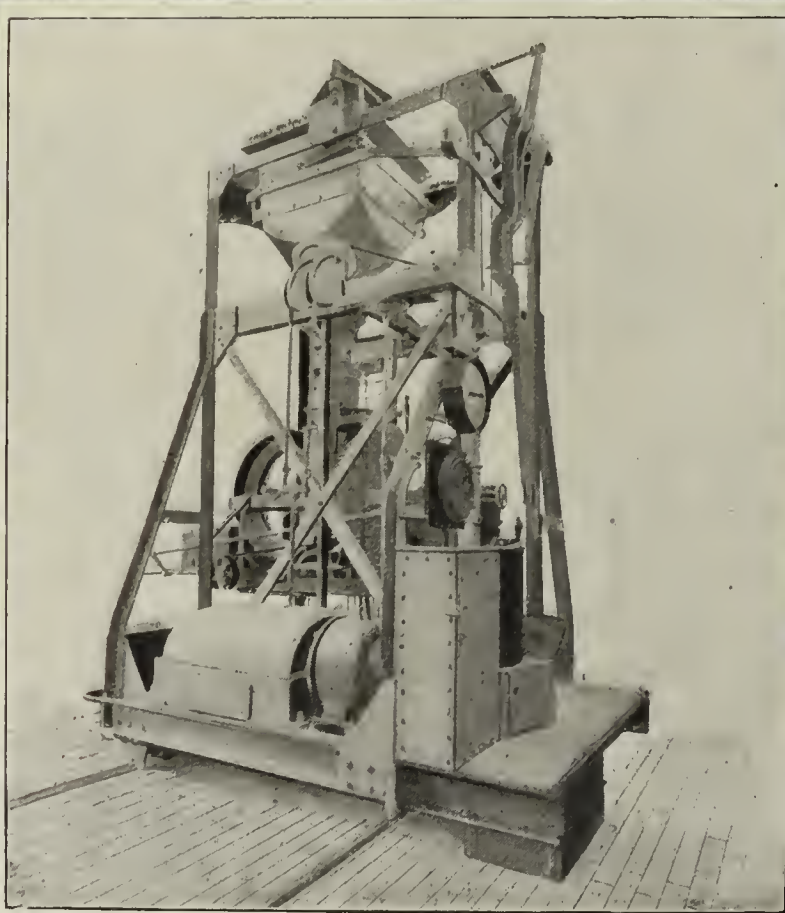
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AT WORK
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Latest Development :

600 C.P. LOW PRESSURE LAMP.

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GAS REGULATION on the TOP of the LAMP.

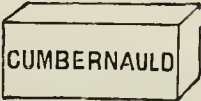
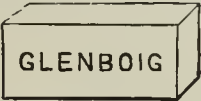
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Every Genuine Glenboig Brick, Block, Gas-Retort, &c., is legibly stamped with one or other of the Glenboig Company's Registered Trade Marks, as here shown.

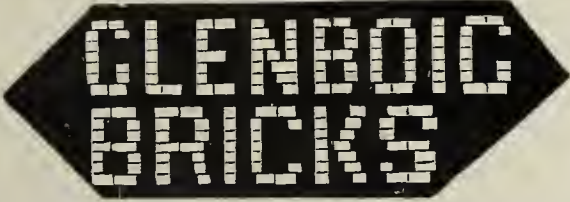
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The Glenboig Trade Marks are imitated, and the Glenboig Name unfairly used by Makers of a lower Class of Goods, which, when sold under their own name, command much lower prices.
The Genuine Brand, Stamped on the Goods, is the only Reliable Guarantee to the Purchaser.

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The SPECIAL BRICKS used in the
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Works : GLENBOIG, LANARKSHIRE.
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The GLENBOIG BRICKS, BLOCKS, AND RETORTS combine, in the highest degree, the qualities of not melting, and not splitting, when subjected to the highest heats and most sudden changes of temperature, and are, in consequence, found to be economical, even in districts where the local bricks can be had at half the price.
Undenoted we give a Table of Analysis and Physical Characteristics of a sample of Glenboig Fire-Clay by J. T. Norman, London; and, in submitting a report from a responsible and reliable public analyst, we would here draw attention to the unreliable character of some recently published analyses where a manufacturer selects not only his own samples, but also those of his competitor, and has them treated by a private analyst. SUCH STATEMENTS ARE ALTOGETHER UNTRUSTWORTHY.

ANALYSIS OF GLENBOIG FIRE-CLAY.

By JOHN T. NORMAN, Esq., F.C.S., &c., The City Central Laboratory, LONDON.
THE GLENBOIG UNION FIRE-CLAY CO., LTD., GLENBOIG, SCOTLAND.
23, LEADENHALL STREET,
LONDON, E.C., September 21st, 1909.
DEAR SIRS,
I have completed the investigation of the samples of Clay received from you on the 10th inst., and now beg to report the results.

CHEMICAL ANALYSIS.

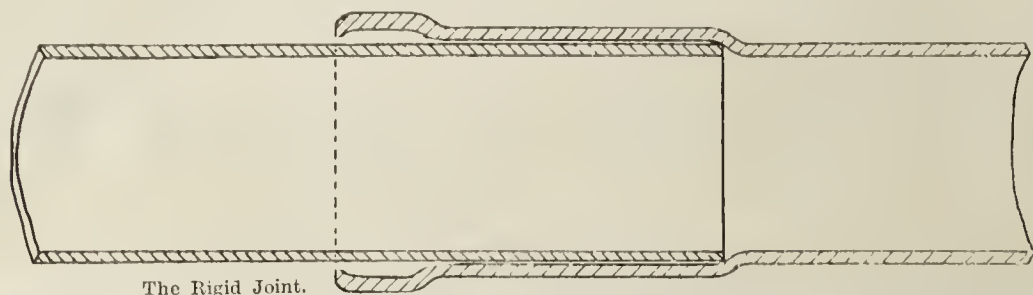
	Raw.	Fired.
Silica, free	3.03 ..	3.49 ..
Silica, combined	43.20 ..	49.77 ..
Alumina	36.55 ..	42.10 ..
Ferrio oxide	1.80 ..	2.08 ..
Titanio oxide	1.30 ..	1.50 ..
Lime	trace ..	trace ..
Magnesia	trace ..	trace ..
Alkaline oxides	trace ..	trace ..
Sulphates as trioxides	0.92 ..	1.06 ..
Loss on Ignition	13.20 ..	— ..
	100.00	100.00

PHYSICAL RESULTS.

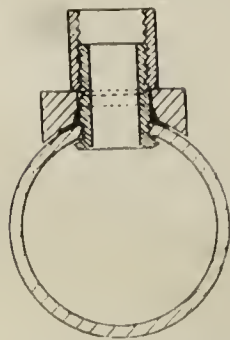
Density	2.65
Volume weight	1.90
Porosity	15.4 %
Linear shrinkage at 100° C.	3.70 %
" " " 1050° C.	4.76 %
" " " Total	8.46 %
Volume shrinkage at 100° C.	10.7 %
" " " 1050° C.	12.6 %
" " " Total	23.3 %
Plasticity	20.0 %
Fire Stability	1850° C. equiv, 3362° F.

(SEGER CONE 36.) (New Scale CONE 38.)
(Signed) J. T. NORMAN.

This Clay is remarkable for its high percentage of Alumina and for the almost complete absence of ingredients tending to lower the refractory properties; its fire stability is extremely high. For some years past I have been urging clients who are working the Clays of the Coal Measures to search for such a material, but you are the first to discover a supply. The possession of this Clay places you in a unique position amongst the manufacturers of refractory goods throughout the world, and I have no doubt will, if duly exploited, enable you to drive out of the market the large quantities of foreign fire-bricks which are being poured into this country for use in the construction of bye-product ovens and for other purposes. —I am, yours faithfully,
JOHN T. NORMAN.



The Rigid Joint.



The Expansion Nipple.

If your MAINS are composed of MANNESMANN WELDLESS STEEL SPIGOT and FAUCET TUBES (Rigid, Ordinary, or Bayonet type), your SERVICE CONNECTIONS are made with the Woodall-Parkinson EXPANSION NIPPLE, and your SERVICES are of MANNESMANN WELDLESS STEEL SCREWED and SOCKETED TUBING, you have a conjunction which will stand the utmost strains that modern conditions of pressure, traffic, &c., and the worst possible circumstances, can put upon them.

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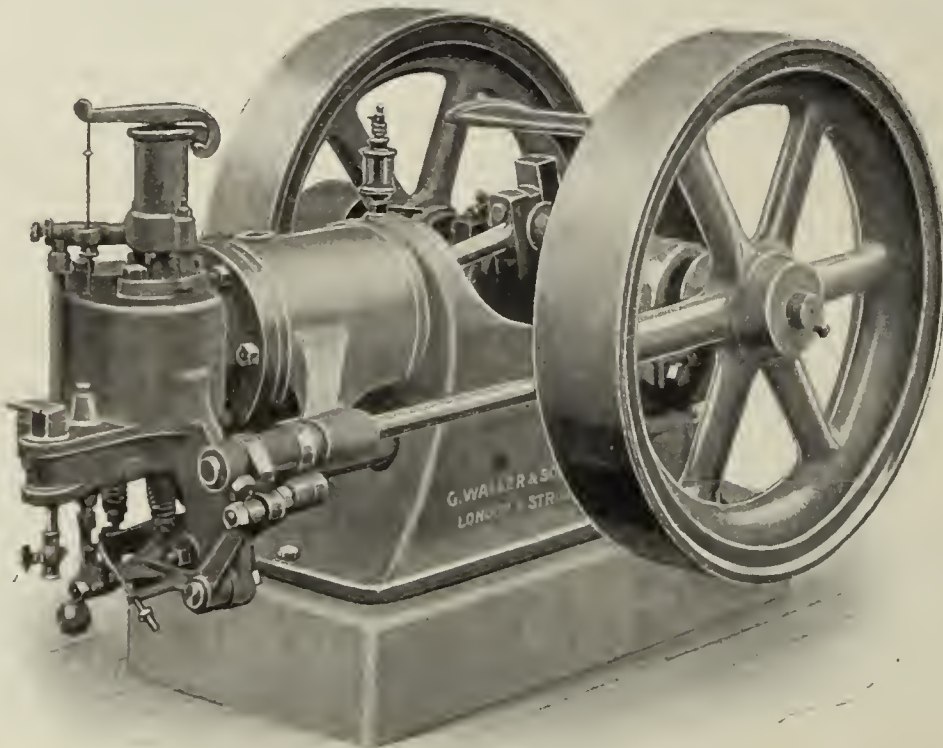
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Very Attractive for
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"PINKNEY"
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 $\frac{1}{2}$, $\frac{3}{4}$, 1, $1\frac{1}{2}$, 2, $2\frac{1}{2}$,
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On combination
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Agents for Scotland: Messrs. D. M. NELSON & CO., 53, Waterloo Street, Glasgow.

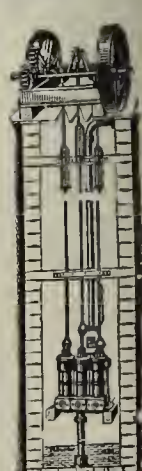
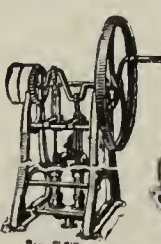
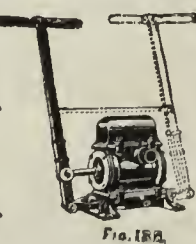
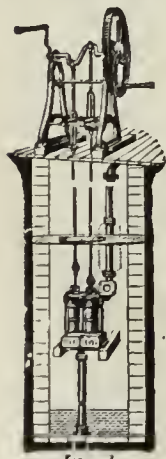
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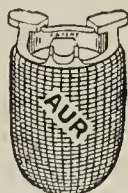


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2 ply Ramie thread, single
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Double Knitted Ramie
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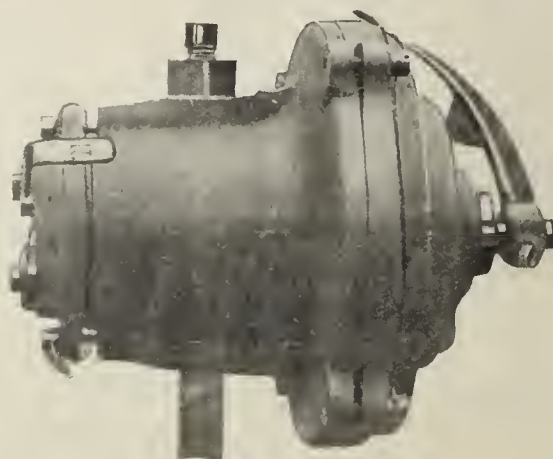
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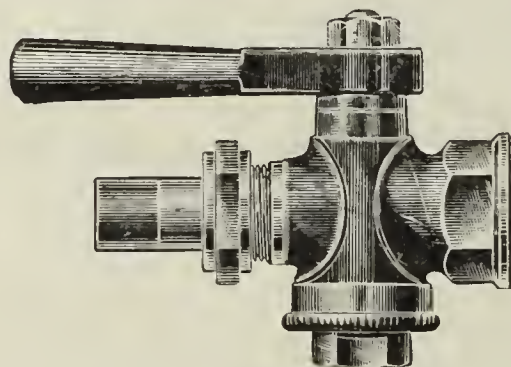
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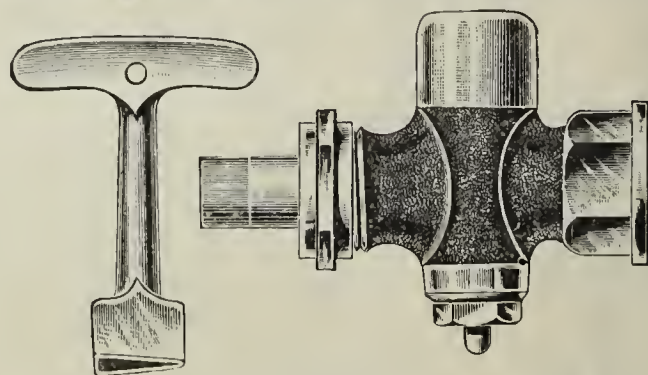
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FULL-WAY GUN-METAL GAS-MAIN COCKS A SPECIALITY.



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With Protecting Cap and Loose Key.

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Coke Barrows, Tools of all Descriptions.*

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Telephone: 273 CENTRAL.

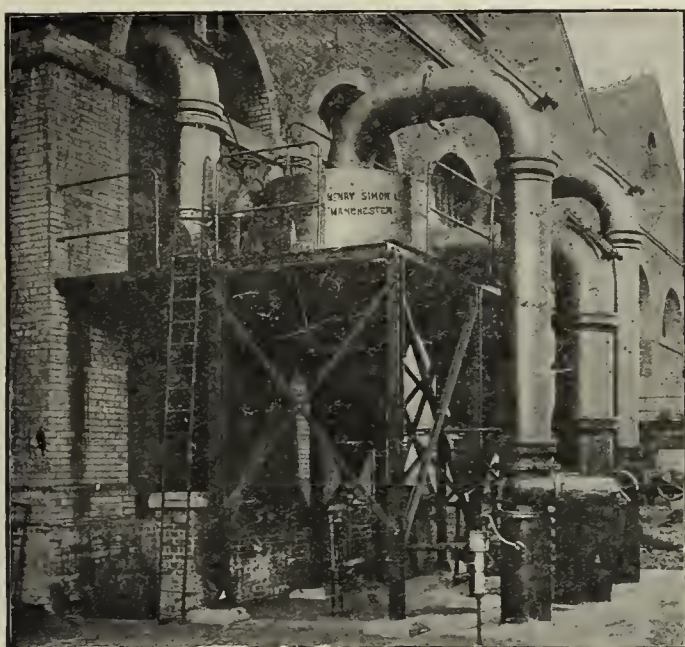
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FOR
VERTICAL, INCLINED, HORIZONTAL, & SEGMENTAL
RETORTS

Of High Grade Quality, apply to

MOBBERLEY & PERRY OF STOURBRIDGE,
LIMITED,

who are also Manufacturers of "Best British" (B.B.) Fire-Clay Goods.

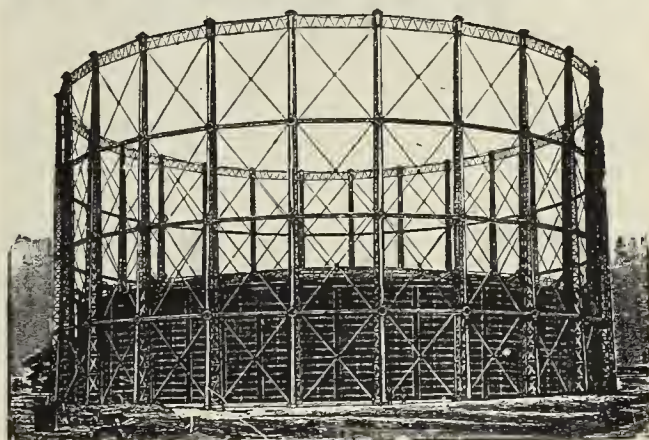


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No Steam.
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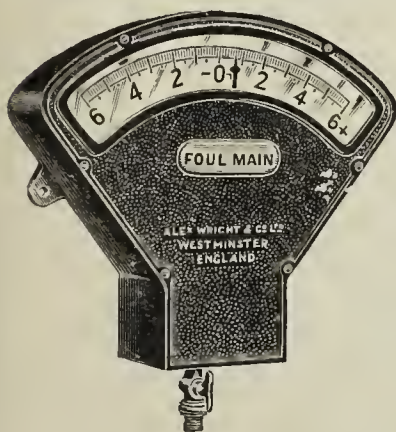
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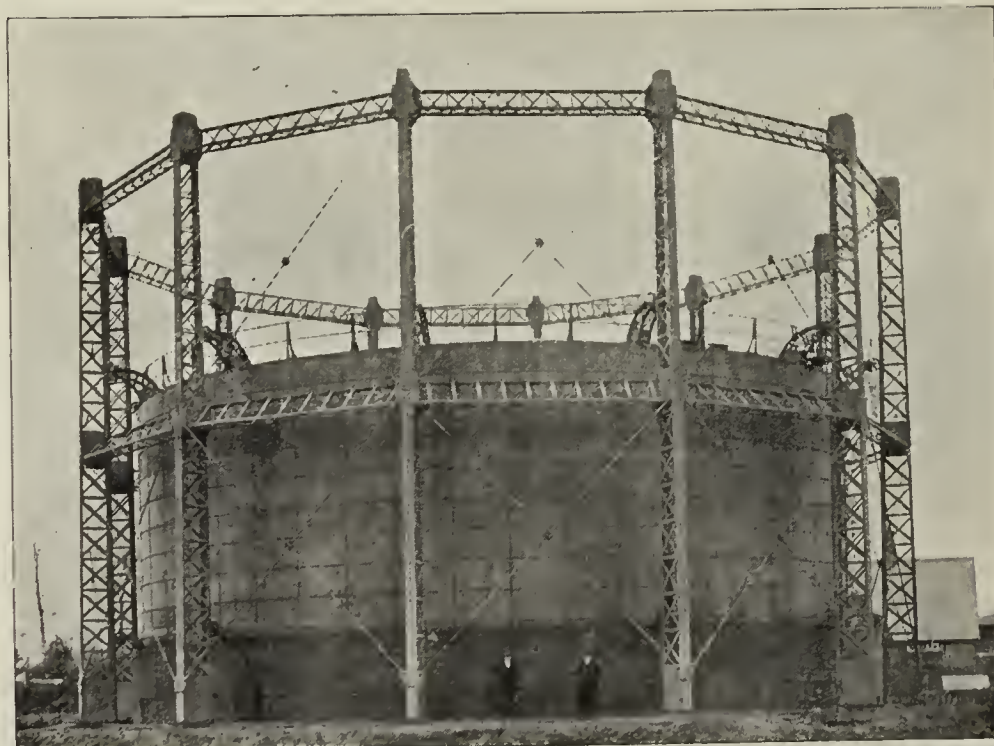
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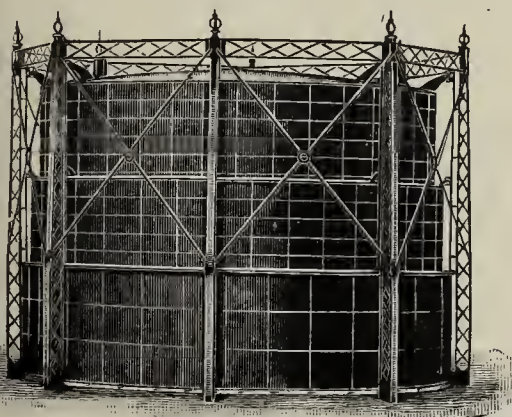
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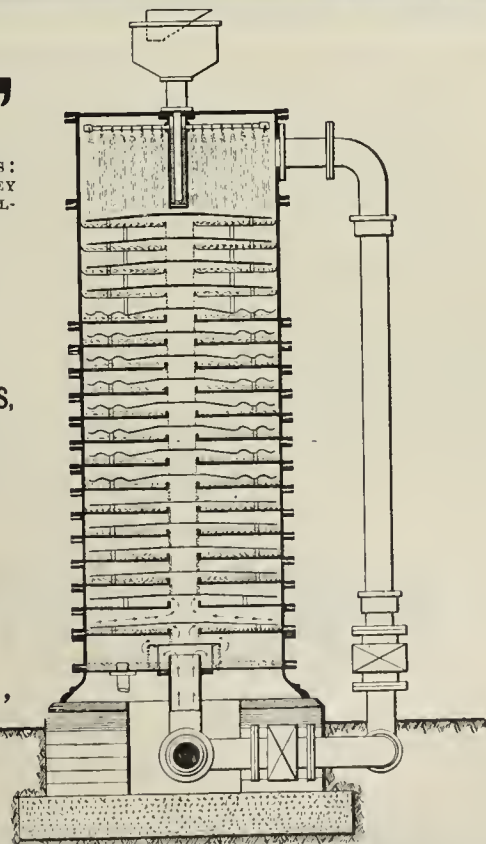
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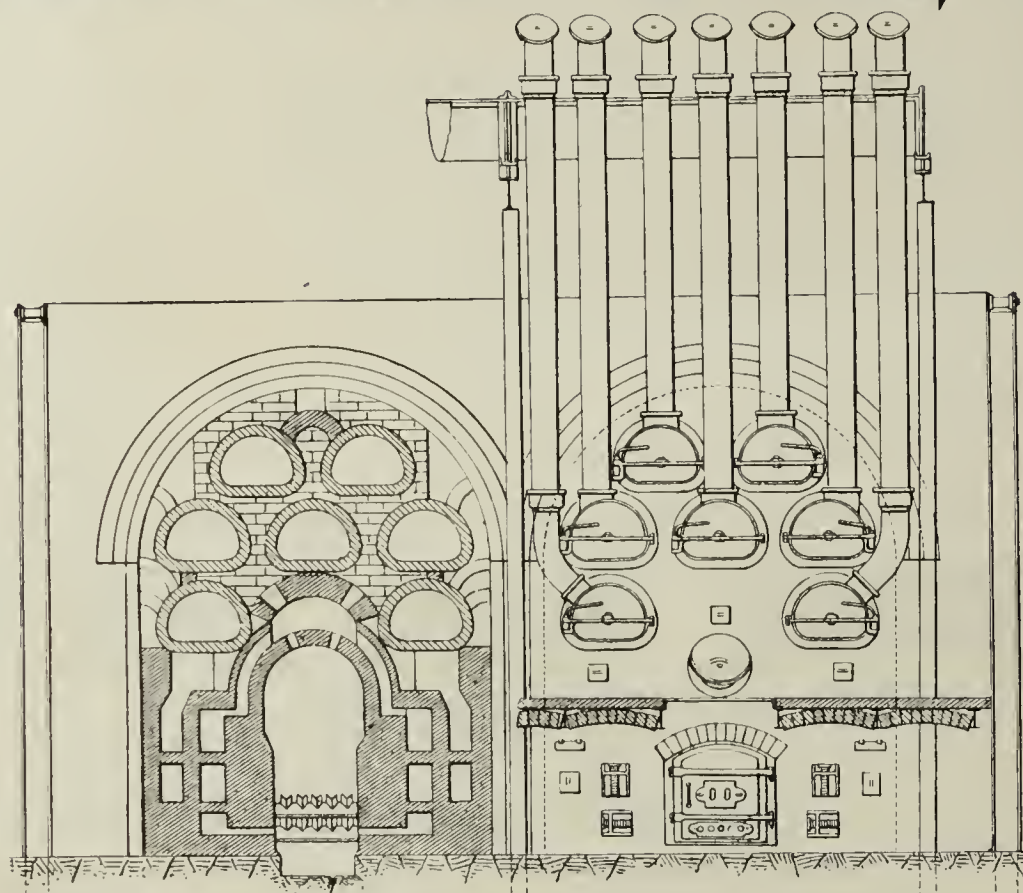
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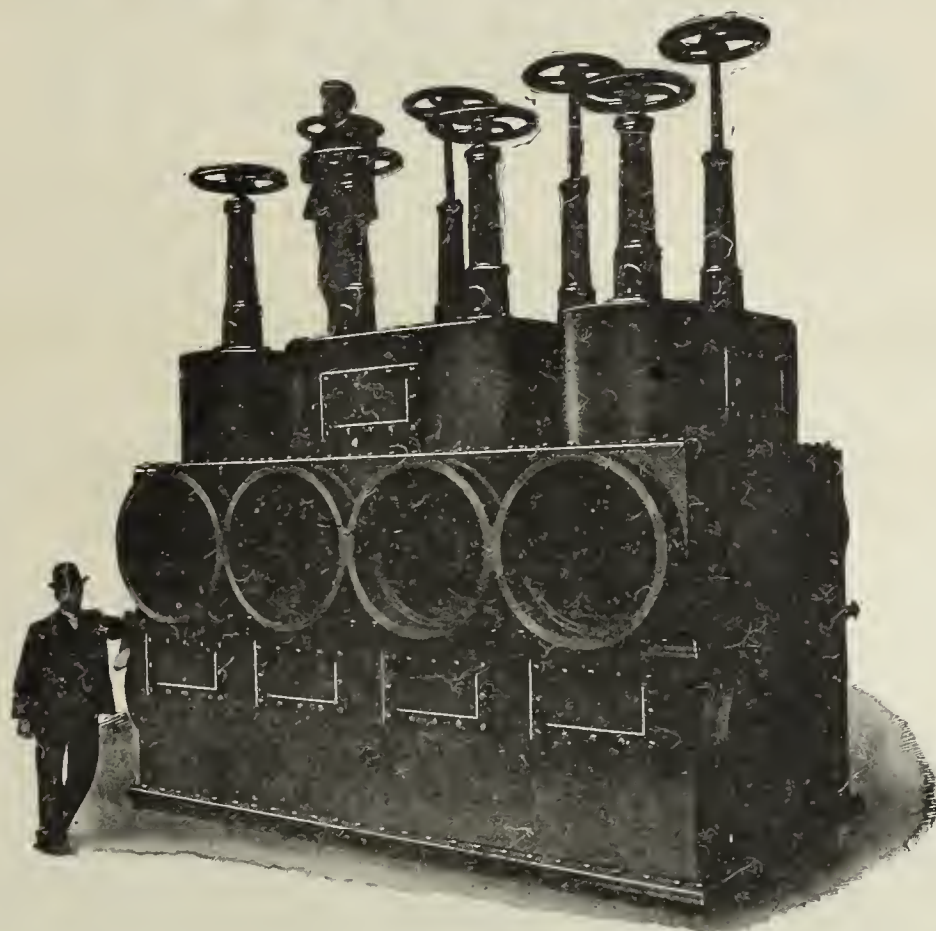
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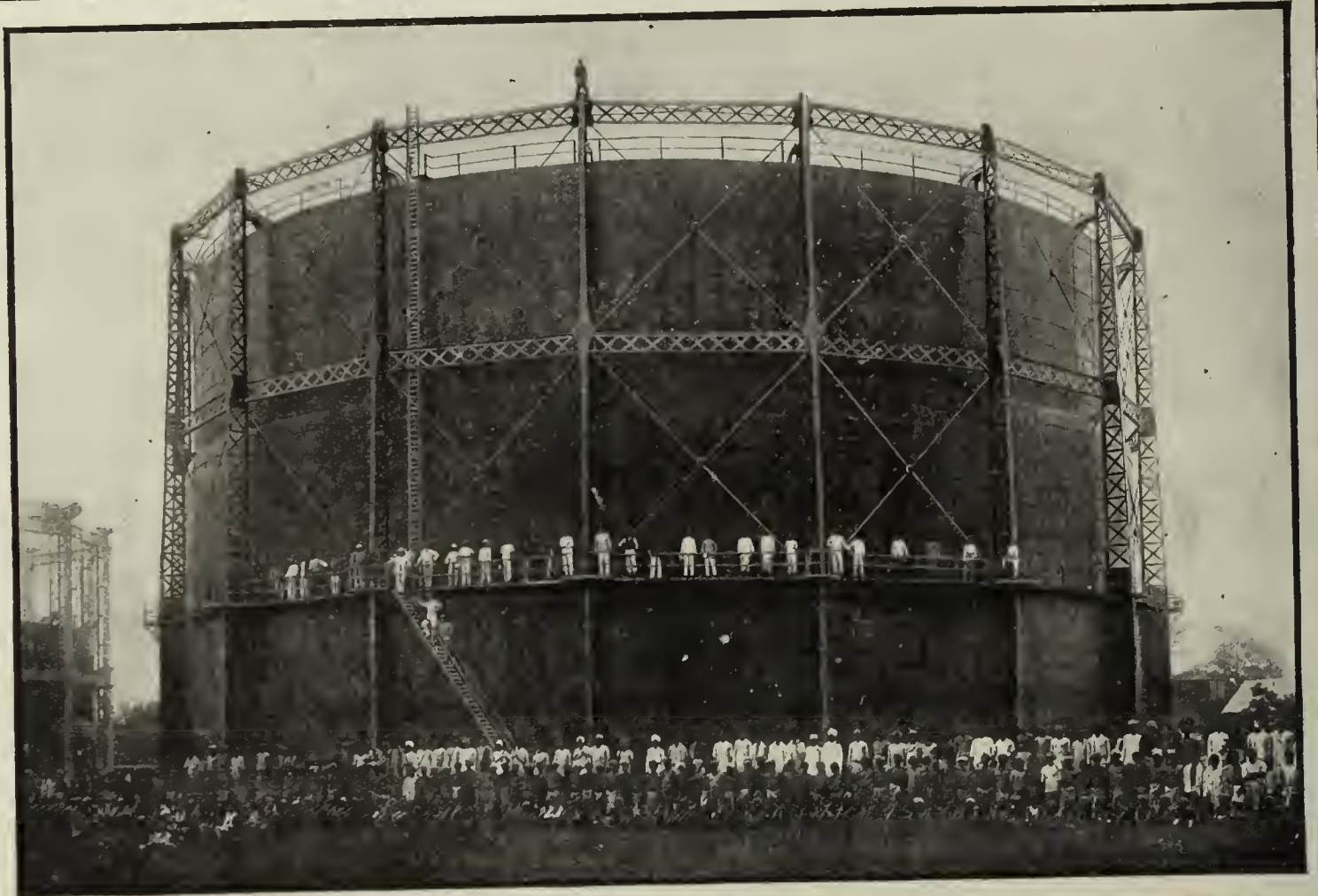
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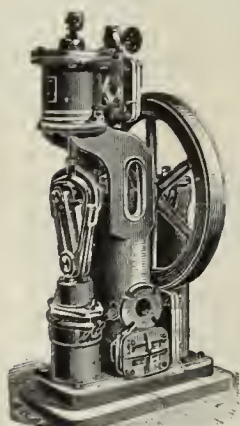


Fig. 705. "SINGLE RAM" STEAM-PUMP.

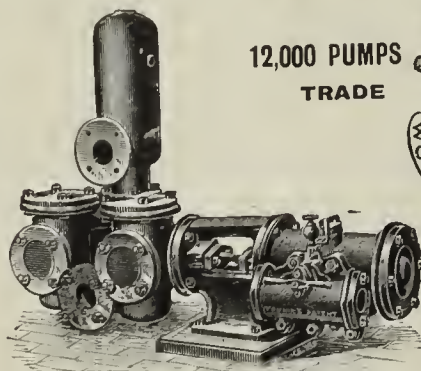


Fig. 598. "CORNISH" STEAM-PUMP FOR BOILER FEEDING, &c.

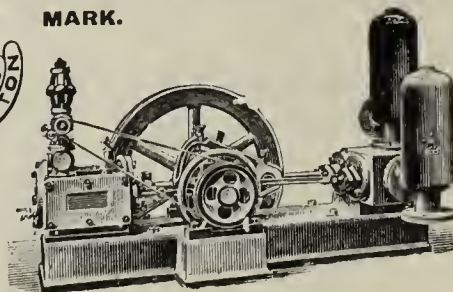


Fig. 685. "RELIABLE" STEAM PUMP FOR: TAR AND THICK FLUIDS.

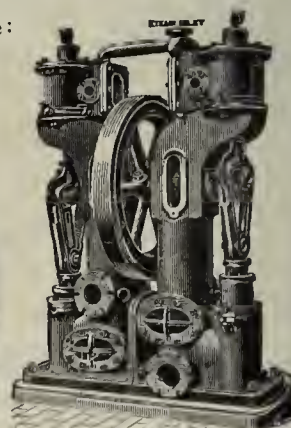


Fig. 712. "DOUBLE-RAM" STEAM-PUMP.

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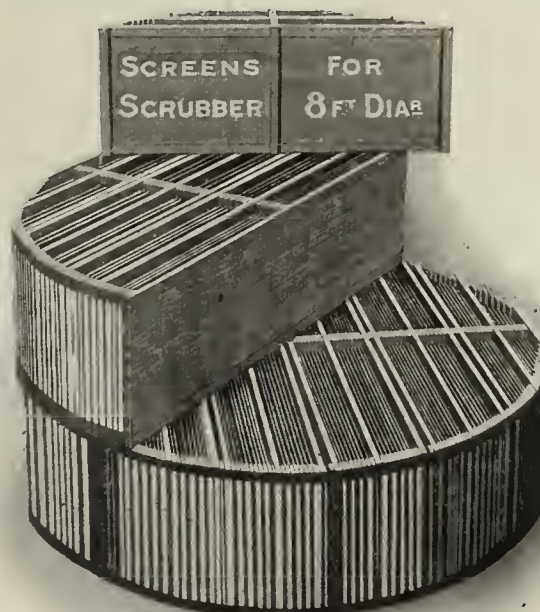
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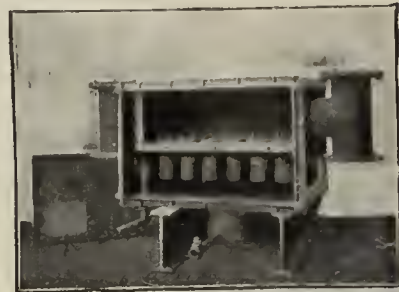
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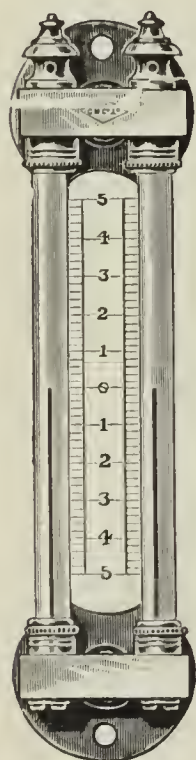
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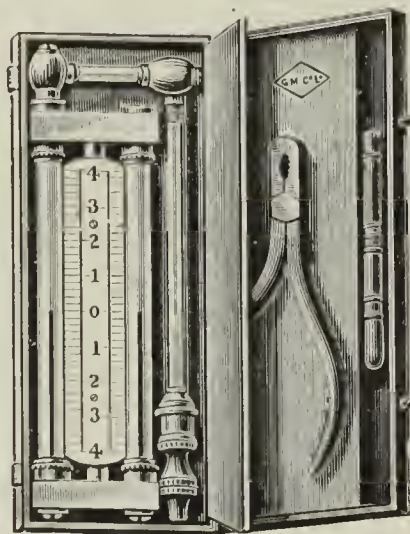
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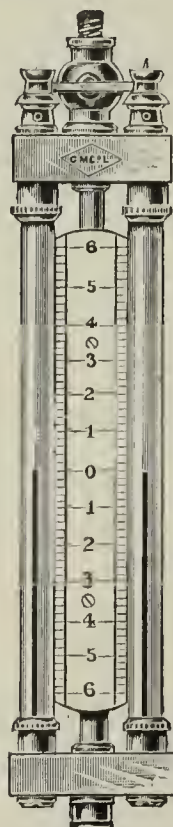
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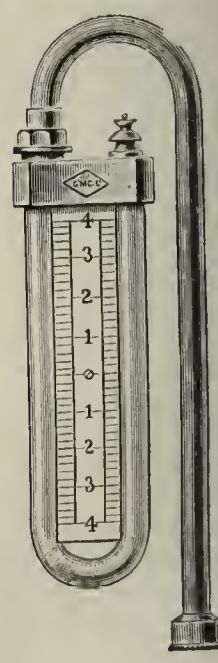
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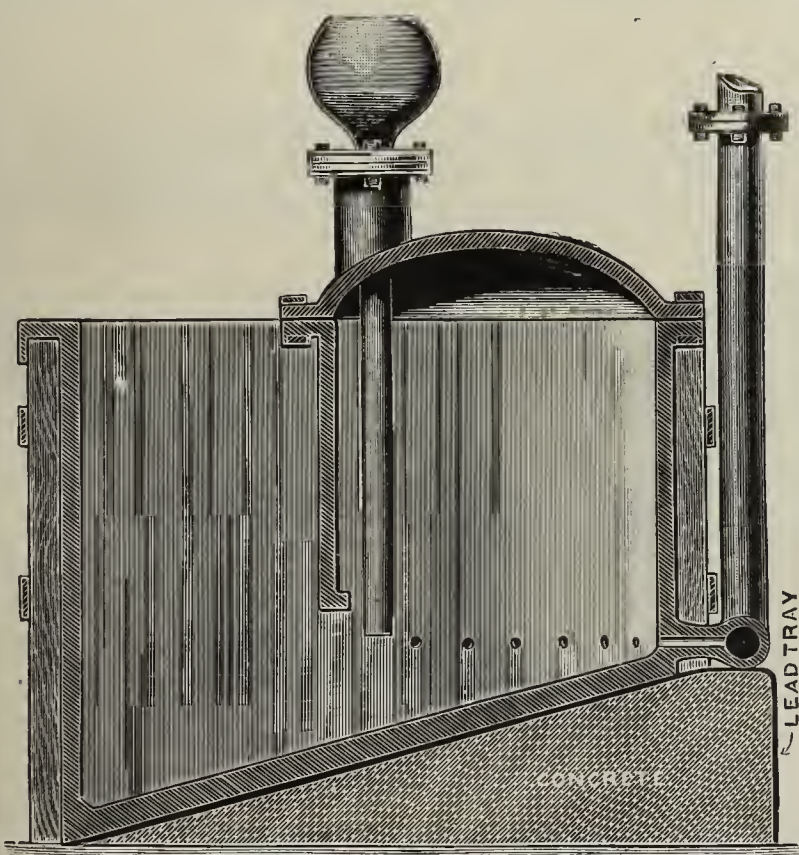
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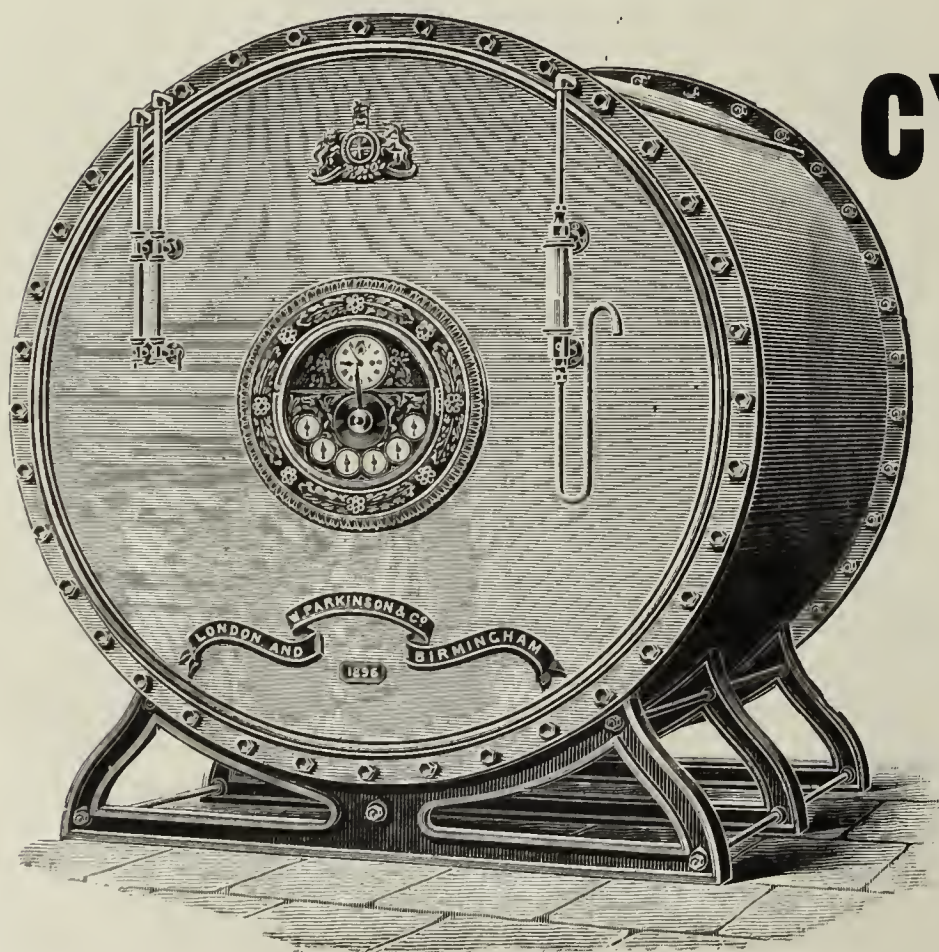
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JOURNAL OF GAS LIGHTING, WATER SUPPLY, &c.

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EDITORIAL NOTES—GAS, &c.

By Leaps and Bounds.

BETTER and better. The accounts of the Gaslight and Coke Company for the past half year will come as a surprise to many. They are the accounts of this Company that are pre-eminent in good qualities. The price of gas has been 1d. per 1000 cubic feet lower during the half year than in the first half of 1910; but business in every way has been good—in fact, there is not a single item, other than public lighting, on the income side of the revenue account—private gas consumption, meter, stove, and fittings rental, and the whole of the residuals—that does not show an increase. The result is that, although the redemption and insurance funds have been looked after liberally (the insurance fund under the Act of this session will soon be merged in a special purposes fund), the profit-balance is £25,979 more than twelve months since, the proprietors are to enjoy a dividend of £4 14s. 8d. per cent., compared with £4 13s. 4d., and the balance that will remain in hand will be £699,350, or an increase of £156,980. This is all excellent; and the balance of close upon £700,000 seems to us to throw the shadow of another coming event which will be much to the liking of both consumers and proprietors.

In these accounts we are on comparable lines again, as the whole of last year included operations in the West Ham area; so that the past six months are on straight terms with the first half of 1910. But the end of this year will see the level comparison again broken by the amalgamation with the Barking Company and the Chigwell, Loughton, and Woodford Company. However, sufficient for our present purpose is the fact that the past half year has a period with which it can compare under corresponding conditions. We look for the reasons for the extraordinarily good financial result of the half year. It is not to be found in any heavy savings in expenditure on revenue account. On the contrary, the total expenditure is £94,171 more. But it is found scattered in three directions. Firstly, in the excellent increase (notwithstanding the Coronation holidays) over the whole private gas business of the Company; secondly, in the fact that the half year has been a particularly good one for all residuals; and, thirdly, in the excellent working that has met such a big increase in business on such a comparatively small augmentation (bearing in mind that higher prices were paid) of the cost of raw materials.

Let us examine these matters in the sequence stated here. The increase in gas consumption was equal to $4\frac{3}{4}$ per cent., compared with $1\frac{3}{4}$ per cent. in the corresponding period of 1910, and 3 per cent. in the second half of the year. The actual amount of gas sold was 12,966,208,000 cubic feet, which is an increase of 590,834,000 cubic feet. The gas sold through private consumers' meters returned £1,577,532, which was an increase of £23,584, notwithstanding that the 1d. reduction in price on the private sale of gas in the half year is equal to no less than £52,127. It is true public lamps returned £6124 less; but this was due both to a reduction of charges and to the transfer of public lamps to electricity by municipal bodies owning electricity concerns. The result is that the £1,641,106 received for gas contributes to the increase of income in the half year—despite the heavy sum represented by the reduction—an amount of £17,461. We congratulate the Company upon the reward of their enterprise, and upon the activities of their sales department. The expansion of the basis of the gas business is attested by the items of meter, stove, and fittings rentals being all larger—the total of £181,920 being £15,304 more. This brings us to the residuals, which have, in the aggregate, increased by £78,629—making the total receipts under this head £527,405. The portents at the beginning of the year were that secondary products would continue to maintain the good positions that they then occupied; but we very much doubt whether the most sanguine expectations and calculations of the Board

of Directors placed the results at the figures the accounts disclose. The improvement ran right through the list. Of the increase, coke yielded its £49,204, breeze £4595, tar and tar products £12,094, and ammoniacal liquor and sulphate of ammonia £12,735. With rents and transfer fees, the total receipts of the half year amounted to £2,355,323, or an additional £111,054.

We have departed from the course customarily pursued in examining gas accounts, in order to accentuate the features that have contributed to this financially "fat" half year. We come next to an important tributary to the good fortunes of the Company. That is the gas-manufacturing department. As we have said, the expenditure on raw materials would not have been so high had the contract and market prices been the same as in the corresponding period of 1910. This is seen by the fact that, although so much more gas was made and sold, the quantity of coal carbonized only increased by 21,801 tons, to 944,580 tons; while the oil used actually decreased by 45,961 gallons, to 6,464,435 gallons. But the cost of coal (£609,388) was £46,895 more; oil (less the value of oil tar) cost £45,120, which was £13,987 less; while coke and breeze used in manufacture (£39,435) cost £4675 more. In other words, raw material cost £693,944—that is an increase of £37,584, to set against which, as already pointed out, residuals gave an additional £78,629. The total quantity of gas made was 14,246,984,000 cubic feet, which was an addition of no less than 725,899,000 cubic feet. But though less oil was used, of the total gas manufactured 2,981,879,000 cubic feet was carburetted water gas, which was an increase of 66,312,000 cubic feet. Now deducting carburetted water gas from the total gas made, we have a total production of 11,265,105,000 cubic feet of coal gas, which is equal to 11,926 cubic feet per ton of coal carbonized. The average production of gas per ton of coal carbonized for the whole of the year 1909 was 11,329 cubic feet; and for 1910, 11,732 cubic feet. The past half-year's working is thus an improvement on 1910 of about 200 cubic feet per ton, or on the total quantity of coal carbonized close upon 200 million cubic feet of gas.

Returning to the disbursements on revenue account, there are not many of the other items that claim notice. The total manufacturing costs amounted to £1,058,592, which is an advance of £96,481. But in addition to the extra cost of raw materials, a further £6000 was spent on purification; and the item of £237,895 for repairs and maintenance of works and plant is greater by £53,596. In the distribution department, we also have a change. The expenditure of £313,534 is actually less by £2565. The two most notable items in respect of alteration in amount in this relation are the repair and renewal of stoves (which cost upwards of £7000 more); but on the other hand, there is a diminution of about £10,000 on gas-fittings, including labour, in connection with prepayment meter supplies. Other changes are found in an addition of £6604 to rents, rates, and taxes; and workmen co-partners are receiving a larger sum. Last year there was a charge of £10,793 for retiring allowances, which has no corresponding representation this year. However, the total expenditure is £1,665,220, which is an increase of £94,171, and the balance to net revenue account is £690,102, which is an increase of £16,882. Adding the increase in expenditure and the addition to the balance together, we have the £111,000 odd by which the income of the half year advanced. It is the best record, taking the whole of the circumstances into consideration—especially the price of gas—of any half-year's working of the Company.

There is an interesting point about the capital account. The expenditure of the half year was £45,652. But the total expenditure after making this addition is reduced by £124,357—represented by the proceeds (£54,397) of the sale of surplus land, and by depreciation writings-off on meters and stoves. This is good financial administration. From this review, it will be seen that the Governor (Mr. Corbet Woodall) will have many good points for his address at the meeting of the proprietors next Friday.

Half-Year's Experiences in South London.

So far as the reports and accounts of working have come to hand for the past half year, the period has been generally an excellent trading one for gas companies—not only in the primary but in the secondary channels of business. The South Metropolitan Gas Company have (as is seen by the report and accounts that Mr. Charles Carpenter will have the pleasure of submitting to the proprietors to-morrow week) shared in the general good conditions. The past few years have seen the Company increasing their stability through changes in their internal operations, while outside, through what appear to have been purely transitory local conditions, the consumption of gas has been marking-time. The Chairman not long since told the proprietors that there were signs that pointed to the turning-point having arrived; and that he gauged the position faithfully is seen by the present accounts, in which the “not unsatisfactory” increase in consumption of 2.62 per cent. is shown. We are a little bit dubious as to the reason that induced the use of the term “not unsatisfactory,” instead of the less cumbrous one “satisfactory.” Whether it is due to modesty, or to a feeling that a percentage increase that is only little more than half the percentage representations of days long passed when the volume of consumption was not what it is to-day, or whether the employment of the words are precautionary, having an eye to the future, we cannot say. Whatever the reason, the fact remains that the expression “not unsatisfactory” may give some lay readers of the report the idea that, though the increase is not unsatisfactory, it is not far removed from being so. But when we look at the quantity of gas sold in the half-year—6,455,939,000 cubic feet, and find that it is 165,207,000 cubic feet in excess of what it was in the first six months of last year (representing too the carbonization, at 12,044 cubic feet per ton, of 13,716 tons of coal), there is a feeling, remembering the stagnant conditions of parts of South London in the past few years, that the increase in the gas business is a very satisfactory one.

Touching further on this increase in business, there is the interesting fact disclosed by the accounts that the whole of the increase took place during the Lady-day quarter, inasmuch as the total receipts for gas for the last six months (£686,497) marks an increase of £17,300, and the increase for the Ladyday quarter alone outstripped this sum by £84. As a matter of fact, the receipts for the Midsummer quarter show a decline of £650. This is a small sum, considering the largeness of the quarter's receipts (£274,783), and the atmospheric conditions and long daylight hours in the latter part of the quarter. On the other hand, public lighting receipts rose by £566. In passing, it is observed that the street lamps advanced in number by 430 (to 24,329), which speaks of the continued preference of the South London local authorities for economy, reliability, and general efficiency in their public lighting systems. Elsewhere, again, there is found concrete evidence of the expansion of the base of business. The number of the Company's meters in use has, in comparison with a year since, increased by 7449 (to 349,289), of cooking-stoves by 8139 (to 285,983), of gas-fires by 3281 (to 29,231). These latter figures would be considerably raised if a census were taken of the private gas-fires and cookers in use. It will also soon be interesting if the number of connections for water heating is published. Going further it is seen that the rentals of meters, stoves, and fittings have increased, by £2130 (to £111,912). All this is extremely gratifying, as proving the vitality of the gas business in South London.

The Directors of the Company, as must all large users of coal, view with considerable anxiety the continued unsettled labour conditions in the coal trade; one of the disturbing indications of unrest being the recent vote in Northumberland calling upon the Miners' Federation to declare a national strike against the working of the eight-hour shift system. The piece of legislation that committed labour operations in coal mining to a form of statutory tight-lacing, and, it would seem, to perennial disturbance, must begin to be regarded as unfortunate even by those who, looking through party spectacles, have endeavoured to persuade themselves and others that all differences aroused by it would soon be composed. Final composure appears to be as far off as ever. Apart from market conditions, the Directors have given us another point of interest in connection with coal; and we hope they will continue to do so. In the revenue account, the item as to the cost of coal in the half year—£336,140—is accompanied by the note that a sum of £2713

for London port and tonnage dues is here included. Twelve months ago, the Directors remarked in their report that “the Port of London Bill, when it passes, will entail “another hardship on the users of gas produced from sea-borne coal;” and the figures now disclosed indicate that, under present circumstances, for South London gas consumers alone, the port and tonnage dues (on coal without considering other materials) will represent something like £6000 a year. Compared with the first half of last year, the increased cost of coal is £14,181, or deducting the amount of the port and tonnage dues, £11,468. The quantity of coal carbonized in the half year was 548,328 tons, which is an increase of 3366 tons; but when this is set in contrast with the increased production of 162,609,000 cubic feet of gas (upon a make of 6,604,125,000 cubic feet) and the reduction of carbonizing wages from £44,480 to £43,927—more coal handled, more gas put into the holders, and a reduction in carbonizing wages of £553—it is seen that there is good cause to compliment officers and men in the carbonizing department upon a profitable half-year's working. The average production of gas per ton in the half year is the highest on record for the Company—12,044 cubic feet, compared with 11,923 cubic feet as the average of the whole of 1910. The yield of ammonia, too, was higher; and the quality of coke and tar also improved. But speaking of these carbonizing achievements, and the additional tax represented by the port and tonnage dues (from which the Company do not derive any advantage other than the hypothetical benefit to London generally), we are reminded of a point in almost the last speech delivered by Sir George Livesey to the proprietors. He deplored the fact that such a large proportion of the financial improvement derived from their efforts within their works and supply area was abrogated by the additional expenses imposed by conditions over which the Company have no control, and in connection with which they have little voice. However, in considering the net cost of coal, it is seen that the residual markets have been favourably inclined to the Company, as to most sellers, during the half year. From various sources, the Company derived an additional £35,986; the total income for bye-products having been £280,800. To the increase, coke contributed £28,528, tar and tar products £3390, and ammoniacal liquor and sulphate of ammonia £4257—breeze alone being down by £189.

Taking a hasty survey of other points in the revenue account. It is observed that the total expenditure amounted to £838,414—an increase of £32,980. The extra cost of coal has been mentioned; £12,481 more has been spent on purification; but repairs and maintenance of works (£110,163) is less by £13,741, which appears to indicate that some of the heavy work involved in reorganizing the carbonizing operations is now easing off. In the result, the total manufacturing expenses—£531,437—exhibit an increase of £12,949. Among the employee co-partners nearly £2000 more has been distributed for the past year. In the distribution department, the outlay of £172,795 is an advance of £11,439—ordinary increments and decrements in the various channels of repair and renewal accounting for this. Expenditure on public lamps has dropped to £1850—a reduction of £3210, suggesting that the rate of conversion of public lamps to the inverted system is slowing-down. Cognate to this is the satisfactory statement of the Directors that ere long all the important shopping thoroughfares of South London will have their examples of parade lighting by high-pressure lamps, which now stand pre-eminent as the means of outdoor illumination. The item of rates and taxes has ascended by £7551 to £55,379. There is nothing else of importance on the expenditure side, beyond a footnote which gives the information that as wage payers the Company (notwithstanding the few hundreds decrease in carbonizing wages) are on the up-grade. Salaries for the half year amounted to £40,601—an increase of £2050, as compared with the first half of 1910. Wages amounted to £282,209—representing the substantial increase of £22,141. Finally, the total receipts having amounted to £1,080,794, or an advance of £55,475, and the expenditure having totalled to £838,414, or an increase of £32,980, the balance of £242,379 carried to net revenue account shows an increase of £22,495. The balance enables the payment of the same excellent dividend at the rate of £5 9s. 4d. per cent. (the price of gas being 2s. 2d.), and there will remain a surplus in hand of £34,371, which is £21,439 better than a twelve-month since. The Company's position is a very strong and healthy one.

Effects of Variation of Atmospheric

Conditions in Photometer Rooms.

THE Photometric Commission has been meeting at Zurich during the past week; but, in the main, the proceedings were in the nature of conference on matters of detail, and, consequently, our *résumé* of what occurred is somewhat shorter on this occasion. At the same time, there are parts of the proceedings which, in the interests of technical knowledge, and as showing that solid work is being conducted in connection with the Commission, it has been deemed desirable to publish. A commencement is made with the publication this week; and probably the completion will appear in our next issue.

It will have been observed from our pages last week that Dr. Harold G. Colman and Mr. W. J. A. Butterfield have been to the conference as the delegates this time of the Gas Institution in place of Mr. James W. Helps and Mr. Charles Carpenter, who, for dissimilar reasons, were unable to attend. Mr. Butterfield has been from the very outset a close follower of the proceedings and work of the delegates; and he did not go among them as a stranger. Furthermore, he was the bearer of a communication to the Commission from (jointly) himself, Dr. J. S. Haldane, and Mr. A. P. Trotter—a photometric coalition that it would be hard to beat. The subject of the contribution had reference to the effects of variations in atmospheric conditions upon photometric flame standards.

It is a matter that has been studied of late years with aspirations and efforts set more or less towards accuracy; but the conditions under which inquiries have usually been conducted have of themselves contributed to somewhat erratic results. The authors of the paper before us recognize this in the introductory lines. They remark that the effects of variation of the pressure, degree of humidity, and vitiation (deficiency of oxygen and excess of carbon dioxide) of the atmosphere on the luminous intensity of flames cannot be determined from the variations naturally occurring in an ordinary photometric testing-room, except, perhaps, by deduction from the data obtained in a prolonged series of observations made with exceptional care concurrently with extremely accurate determinations of the composition of the air. The authors, however, have been enabled to carry out an investigation into the question of these effects in a chamber in which one set of conditions could be varied at will to any reasonable desired degree, almost or wholly independently of the other two sets of conditions—that is to say, pressure, humidity, or vitiation could be separately varied to any extent with little or no effect upon the other two conditions. Under such circumstances, the authors were enabled, by being in possession of the means of accurate control, to produce trustworthy results.

This, however, is one of those inquiries that, on early acquaintance, debar criticism or comment, primarily through investigation having been conducted on unique lines. Moreover, caution is needful when men of the repute in scientific research of the authors both, in conference, conduct the investigation and put forward the results. Under the circumstances, we will merely give further expression to some of the results found by the authors, by relieving those results of the explanatory and other detail found in the paper. The objective of the investigation was to establish the corrections applicable to the Harcourt pentane ten-candle lamp, when the atmospheric conditions were other than normal. While on the work, the inquiry was extended to the Hefner amyl-acetate lamp; and a few observations were also made on the "Metropolitan" argand No. 2 burner. In the pressure observations, the range of variation was from about 450 to 1000 m.m. (from about $17\frac{3}{4}$ to $39\frac{1}{2}$ inches.) Among the lessons derived is that the relation between atmospheric pressure and the yield of light is not constant; the falling off in the light with reduction of pressure being much greater at the lower than the higher pressures. It is shown that the curve for the Harcourt lamp is nearly a straight line for the range of 700 to 850 m.m., and that, within these limits, the light increases or decreases by 1 per cent. with an increase or decrease respectively in pressure of 12.5 m.m., or that a variation of 10 m.m. in pressure is attended by a variation in the same sense of 0.8 per cent. in the light afforded by the lamp. The same straight line is obtained within the same range for the Hefner lamp; and within these limits, the light increases or decreases by 1 per cent. with an increase or decrease respectively in pressure of 25 m.m., or a variation of 10 m.m. in pressure is attended by a variation

in the same sense of 0.4 per cent. in the light afforded by the lamp—in other words, in the neighbourhood of normal, variation of pressure has only half the effect on the light of the Hefner lamp which it has on that of the Harcourt. In carrying out these tests, the authors made corrections for both aqueous vapour and carbon dioxide in the air, in order to eliminate their effect; and, this being so, they submit that their figure of 0.4 should now be accepted in preference to Liebenthal's 0.1 per cent. for the effect on the light of the Hefner lamp of a change of 10 m.m. in barometric pressure, inasmuch as Liebenthal did not make any correction for the proportion of carbon dioxide in the air.

Concerning the investigations into atmospheric humidity, the results show that the light of both the Harcourt and the Hefner lamps decreases by 1 per cent. for an increase of 0.16 per cent. in the aqueous vapour in the air, or that an increase of 1 per cent. in the aqueous vapour in the air is attended by a decrease of 6.25 per cent. in the light of the lamps. Regarding the work done to determine the effect on the light afforded by flames of different degrees of vitiation of the atmosphere, trials were made on air vitiated partially by breathing and partially by the combustion of pentane or illuminating gas. As a result, it was found that 1 per cent. decrease in the light of the Harcourt lamp was caused when approximately 0.35 per cent. of carbon dioxide was present in the air, and in the light of the Hefner lamp when 0.045 per cent. was present. Or the presence of 0.01 per cent. of carbon dioxide in the air was attended by a reduction of 0.29 per cent. in the light of the Harcourt, or of 0.22 per cent. in the light of the Hefner lamp. The diminution in light, it appears, is fairly uniformly proportional to the increase in the amount of carbon dioxide, up to about 2 per cent. of the latter.

Without going farther into the paper, it will be conceded by all photometrists that the joint work of Messrs. Butterfield, Haldane, and Trotter will be exceedingly valuable, in carrying out precise photometrical work; and not the least valuable of subsidiary effects must be the curbing of the animosity against flame standards that has had a tendency to grow especially in electrical circles, owing to the exaggerated effects attributed to atmospherical variations. The results referred to above, as well as others in the paper (which we reproduce), indicate that "small variations in the atmospheric conditions of a gas-testing room will not appreciably affect the results of photometric comparisons in which the Harcourt or Hefner lamp is used as the standard of light; and that these standards will give as accurate results as are, anyhow, practically obtainable in determinations of the illuminating power of gas if they are used in all ordinary circumstances without correction for any divergence from normal atmospheric conditions. In other circumstances, however, as in the testing of electric lamps by a flame standard, corrections are called for."

First Joint Public Lighting Contract.

THE first joint contract for public lighting the parties to which are a Gas Company and an Electric Supply Company who are customarily in opposition has been (as will be seen in our news columns) finally accepted by the Holborn Borough Council. It has been a long lane to this consummation; but, like most lanes, it has an end, and the end is in this joint contract, under which it is hoped all parties will be happy and contented. The joint contractors are the Gaslight and Coke Company and the Metropolitan Electric Supply Company. Whether what they have done will lead the way in this matter remains to be seen; but we are rather hoping that a similar set of conditions will not arise under which recourse to such a proceeding will be necessary. We prefer in competition a fair field and no favour—straight competition, and the contract awarded to the tenderer who can give the best value in requisite efficiency for the least money. We should not like such joint contracts to become the rule under all circumstances.

But there is a set of conditions with which the Gaslight and Coke Company and the Metropolitan Electric Supply Company have shown how to deal by uniting forces. Such a set of conditions arose in Holborn through the procedure adopted by the Borough Council in dealing with the question of a public lighting contract, and through the onerous conditions that it was proposed to impose. If local authorities use their position, in the mistaken belief that they are acting justly and wisely in the interests of the ratepayers, to force competing contractors who have the monopoly of

their respective commodities into a situation in which no profit can attach to their service, or to attempt to compel the acceptance of a contract lined with unreasonable stipulation, then they must expect that, if the competitors are prudent, they will unite, and offer the resistance that is to be so obtained. There are occasions when it is a discreet thing to do what would not be contemplated under other circumstances; and this is one of them. At the same time, let us point out that the amalgamation of the competitors in the case of Holborn has not put them into any inimical antagonism to the Borough Council. The Council quite saw that the Companies could not continue competing without sacrificing all commercial interest in the matter. The Council also appreciated that the dictation of terms no longer rested solely with the Council, but that the Companies by their action had brought about a position from which a bargain could emerge to the mutual benefit of all. It was, under the circumstances, a wise arrangement.

Dust Impressions.

THE fairly wet summers of the past five years have not done much in making the advantages of the tar-surfacing of roads so manifest to the general public as has been the case this year. The recent hot dry weather and the increase in motor car traffic have together assisted in impressing, and that deeply, on the public mind that surface tarring is an effective means of alleviating a nuisance that is distressing alike to pedestrians and to householders whose residences border main roads. People who are fortunate enough to live in houses facing roads that have been tar-treated have, during the past few weeks, found excellent reason to be grateful for the discovery of the binding and protective power of a coating of tar. While those who live in houses facing roads that have not been treated, and the surfaces of which roads have become thickly coated with a fine dust caused by the long unbroken run of scorching heat and the tritulating effects of fast moving motor cars have begun to clamour loudly for the relief that others enjoy. We cannot blame them.

Quite near London, we have seen residential thoroughfares the last few weeks, through which fast-moving cars frequently pass, along which it is often impossible during a day to penetrate by the eyes the dust-befogged atmosphere. The residents in these roads (heavy contributors though they be to the expense of maintaining the neighbourhood) have been quite unable during these sweltering days to, through the clouds of dust, keep open any of the windows facing the roadway. Only the other day, an Alderman at the meeting of the East Sussex County Council, put the truth briefly and forcibly when he said that, where tarring was not done, and where motors ran with full force over dusty roads, life was not worth living. The experiences of this year, however, will undoubtedly bring more pressure to bear upon the road authorities concerned. It is not a question now with the authorities of an unremunerative expenditure on tarring. Experience has taught them how tar-spraying can be expeditiously and economically performed; it has proved, too, that the use of tar on roads is a paying proposition, from the standpoint of profitable economies apart from the abating of an increasing nuisance. The authorities have done much in the way of producing alleviation; public and practical considerations demand that they shall do still more. In our opinion, judging from reports that have come under notice, the heat of the past few weeks, in addition to having helped to create much dust, will also have contributed to enforcing the lesson that there is still much more to be done in utilizing tar for the protection of humanity and for the better preservation of roadways.

Publicity Supporters.

At the request of the Publicity and Special Purposes Committee, we are to-day publishing a list of the promises of support to date to the scheme. But this list, it is hoped, is only in the nature of a preliminary one, and that it will be considerably extended by the names of those Companies and Local Authorities who still have the matter under consideration, and those who have deferred decision for various reasons. It is pleasing to learn that the position is now sufficiently secured to warrant the Committee taking the next step in furtherance of the scheme; and therefore it has been decided to have a conference of the supporters on Oct. 12 to constitute the governing body and appoint an Executive Committee. This is looking well ahead. But the

Committee want this conference to be fully representative of the supporters, and of all who are interested in any way in the scheme, and to ensure this, it is advisable to first see the end of the summer holiday season. It is hoped that the conference will find the list of supporters substantially lengthened. When we come to look down the list of the supporters already enrolled, and consider the administrative power that it represents in the gas industry, it shows an endorsement of the movement that renders it altogether unnecessary to further argue the matter. The list is the best argument that at this stage can be presented to the portion of the gas industry still outstanding.

The List Examined.

The total number of Companies and Local Authorities included in the list is 176, or if we count the concerns represented by the British Gaslight Company and the Devon Gas Association individually, the total will be 184. Seeing that there are 794 statutory concerns mentioned in the last Board of Trade returns, and that there are a few hundred non-statutory ones in the country (the list only including a few), there are several hundred more undertakings the managements of which may be assured of a hearty welcome among those who have so far entered into this progressive movement. It is found that there are in the list 159 Companies and private owners represented, and only 17 Local Authorities. But when the other 280 (or thereabouts) gas-owning local authorities investigate the names and position of those who are subscribing, it is to be hoped that a stimulating effect will be the result. Geographically examined, it is found that 158 of the supporting undertakings are situated in England and Wales, 12 in Scotland, 5 in Ireland, and Australia, it is gratifying to record, is giving its adhesion in and through the Metropolitan Gas Company of Melbourne. It will also be remarked that the three London Companies are enrolled among the subscribers. It is computed (a few more millions would have to be added if the Board of Trade returns were available to December last for Companies and March for Local Authorities) that the sale of gas represented by the present list of supporters is approximately 108,327 million cubic feet, divided among the Companies and Local Authorities as follows: Companies, 82,225 million cubic feet; Local Authorities, 26,102 million cubic feet. The sale of gas of the 794 statutory concerns quoted in the last issued Board of Trade returns was about 177,686 million cubic feet.

Manchester and Publicity.

The next best item of news that we have to give the gas industry this week in connection with the same matter is that the Manchester Corporation Gas Committee, subject to ratification by the Council, have resolved to contribute to the scheme on the basis of 2s. 6d. per million cubic feet of gas sold, subject to Manchester being satisfactorily represented on the Committee administering the fund. The influence of this decision, combined with that of Salford, should be of immense value in hastening similar resolve among municipal gas undertakings generally, and among the numerous ones of Lancashire and Yorkshire particularly. When such a hard-headed veteran municipal gas administrator as Alderman Gibson gives his support to a scheme of this kind, and leads (by the aid of the Chief Engineer of the Department, Mr. J. G. Newbigging) his colleagues to see the wisdom of the proposal, this is in itself a substantial answer to the critics who are contented with things as they see them, and who advise a *laissez aller* policy. It is right that such a gas undertaking as that of the Manchester Corporation should take its correct position in the forefront of all movement that has for its object the progress of the industry, and the development of the services the industry can render to the community. The endorsement of the Manchester Corporation will, with confidence, be sought tomorrow. Meanwhile, the progressive section of the gas industry will be highly gratified with the adherence to the movement of so powerful a body as the Manchester Gas Committee.

Public Lighting in the City.

The report of Mr. Frank Sumner, M.Inst.C.E., the City Engineer, is of interest in more senses than one. It shows the extensive character of the experimental work in street lighting that has been undertaken in the City; and it also indicates the bold struggle, without regard to cost, that the Electric Supply Companies have been, and are, making to stop the growth in public favour of high-pressure gas lighting by inverted burners

for street illumination. The Electric Companies have adopted the policy of lavish display to produce a win in the City, the Corporation of which, it will be recollected, were advised, by a deputation of their own number, that "high-pressure incandescent gas-lamps, with inverted burners, should be adopted as the illuminant, but where gas is impracticable, electricity with open arc and flame arc lamps should be installed." Since that report was made, the march forward of high-pressure lighting has proceeded. Most of the City Fathers have no doubt seen what has been accomplished in Westminster and in the grounds of the Crystal Palace. If not, they will do well (for personal information purposes) to make inspection in both quarters. Turning to other parts of Mr. Sumner's report, it is seen that during last year 2659 gas-lamps, high and low pressure (ordinary and experimental), were in use in the City; and that throughout the year, with all these lamps, there were only 42 failures, and 1721 feeble lights—"feeble lights" being a very different matter from total extinction. In the case of only 460 electric lamps (mostly arcs), there were 89 defective lamps. Nine of them were in connection with experimental lighting. But for 80 of the "failures"—not "feeble lights," but "failures"—the City of London Electric Light Company had to pay £14 14s. 11d. Another point is that for special lighting on 27 foggy occasions, 450, or thereabouts, electric lamps (36 of which were metallic filaments) cost £108 12s. 11d., or, on an average, £4 per fog, while the 2659 gas-lamps, on 34 days, cost only £200 9s. 9d., or an average of £5 17s. 6d. per fog. The difference in the number of lamps and days will be noted when considering these figures.

Income-Tax and Depreciation.

From statements appearing in our news columns to-day, it will be remarked that the tussle over the question of allowance for depreciation in respect of income-tax is a long way from being at an end. Percentage deductions continue to be made on appeal—in three fresh cases reported, the Special Commissioners have allowed 2 per cent. on the value of gasholders and 5 per cent. on all other plant, including stoves and meters. But the representative of the Crown in these cases is dissatisfied with the decision of the Commissioners; and there is every appearance of further contest over the point as to whether meters and stoves are machinery and plant within the meaning of the Act. That is an important matter for gas undertakings, in view of the heavy expenditure upon the repair and upkeep of these appliances; and careful watch will have to be continued, in order to defeat any further attempt to subvert a very just claim. Another question of equal importance has arisen in connection with the Merthyr Tydvil Gas Company. The circumstances are set out clearly in the communication that we publish on the subject. The case serves to enforce the lesson that gas undertakings must not wait until plant is worn out, or has become obsolete, before claiming a deduction for depreciation, but must insist on their legal right to an annual allowance in view of the inevitable time when replacement will have to take place. The Merthyr Company's unfortunate experience, though regrettable, will be of present and future value to them and all other gas undertakings.

Gas Workers and National Insurance.

Since the conclusive statement that Mr. Charles Carpenter addressed to the Daily Press (*ante* pp. 91, 120), showing that the employees of the South Metropolitan Gas Company would be worse off under the terms of contribution and benefit of the National Insurance Bill than they are under their existing sick fund, the matter has publicly dropped out of sight, but there is activity behind the scenes for trying to obtain for gas companies, with sick funds equal or superior to the national scheme, the same exception proposed for local authorities, "where the Insurance Commissioners certify that the terms of the employment are such as to secure provision in respect of sickness and disablement on the whole not less favourable than the corresponding benefits conferred by the Act." This is a matter to which we called attention on the original publication of the Bill, and again on the 11th ult. The existence of the movement is seen in the report of the Directors of the South Suburban Gas Company, as signed by Mr. Charles Hunt, the Chairman. Succeeding reference to the fact that the Bill affects the interests of the Company's employees (who receive from the sick fund, which was established in the year 1880, greater benefits for smaller contributions

than are proposed by the Bill) is the remark that "endeavours are being made to secure autonomy for this and similar sick funds by excepting them from the operations of the Bill, as already conditionally provided in the case of employment under the Crown or any local or public authority." We are glad to hear of this movement, notwithstanding that there is a prospect (there is no certainty about it yet) of the Insurance Bill, through the large amount of opposition, being dropped for this session in its present shape, and revived in revised substance and form next session. The more that the Labour Party look into the measure, the more defective they find it. The more most people look into it (though agreeing with the principles on which it is based), the more they find it a crudely constructed scheme, without regard for all the interests involved, and with administrative machinery that will be most expensive to run. Most gas companies are doing more for their men than is contemplated by the scheme, and yet on more economical lines. While this is so, so far as those gas companies are concerned, the national scheme stands condemned as inferior. Since the foregoing was written, the half-yearly report of the South Metropolitan Gas Company has come to hand. The closing words are: "The provisions of the National Insurance Bill so adversely affect them [the employees] that they are endeavouring to obtain the same principle of exemption for the Company's sick fund (which has been in existence since 1842, and has been of great benefit to all concerned) as was accorded in the case of the Workmen's Compensation Acts."

Compensation Law.

The House of Lords have settled one more interesting point in connection with the administration of the Workmen's Compensation Act; and it may be useful, for future guidance, to briefly put the facts on record here. A miner died as the result of an accident arising out of his work; and the employers were ordered by the County Court Judge to pay a sum of £263 to the dependants of the deceased. He further declared that the whole of this amount should be apportioned to the widow. The deceased, however, was married in 1881; and seven years later his wife left him, taking the four children of the marriage with her. Since that time she had never lived with her husband or seen him; and she had not received any communication or support from him. There was not even evidence that she had made application to him for support, or was wishful to return to him; and at the date of the accident she was earning her living as a housekeeper. The employers therefore denied that she was a dependant upon the husband's earnings at the time of his death. But the County Court Judge held, on the facts, that there had been no abandonment of her rights by the widow; and on the ground of partial dependency he awarded her compensation. The Court of Appeal upheld the County Court Judge's view; but the House of Lords unanimously reversed this judgment. Lord Atkinson said (as reported in "The Times") he could not conceive how any reasonable man could, on the evidence, come to the conclusion that the deceased had maintained his wife wholly or in part, or that there was any probability that he would ever do so, either voluntarily or under compulsion. She had reared her children; and they had been married, and placed out in life. It might be that her husband was in law bound to maintain her; but it was by the discharge of this obligation, not by its mere existence in law, that a husband supported and maintained his wife. The pecuniary loss to the widow by reason of the cessation of her husband's power to earn money was *nil*; and if this were so, the award of the arbitrator, in its results, defeated the object and intention of the Statute. Of course, the existence of the obligation, the probability that it would be discharged either voluntarily or under compulsion—the probability that the wife would ever enforce her right if the obligation were not discharged voluntarily—were proper matters to be considered by the arbitrator in determining whether or not the wife, at the time of her husband's death, looked to his earnings for her maintenance and support in whole or in part.

Municipal Income-Tax.

By a majority, the Court of Appeal have reversed a judgment of Mr. Justice Hamilton in the King's Bench Division, who upheld a decision of the Income-Tax Commissioners of importance to municipal authorities. The Corporation appealed (the

case being a test one, in which the appellants were supported by other corporations) against the assessing to income-tax by the Commissioners of a sum of £78,000, on which the Corporation contended that the tax had already been paid by their various municipal undertakings. It was admitted that the question was of a complicated character, and raised difficult points; and it came before the King's Bench Division in the form of a special case, stated by the Income-Tax Commissioners for the opinion of the Court. The facts, as stated at the time, were that, by the Corporation Act of 1901, the loans obtained previously were gathered into one department, and the interest and capital charges of all loans were put into one pocket and charged *pari passu* to the revenue of the Corporation. To pay all the interest on the loans, the Corporation required in the year in question (the twelve months ending April 5, 1903) a sum of £285,000. This was paid, and the income-tax thereon was deducted from the amounts due to the stockholders. From the water-works, gas-works, tramways, electricity works, city fund, and consolidated fund, the Corporation received £270,000, derived from taxable property of different kinds; and upon the whole of this amount tax had been paid by the Corporation. In his judgment, Mr. Justice Hamilton remarked that, there being an aggregate excess of £78,000 in respect of water-works, gas-works, tramways, and city fund, it was contended by the Corporation that to this extent they were entitled to retain these deductions by way of income-tax which they had made as against their stockholders, because they were entitled to claim that, in the contemplation of the law, they had paid, or might have paid, interest, on the other part of the undertakings, by the application of what he might call the borough rate undertaking excesses to that purpose, and, having paid the income-tax already on this £78,000, as part of their total taxable income of £270,000, it would be calling upon them to pay the tax twice over on the same sum if they were not entitled to claim to retain the several sums deducted from stockholders on this amount, and to assert that the interest on the amount had been paid out of the surpluses that amounted to this sum in the aggregate. He held that the claim to treat the fund paid over to the stockholders as having already borne a charge failed, as did the contention that the Crown was claiming income-tax twice over on the same sum.

Judgment of the Court of Appeal.

It was this view of the matter that was appealed against; and, in the course of his judgment, the Master of the Rolls said the question really was whether the Leeds Corporation could apply the profits from one municipal undertaking to the payment of interest on loans from another. The Act of 1901 was one of the most remarkable it had ever fallen to his lot to attempt to understand. The sections were not consistent with one another; and a prolonged attempt to understand it, had been futile and vain. He had, however, come to the conclusion that the interest on the loans was no longer payable out of the net receipts of each separate undertaking. The Corporation paid into the dividend fund the profits of all; but they were bound to keep the accounts separate, so as to show the profits on each undertaking. Under these circumstances, he thought the decision of Mr. Justice Hamilton could not be supported. Lord Justice Farwell agreed, and remarked that he found nothing in the Act to support the contention of the Crown. He did not believe any Court would grant an injunction against the Corporation restraining them from paying the interest on one loan from the profits made by an undertaking which was the subject of another loan; and if a ratepayer could not succeed, the Crown could not. It was clear that income-tax was not payable twice over on the same profits and gains; and if the Crown succeeded, the Corporation would be paying twice. Lord Justice Kennedy dissented. Thus, by a majority, the decision of the Income-Tax Commissioners was held to be incorrect, and the order of Mr. Justice Hamilton reversed.

Chemical Industry of Germany.—The following special communication from Berlin appeared in the "Financial News" last Saturday: "According to official statistics just published, the export of anilin and other coal-tar materials considerably increased during the first half of 1911; also the export of indigo has been larger than ever, as artificial indigo seems to gain ground everywhere. Since 1909 the export of anilin and other coal-tar stuffs has increased by 2,400,000 marks; the largest consumers being the United States, followed closely by Great Britain."

GAS STOCK AND SHARE MARKET.

(For Stock and Share List, see p. 318.)

THE Stock Exchange in the week just concluded went through a wave of intense agitation. The alarm engendered by the Morocco incident was brought to the highest pitch on Tuesday, when the orders issued to the Fleet became known and insurance against war risks was an active branch of the underwriting business. Happily, this tension was not long in relaxing, thanks in great measure to Mr. Asquith's temperate and firm speech; and before the close of Saturday the public mind was easier. But, meanwhile, markets had been rudely shaken. The opening on Monday had been quiet and fairly firm; but the position weakened in the afternoon. Consols were unmoved; but Railways lost more than they had gained in the morning. Americans were similarly affected, and Foreigners were not strong. Tuesday was much depressed. In addition to the dread of war, our home politics and labour disputes were lowering factors. Consols marked 78—a new record. But this was outdone on Wednesday, when Consols touched 77 $\frac{3}{4}$, though they rallied later. Thursday was less agitated, but very quiet. Government stocks continued weak; but the low prices to which Rails had fallen attracted buyers and brought about a recovery. On Friday, dullness and depression prevailed; no satisfactory advance in the Morocco question being visible. Consols went down to 77 $\frac{15}{16}$; Rails were lowered by liquidations in spite of good dividend announcements; and two failures hampered the settlement. Saturday was very quiet; but the general tone was improved—more hopeful views prevailing as to the preservation of peace. Consols closed at 78 to 78 $\frac{1}{4}$. The Money Market was very easy at first; but rates hardened later on, and discount quotations were firm. Business in the Gas Market was much quieter; the extreme heat of the weather and the imminence of August checking activity as usual. The market was very firm, well satisfied with the reports for the half year which have come to hand. The sales of gas are gratifying, and residuals have been very helpful. In Gaslight and Coke issues, the ordinary was much less active than the week before, but equally strong and steady; all transactions being within the same limits—107 to 108. In the secured issues, the maximum realized from 85 to 86 $\frac{1}{2}$, the preference from 103 $\frac{1}{4}$ to 104 $\frac{1}{2}$, and the debenture 79 special. South Metropolitan was a quiet market at from 119 to 120, and the debenture made 79 $\frac{1}{2}$ and 80. In Commercial, only the 4 per cent. was dealt in—realizing 114 and 114 $\frac{1}{8}$. Among the Suburban and Provincial group, Alliance and Dublin changed hands at 82 $\frac{3}{4}$ and 83, Brentford new at from 203 $\frac{1}{2}$ to 205, and Lea Bridge at 121 $\frac{1}{2}$ and 122. In the Continental companies, Imperial continued to recede, marking from 183 down to 180 (a fall of 2 $\frac{1}{2}$), Union was a point lower, European changed hands at 19 $\frac{3}{4}$ *cum div.* and 19 $\frac{1}{8}$ *ex div.*, and Tuscan at 81 $\frac{3}{8}$. Among the gas undertakings of the remoter world, Bombay was done at 61 $\frac{1}{8}$, Monte Video at 12 $\frac{3}{4}$, Primitiva at from 71 $\frac{5}{8}$ to 72 $\frac{1}{2}$ (a fall of $\frac{1}{8}$), ditto preference at from 51 to 53 $\frac{5}{8}$, and San Paulo at 22.

ELECTRICITY SUPPLY MEMORANDA.

Private Gas-Driven Generating Sets—Gas-Engines and Insulation Troubles—Revival of the Electric Cooker—Demonstrations at Olympia—A Suggestion—Straight Talk—Momentous Results of an Inquiry at Hastings—Metallic Filament Effects.

ELECTRICITY purveyors are not looking with equanimity upon the increasing means that are being offered to users of considerable quantities of energy for becoming their own generators of current at prices below those that can be profitably taken, putting lighting and power requirements together, by the local electricity concern. Some large electricity consumers in London and elsewhere have now their own gas-driven electricity sets, and are supplying themselves at a price below what was being done in former days when they took energy from the local mains. The lower costs that now obtain for town gas for power purposes, and the extensive field—including gas-works—from which fuel can be drawn for such engines as the Diesel, are making electrical engineers inquire as to how the interests of their undertakings stand in the light of these developments. Only the other day, at a meeting of the Barking Ratepayers' Association, the Chairman of the Electricity Supply Committee (Mr. Councillor Blake), in a discussion as to a new loan for the Electricity Department, stated that he thought the amount might be reduced. Among the reasons he advanced for this action was that there were rumours of certain large manufacturers in the town putting down their own plant, which, in his opinion, would be a serious matter for the electricity department. The manufacturers of dynamos and other electric apparatus are experiencing a larger business than aforesaid in the supply of private plants; and they are not at all averse to picking up these orders in a period when there has come a lull in business after a little flash of brighter prospects, which sent hopes soaring upwards in a very graceful and gratifying manner. However, gas companies have very catholic notions about business; and they are just as ready, if a factory owner or a hotel keeper prefers the electric light, to supply gas to an engine for

electricity generation purposes as they are to supply gas to bed-room fires, to cooking-ranges, and to laundry machines.

While talking of gas-engine driven generating plants, an interesting point is referred to in an article, by Mr. A. P. M. Fleming and Mr. R. Johnson, published by the "Electrical Review." The information may be valuable to gas engineers to put away among their collection of practical hints. With the increasing application of gas-engine driven generators, insulation troubles peculiar to these machines are receiving more and more attention. That such troubles are still experienced is, the writers of the article say, due mainly to an entire misconception of the root cause of the failures. The opinion generally held is that the chemically active fumes from the gas-engine attack the insulating materials on the windings, and destroy their protective value; and this has led to the extended use of special acid-resisting varnishes on all exposed portions of the windings. From the fact, however, that practically all the troubles experienced occur on direct-current machines, it is quite clear that other factors have to be taken into account. A number of insulation failures on gas-engine driven machines have been investigated by Messrs. Fleming and Johnson. While in some instances the insulating coverings, particularly the varnished surfaces, have been attacked to a slight extent, no cases of breakdown traceable to this cause were found. This is the explanation given: Trouble is first indicated by a gradual reduction of insulation resistance. Finally the windings become grounded, due to surface creepage and burning. This invariably occurs on the commutator end of the windings, and can be traced to the formation of a conducting surface from the commutator to "ground." The surface creepage usually takes place from the commutator necks across the under side of the insulated ends of the coils to the armature iron, though occasionally "grounding" may occur over the commutator bushing. If the trouble is taken in hand in time, a thorough cleaning of the surfaces affected is sufficient to restore them to their original condition. The conducting deposit is formed by the action of fumes on the wearing surface of the commutator, the sulphide or other salt formed being worn off by the brushes, and, together with carbon dust, carried by windage on to the surfaces already referred to. Failure may be prevented by frequent cleaning; the insulation resistance of the winding not being allowed to drop below a certain minimum figure. Usually, however, the affected surfaces are very difficult to get at; and the cleaning becomes an expensive and a somewhat tedious undertaking.

The electrical cooking business is very much with us at the moment. There appears to be hardly anything else for our respected journalistic friends to talk about just now. They have exhausted themselves on the subject of the ending of the strain caused by metallic filament lamps, to their vapourings upon which the Westminster Electric Supply Corporation say "Fiddlesticks; we are going to lose money over metallic filaments for some years yet." The electrical papers, too, cannot say more at the moment about the break in the cloud for the electrical plant manufacturers, seeing that the latter do not find the outlook for new business even as promising as 1910 actually was. As a matter of fact, we read paragraphs to-day about the handicap of tramway expansion, and of the shrinkage of the imports and exports of electrical goods during the first six months of this year, which fact affords little encouragement. However, cooking by electricity is a good standing dish—ever ready to be dragged up when one is required. So it is the topic that is very much in the forefront to-day. It has had a periodical resurrection since the last Olympia Exhibition. Then we were on the threshold, electrically speaking, of wondrous things in the matter of cooking by electricity. The apparatus was perfect, the cost did not exceed that of gas, the meat was not poisoned, and the time occupied in cooking was not greater than that demanded by gas. The world tittered, and went on its way. The electrical fiction quickly passed from sight. It has peeped now and again through other matters of greater material importance; but now the old story is with us again, added to by fresh brains and imaginations, as was seen by our allusions to it in last week's issue.

We are promised an elaborate "display of cooking demonstrations" at the forthcoming exhibition at Olympia. So anxious are the promoters to obtain these demonstrations, that the electric cooking-stove manufacturers have had space granted to them without rental charge, and with a free supply of current. If the manufacturers of cookers can only be tempted to demonstrate by the offer of free space and current, and not on the usual terms, it does not look as though they anticipate that there will be much in the results for them. Why, if they had any idea that a boom in cooking appliances would follow the exhibition, they would be falling over each other to pay the full price of the advertisement the demonstrations would give them. It is hoped by the "Electrical Engineer" that "this arrangement will be of great public interest." As the context shows that "the arrangement" refers to the free space and free current, we have no doubt at all that it will be of exceeding great public interest. Of course, the electricity being supplied free, the cost to the manufacturers of cooking dinners will certainly be as cheap as cooking by gas. Let us make a suggestion. Why not, to kill gas for ever so far as cooking is concerned, get the Gaslight and Coke Company to send along to Olympia a gas-cooker and lady demonstrator to show what a stupid thing the gas cooker is in comparison with the electric cooker? The electrical journals are of opinion that the Gaslight and Coke Company do not know how to manage their own business; and so the Editors will not be surprised when we

say that it is our decided opinion the gas cooker and the demonstrator would be sent to Olympia upon a request being made to the Company. There is a chance for the promoters of the exhibition to distinguish themselves, and to do something in the effort to extinguish the Gaslight and Coke Company. By the way, has the electrical industry noticed the Company are increasing their dividend on their consolidated capital, and carrying forward a larger balance than ever for the past half year?

In the same paper—the "Electrical Engineer"—there is a friendly editorial word with the manufacturers. It is remarked that electric cooking and heating have now been more or less prominently before the public for "some years." That is true. "Experience on both the technical and selling sides has brought to light many points of an interesting and important nature." That is also true. Further, "it must be admitted that despite the possession of certain excellent features of which there can be no question [we may question them when we know to what our contemporary is alluding], electric cooking has not attained that degree of popularity which a few years ago was considered probable, if not certain." That is likewise true. Then we proceed to read that manufacturers [presumably of electric cooking appliances] tell us that their output of these goods is growing, and supply authorities are equally anxious to point to increased connections of heating and cooking apparatus; but when their returns are analyzed it becomes apparent at once that, while they certainly indicate progress, it is of such microscopically small proportions as compared with the standard set by the gas companies that it cannot safely be taken even as an augury of ultimate success." There we have truth, reproach, and doubt as to the future, all rolled up neatly in one bundle. It is a very courteous way of telling the manufacturers and electricity suppliers that they are guilty of prevarication.

Following, we have more straight talk. There is a confession of meagre results and of unattractiveness to the consumer:

The largest and most enterprising supply authorities individually record perhaps several hundred radiators and irons, a lesser quantity of hot-plates, a score or so of ovens, and a few, very few, complete cooking ranges. These may have been connected; how many are in active and regular service is another matter. We know that certain companies and municipal authorities have adopted a very progressive policy, including facilities for the free trial of cooking apparatus; but it is impossible to contend that their efforts have met with anything like satisfactory results. Consumers are urged into experimenting with loaned articles; and it is possible by this means to induce a small percentage to instal certain of the lesser devices, such as irons, toasters, and the like. The vast majority of the apparatus, however, comes back, and after a more or less lengthy period of probation in the stores is consigned to the scrap heap as hopelessly out of date.

And this after all the varied effort—after all the advertising, after all the exhibitions, after all the vain boastings, after all the malicious slander as to the poisoning of food cooked by gas [we are wondering who will be the first victim in the electrical industry of this particular ill-directed effort], after all the circularizing of householders, and after all the joints and chops and steaks that have been, or are said to have been, cooked by electricity! Our contemporary, however, puts the non-success so far down to the great initial cost of electric cooking appliances as contrasted with gas appliances; to the heating elements being none too reliable—even the best having to be renewed periodically. To sum up, our contemporary warns manufacturers that improvements of a radical nature are essential if much progress is to be made in competition with gas. There is likewise the overt view that it is ridiculous to endeavour to mask by pretence the advances that have been effected in gas heating and cooking appliances.

A Special Committee of the Hastings Corporation have been engaged in investigating the affairs of the various departments of the Corporation; and we have been looking with interest to the results of their examination of the Electricity Department. We have got them before us at the present time. There are two results. The less of the two is that the Committee, after mature deliberation, have suggested little increases in the salaries of two clerks and the office boy. From the humanitarian point of view, we cannot but applaud their conduct in the matter. But it is a case of the mountain having been in labour, and producing a mouse. The greater of the two results is that the Special Committee have shown a splendid incapacity for investigating the affairs of the department. They went and saw the electrical machinery, and it struck them as being very fine; but whether it is really so or not, or whether a large amount of it will have to be renewed before a reserve is established and built up to a sufficient sum for the purpose without having to raise fresh capital, or whether the latter course will have to be taken before the whole of the money that has been borrowed on any plant that will have to be replaced has been repaid, the Special Committee cannot say any more than the man in the moon. It is also stated that they investigated the working of the Electricity Department; but they do not (at all events we do not see it in the local "Observer") tell the Council what they really found. Perhaps they are not sufficiently competent to feel secure upon any point. There are several matters that could be suggested to them.

A few may be instanced. There is the laying of unproductive mains; there is the question as to why the electrical machines kindly generate current at a lower cost for the public lighting than for private and shop lighting; there is the question as to why the same machines considerably generate current at a lower cost for

street metallic filament lamps than for street arc lamps. There is the financial question, too, as to the provision of reserve and other funds in order to make the concern financially sound; there is the further point as to seeing that the concern is conducted in a way that will protect the ratepayers from being further robbed of their hard-earned money in support of the electricity concern; there is also the question of considering by what means the ratepayers can have returned to them the money which they have been forced by the policy of the Council to find for the maintenance of this concern that has not been run on ordinary commercial lines. There are many subjects to which the Special Committee might usefully direct their minds. We can only surmise that the reason they have not tackled and reported upon them is that the policy and methods of the Electricity Department are such wonderful and complicated matters that, long as the members of the Special Committee have been on the Council, they have not succeeded in mastering them sufficiently to express an opinion upon them. However, perhaps the ratepayers will find a little consolation in the amusement and satisfaction they will experience in the fact that the Special Committee have sat in judgment upon, and have given most profound consideration to, the momentous question of the wages of the office boy to the Electricity Department. Does such a matter form the sum and substance of the affairs of the department? How long are the ratepayers of Hastings going to rest content with such farcical proceedings? By the way, it is observed that the attention of the Borough Engineer has been called to the bad ventilation of the electrically-lighted Council Chamber. Perhaps it would have been more appropriate if the attention of the Borough Electrical Engineer had been called to the matter. It would have given him another opportunity for increasing the load upon his beautiful electric plant, by putting in an electric fan.

The Westminster Electric Supply Corporation have been unsuccessfully appealing against the assessment of their undertaking in the St. George's (Hanover Square), Strand, and Westminster Unions. The matter does not particularly concern us, excepting incidentally. In the course of the proceedings, the large effect that metallic filament lamps have had upon the revenue was shown. In 1905 the Company decided to make a large reduction in the prices for electric current; and they prepared an estimate of the balances that would probably be shown by the revenue account during each of the ensuing five years. Owing to the effect of metal filament lamps on the consumption of current, the expected increase did not take place. The estimated balance in December, 1905, was £75,000, actual balance £74,409; 1906, £80,000, actual £72,267; 1907, £85,000, actual £66,429; 1908, £90,000, actual £76,507; 1909, £95,000, actual £76,676. Following this experience, the Company estimated that in the five years 1910 to 1914 the balances on revenue account would be respectively £65,000, £56,000, £52,000, £54,000, and £57,000. As a matter of fact, the balance in 1910 was only £60,330. Under these circumstances, they estimate that there will be a diminution of their balances during the next five years, as the enormous increase in the use of metallic filament lamps has made a serious difference in the sale of the units for lighting. The effects of the increased competition of the gas companies will, they also say, compel them to further reduce prices. It is an interesting thing to find an electric company who do not run away from hard facts, but acknowledge their existence.

"Gas Kai."

It has been a pleasure to receive from Mr. S. Fujisaki, of the Tokyo Gas Company, a copy of a new gas periodical, entitled "Gas Kai," which is the first journal devoted to gas matters in Japan. We heartily welcome our new contemporary, which is quite a bulky little volume, printed in Japanese. That a gas publication is called for, does not surprise one, in view of the significant facts to which our correspondent calls attention. The gas industry in Japan is growing by leaps and bounds; and there are twenty companies applying for organization, while forty-five concerns are actually manufacturing and supplying gas in the principal cities and towns. The extraordinary nature of the progress made will be better understood when it is considered that only eight years ago there were but two gas undertakings in the country—namely, those of Yokohama City and of Tokyo. Since that date, the latter has been continually growing, until now it has become the biggest gas-works in the Orient; the nominal capital being at the present moment about thirteen times as much as was the case at the beginning. It is the recent remarkable progress in this line of business which has been responsible for the publication of this new gas periodical—the only one, it is believed, in the Eastern Countries. The first issue, it may be remarked, contains a very good likeness of William Murdoch. May the career of "Gas Kai" be a never-ending one, and its success as great as that attending the gas industry of Japan.

Provost A. Y. MACKAY, of Grangemouth, has tendered his resignation. He has been a member of the Town Council since 1892, and Provost since 1900. During the period of the provostship the burgh boundaries have been extended, the gas undertaking has been acquired, and a new water supply (inaugurated a few days ago) brought in. The gas-works were purchased at Whitsunday, 1906, at the price of £28,500; and the expectation is expressed that the first-fruits of the transfer will be realized this year in a large reduction in the price of gas.

OBITUARY.

Mr. THOMAS FROST, of the Manchester Water-Meter Company, Ardwick, was found dying last Wednesday on the flagged floor of the Victoria Arcade, Deansgate, having fallen or jumped from the gallery on the third storey. At the inquest, the Jury returned a verdict of "Suicide." Mr. Frost, who resided at Wilmslow, had been subject to fits of nervousness; but on the morning of the occurrence he told his brother he was feeling rather better.

Mr. JAMES FREDERICK BUCKLEY, J.P., Chairman of the Ashton-under-Lyne Gas Company, died under tragic circumstances last Friday. He was travelling to Manchester from Greenfield by train, as usual; but before reaching Stalybridge station, he collapsed in the compartment, and died. Mr. Buckley, who was in his 73rd year, was a Director of the Cambrian Railway Company, the Chairman of the Saddleworth Bench of Magistrates, and had been on the Board of the Manchester and County Bank. He was a retired cotton spinner.

A well-known Scottish coalowner and mining engineer has lately passed away in the person of Mr. JAMES S. DIXON. He was born in Glasgow in 1850, and was educated at Hamilton Academy and Glasgow University. In 1872, he leased the Bent Colliery, and afterwards acquired the coalfields under Hamilton Palace grounds; both collieries being worked by a Company of which he was the managing owner. Mr. Dixon was appointed a member of the Royal Commission on the Coal Supplies of Great Britain; and his report upon the available resources of Scotland is a standard authority on the subject. He took great interest in the formation of the Mining Institute of Scotland, and was elected its President; and he had the further honour of being selected for the presidency of the Institution of Mining Engineers of Great Britain.

We regret to record the death on the 20th ult., after a short illness, of Mr. ROBERT HARRISON, the Secretary and Manager of the Monaghan Gas Company—a position he had occupied for almost a decade. He was President of the Irish Association of Gas Managers for the year 1910-11, and was at the time of his death District Member of Council on the Institution of Gas Engineers. He served his articles in the Limavady Gas-Works, of which town he was a native, and was afterwards employed as Manager at Aughnacloy, Warrenpoint, and Wicklow, before going to Monaghan. He was a Freemason and a member of the Orange Institution—occupying prominent positions. The funeral took place on Saturday, the 22nd ult.; the body being conveyed to the Monaghan Parish Church, where a service was conducted by the Rev. Canon Mackanaway, prior to the interment in the New Cemetery. The chief mourners were Mr. Harrison's five brothers; and among the others were Mr. George Airth, the Hon. Secretary and Treasurer of the Irish Association of Gas Managers, and several of the members of that body, who sent one of the numerous wreaths. The respect in which the deceased was held was evidenced by practically the whole of the residents attending the funeral; business being entirely suspended during the passing of the procession through the town.

Sulphate of Ammonia Manufacture.—We have received from the publishers, Messrs. John Allan and Co., of 8, Bouverie Street, E.C., a book bearing the title of "The Manufacture of Sulphate of Ammonia," by Mr. Gascoigne T. Calvert, late Works Manager at the Nchells Chemical Works, Birmingham. In the preface it is stated that the book has been written with the view of making the subject easily understood by any workman of average intelligence. The text, which is fully illustrated, occupies 140 pages. It is followed by an appendix; and there is an index. The price is 7s. 6d. net.

Gas-Engines at Sea.—In the column headed "The Marine Engineer" in yesterday's "Daily Telegraph," the following remarks on the above-named subject were made by the Engineering Correspondent of that paper: "The story has often been told of how it has come about that the steam-turbine has, for speed purposes, fought its way to the front. We have not yet reached finality in the way of economy with these prime movers. But we have already had our thoughts turned to the next great change at sea—the adoption of the internal combustion engine. Until quite recently, the oil-engine has only found a place, on large ships, for generating electrical energy. Current is not only used for lighting purposes, but for providing power for the auxiliary apparatus. The oil-engine is not, however, likely to be used in the immediate future for the propulsion of large ships. But we have it on good authority that there are 'many famous engineering firms now strenuously engaged in the development of marine gas propulsion.' There are obvious advantages in superseding steam by gas. Great reticence is being shown by the firms so engaged; but, largely from theoretical considerations and data obtained from plants working on land, we are able to say that there are certain advantages and disadvantages. There is a great saving in space occupied by, and the weight of, propelling machinery. The number of stokers required is less. There is less labour required for the removal of ashes. Funnels and smoke are dispensed with. The two chief difficulties are the construction of a suitable gas-producer, the variation of speed necessary in the engine, and the danger of asphyxiation due to gas leakage. No one can doubt, in view of the remarkable progress made with gas plants ashore the last few years, that these difficulties will be overcome."

THE PUBLICITY AND SPECIAL PURPOSES COMMITTEE OF THE INSTITUTION OF GAS ENGINEERS.

THE Secretary of the Institution of Gas Engineers (Mr. Walter T. Dunn) forwards the following communication as to the supporters of the Publicity and Special Purposes Fund, made up to the present date:

THE INSTITUTION OF GAS ENGINEERS.

Publicity and Special Purposes Committee.

At a Meeting of the Publicity and Special Purposes Committee held on July 24, it was reported that a considerable number of additional promises of support had been received in response to the circular letter sent out; and the funds promised are now

sufficient to warrant the Committee in taking the next step in furtherance of the scheme.

It was therefore resolved to hold a meeting in London, of the supporters, on Thursday, Oct. 12, at 3 p.m., to constitute the governing body, and appoint an Executive Committee.

All those interested are cordially invited to be present.

The following undertakings have promised their support, and a number of others have the matter under consideration.

ENGLAND AND WALES.

Aldershot Gas, Water, and District Lighting Co.
Alford Gas Company
Ambleside Urban District Council
Ammanford Gas Company
Axminster Gas Company
Barnard Castle Gas Company
Bath Gas Light and Coke Company
Berkhampsted Gas Company
Birmingham Corporation
Bishop's Waltham Gas and Coke Co., Ltd.
Blandford Gas and Coke Company, Ltd.
Bottesford (Mr. F. Turner, Proprietor)
Bournemouth Gas and Water Company
Bradford Corporation
Brentford Gas Company
Bridgwater Gas Light Company
Brighouse Corporation
Brighton and Hove General Gas Company
British Gas Light Company—
 Hanley and Tunstall
 Holywell
 Hull
 Norwich
 Trowbridge
Bury St. Edmunds Gas Company
Caldicot and District Gas Light and Coke Company, Ltd.
Camborne Gas Company, Ltd.
Cambridge University and Town Gas Light Co.
Carmarthen Gas Company
Chard Corporation
Cheltenham Gas Light and Coke Company
Chepstow Gas and Coke Consumers Co., Ltd.
Chester United Gas Company
Clevedon Gas Company
Colwall Gas Company, Ltd.
Colyton, Gas, Coke, and Coal Company, Ltd.
Commercial Gas Company, London
Coventry Corporation
Cradley Heath Gas Company
Croydon Gas Company
Cwmbran and Pontnewydd Gas Company, Ltd.
Dartford Gas Company
Derby Gas Light and Coke Company
Devon Gas Association, Ltd.
 Chagford
 Chudleigh
 Moretonhampstead
 North Tawton
 South Brent
Doncaster Corporation
Dorchester Gas and Coke Company, Ltd.
Dorking Gas Company
Douglas Gas Light Company
Earby and Thornton Gas and Lighting Co., Ltd.
East Grinstead Gas and Water Company
Enfield Gas Company
Exeter Gas Light and Coke Company
Falmouth Gas Company
Fareham Gas and Coke Company
Felixstowe Gas Light Company
Fleetwood Gas Company, Ltd.
Formby Gas Company, Ltd.
Frodsham Gas and Water Company
Garstang Gas Company, Ltd.

Gas Light and Coke Company, London
Grantham Gas Company
Grays and Tilbury Gas Company
Great Grimsby Gas Company
Great Yarmouth Gas Company
Halifax Corporation
Hampton Court Gas Company
Harrogate Gas Company
Harrow and Stanmore Gas Company
Hartlepool Gas and Water Company
Hatfield Gas Company, Ltd.
Hathersage and District Gas Company, Ltd.
Hayward's Heath District Gas Company
Hemel Hempstead and District Gas Company
Herne Bay Gas and Coke Company, Ltd.
Hertford Gas Light Company
Hexham Gas Company
Holbeach Gas and Coke Company
Holmfirth Gas Light Company
Horley District Gas Company
Hornsey Gas Company
Horsham Gas Company, Ltd.
Houghton-le-Spring District Gas Company
Hyde Gas Company
Ilfracombe Gas Company
Keighley Corporation
Kenilworth Gas Light and Coke Co., Ltd.
Kettering Gas Company
Kidderminster Gas Company
Kirkheaton, Dalton, and Lepton Gas Company
Lea Bridge District Gas Company
Leamington Priors Gas Company
Leighton Bussard Gas Company
Lichfield Gas Company
Littleborough Gas Company
Liverpool United Gas Light Company
Long Eaton Gas Company
Lowestoft Water and Gas Company
Maidenhead Gas Company
Maidstone Gas Company
Manchester Corporation
Merthyr Tydfil Gas Company
Mitcham and Wimbledon District Gas Light Co.
Newcastle-upon-Tyne and Gateshead Gas Co.
New Kinver Gas Company, Ltd.
Newmarket Gas Company
Newport (Isle of Wight) Gas Company
Normanton Gas Company
North Middlesex Gas Company
Oakengates and St. George's Gas and Water Co.
Oldham Corporation
Oswestry Gas Light Company, Ltd.
Otley Gas Company
Paignton Gas Company
Peterborough Gas Company
Preseot Gas Company
Radcliffe and Pilkington Gas Company
Ramsbottom Gas Company, Ltd.
Reading Gas Company
Redditch Gas Company
Redhill Gas Company
Richmond Gas Company (Surrey)
Ringwood Gas Light and Coke Company
Ross Gas Company, Ltd.
Rugby Gas Company
Runcorn Gas Company

Ryde Gas Light Company
St. Albans Gas Company
St. Austell Gas Company, Ltd.
Salford Corporation
Sandown Gas and Coke Company, Ltd.
Scarborough Gas Company
Sevenoaks Gas Company
Shanklin Gas Company
Sheffield United Gas Light Company
Sleaford Gas Company, Ltd.
Southampton Gas Light and Coke Company
South Metropolitan Gas Company, London
South Shields Gas Company
Sowerby Bridge Urban District Council
Stalybridge Corporation
Stanford-le-Hope Gas Company, Ltd.
Stockton-on-Tees Corporation
Stretford Gas Company
Sunderland Gas Company
Tonbridge Gas Company
Torquay Gas Company
Tottenham and Edmonton Gas Light and Coke Company
Truro Gas Company
Tynemouth Gas Company
Usk Gas Company, Ltd.
Ventnor Gas and Water Company
Wakefield Gas Light Company
Walker and Wallsend Union Gas Company
Walton-on-Thames and Weybridge Gas Co.
Wellingboro' Gas Light Company, Ltd.
Wellington (Salop) Gas Company
Westgate and Birchington Gas Company
Weston-super-Mare Gaslight Company
Whitby Gas Company
Winchcombe Gas Light and Coke Co., Ltd.
Winchester Water and Gas Company
Wolverhampton Gas Company
York United Gas Light Company

SCOTLAND.

Arbroath Corporation
Breachin Gas Company, Ltd.
Cardenden Gas Company, Ltd.
Castle Douglas Gas Light Company
Dalkeith Gas Light Company
Dollar Gas Company
Glasgow Corporation
Kelty Gas Company
Moffat Gas Light Company
Musselburgh Gas Light Company
Newtongrange (Lothian Coal Company)
Tranent Gas Company, Ltd.

IRELAND.

Ballina (Mr. T. J. Reid, Proprietor)
Cookstown Gas and Light Company, Ltd.
Dublin. Alliance and Dublin Consumers' Gas Company
Tullamore Gas Company, Ltd.
Westport Gas Company

AUSTRALIA.

Metropolitan Gas Company, Melbourne

Next Year's City and Guilds Examinations.

We have received from the Superintendent of the Department of Technology of the City and Guilds of London Institute (Sir Philip Magnus, M.P.) the programme for the session 1911-12. It contains full information in regard to the examinations in the subjects in which the younger of our readers are interested, including, as usual, a list of the works of reference which candidates are advised to consult while prosecuting their studies. As before, separate examinations will be held in "Gas Engineering," which will include manufacture, and "Gas Supply," including distribution and the various applications of gas. The examiner in the former subject is Mr. Thomas Glover, of Norwich, and the examination will be held on Saturday, April 27, 1912. Mr. J. H. Brearley, of

Longwood, has relinquished the examinership in "Gas Supply;" and the name of the gentleman who will succeed him is not given. The examination will be held a week later than the other—viz., May 4. In addition to the above-named subjects, examinations will, as hitherto, be held in "Coal-Tar Distillation and Intermediate Products" and "Coal-Tar Colouring Matters." Recent additions to the programme are the subjects of "Structural Engineering" and "Heating and Ventilation." The programme contains lists of scholarships, exhibitions, and money prizes offered by the City Livery Companies, the money prizes given by the Institute, and the persons registered as qualified teachers in technology. It may be obtained from any bookseller, or from the publisher, Mr. John Murray, 50A, Albemarle Street, W., price 9d. net (postage extra).

INTERNATIONAL PHOTOMETRIC COMMISSION.

Third Session at Zürich.

The International Photometric Commission, which was founded at the Gas Engineering Congress held in Paris in 1900, has since held two sessions in Zürich—viz., in the years 1903 and 1907. A third session opened, also at Zürich, last Wednesday, and closed on Saturday. The representatives of the Institution of Gas Engineers—viz., Mr. Charles Carpenter and Mr. James W. Helps—were both unable to attend this session; and the Council of the Institution nominated Dr. Harold G. Colman and Mr. W. J. A. Butterfield to act in their stead. It had been announced beforehand that, as the proceedings at the session would be largely concerned with questions which could best be discussed in private, it was undesirable that reporters should be admitted, but that the *procès verbaux* and the papers submitted for discussion would be communicated to the Press. The following report of the proceedings is derived from these documents.

At the opening of the session in the Federal Polytechnic at two o'clock on Wednesday, there were present the following delegates: France—The President, M. Th. Vautier, Professor at the University of Lyons; M. Sainte-Claire Deville, Engineer of the Experimental Works of the Paris Gas Company; and M. F. Laporte, Sub-Director, the Central Laboratory of Electricity, Paris. Germany—Dr. Brodhun, Member of the Imperial Physico-Technical Institute ("Reichsanstalt") at Charlottenburg; Professor H. Drehschmidt, Chemist at the Berlin Corporation Gas-Works at Tegel; and Dr. P. Eitner, Professor at the Technical College at Karlsruhe. Great Britain—Mr. W. J. A. Butterfield and Dr. Harold G. Colman, both of London. Austria—Dr. Hugo Strache, Professor at the Technical College at Vienna. Holland—Dr. L. J. Ternerden, Engineer at the Corporation Gas-Works of Amsterdam. Italy—Signor M. Böhm, Consulting Engineer, of Milan. Switzerland—M. Weiss, Manager of the Zürich gas undertaking.

In opening the proceedings, the President said M. Weiss had proposed that Dr. Ott, Chemist at the Zürich Gas-Works, should be made an additional member of the Commission, and that a vote on this proposition would be taken the following day. He also invited the members to consider a proposal made by Dr. Strache that Dr. Kuminsky and Dr. Eger should be admitted to the meetings at this session; and this proposal was agreed to. The President then proposed the following programme of proceedings for the session.

1. The reception and discussion of a report by Dr. Eitner on "The Methods of Photometry in Use in Germany."

2. Discussion of the conclusions deducible in regard to the absolute illuminating power obtainable by incandescence, and the absolute illuminating power flames, from the results of experiments reported on by M. Sainte-Claire Deville in 1903 and 1907, and the experiments made subsequently in Karlsruhe.

3. Private business—viz.: (a) Increase of membership of the Commission. Experience had shown that there were too few members, and it was desirable that an opinion should be expressed for transmission to the nominating technical institutions of gas engineers, to the effect that the countries which now have four members should be entitled to at least six, and those which now have one to at least two. [At this point, Dr. Colman inquired what effect this increase of numbers would have on the vote of the different countries; and having been informed by the President that there was at present no rule settling the method of voting, he suggested that it would be convenient to make such a rule before discussing the question of the increase of membership. Dr. Brodhun pointed out that hitherto the Commission had agreed unanimously rather than by voting.] (b) Renewal of the appointment of members of the Commission by the technical institutions nominating them as their delegates. It would be well to ask these institutions to renew the appointment of all their representatives on the Commission, and that this renewal should take place after each session. The expiration of the appointment would allow any members to retire who might be prevented, either by the state of their health or by their engagements, from taking part in the work of the Commission or assisting at its sessions. It was quite understood that all the retiring members would be eligible for re-election. [Professor Drehschmidt here suggested that the different technical institutions might settle this question. But the President pointed out that while the ultimate decision would rest with them, it would be very difficult and tedious to handle the question by correspondence between them; and it was desirable that they should know the views of the Commission.] (c) Hitherto the Commission has had no authority to advance funds for promoting any investigation connected with its programme of work, and it might be useful to put an end to this state of things. There were two ways in which this might be done—to ask the nominating technical institutions to grant each year to the Commission an amount which it would reserve for this purpose, or to wait until there was an opportunity of subsidizing an interesting research, and then ask these institutions for the necessary funds. [Dr. Strache remarked that the annual contribution

seemed preferable.] (d) The admission to the Commission later of representatives of electrical interests. The President had received, a few months after the 1907 session of the Commission, a letter from Herr Dettmar, General Secretary of the Association of German Electricians, in which he said that his Society would like to be represented at the meetings of the Commission, and asking on what conditions this could be arranged for; and if its delegates were admitted, what would be the number allowed. The same proposition had been made verbally by other important electrical institutions. The question would involve consideration of the best manner in which the electrical interests of the different countries could be dealt with; and it might be that the National Electrotechnical Committees should appoint representatives, or failing them the International Electrotechnical Commission. [Dr. Colman interposed to say that the different technical gas and electrical institutions might nominate members of the Commission, as well as the national laboratories. M. Sainte-Claire Deville pointed out that the Commission was originally constituted to deal with incandescent gas lighting. But the President said it was not a question of such extensive modification. They had only to settle if representatives of the electricians should be admitted to meetings in which subjects of common interest would be discussed, such as photometric units, the adoption of a standard of light, or photometric rules applicable to both methods of lighting. On the other hand, there were many questions to be studied respecting incandescent gas lighting in which electricians were not interested.]

4. A communication by Messrs. Butterfield, Haldane, and Trotter, on "Corrections for the Effect of Atmospheric Conditions on Photometric Flame Standards."

5. Rectification of the numbers settled at the 1907 session for the ratios subsisting between the intensity of the lights of the Hefner, Carcel, and Vernon Harcourt lamps. [The President pointed out that a few months after the 1907 session, he had heard from Dr. Glazebrook that the National Physical Laboratory, acting with the Metropolitan Gas Refractors, had considered the desirability of retaining the value of 10 litres per cubic metre of air for the standard humidity in the case of the pentane lamp; and, for reasons named in a communication made by Dr. Glazebrook to the British Association at Dublin in 1908, it had been decided to adopt the value of 8 litres per cubic metre (measured by the Assmann hydrometer) as standard humidity. The National Physical Laboratory suggested that the question should be reconsidered at the next meeting of the International Photometric Commission. The President suggested that Messrs. Brodhun and Laporte, who had already acted on the Sub-Committee who had reported in favour of the adoption of the numbers for the ratios already referred to, should make the correction suggested by Dr. Glazebrook, and bring forward the corrected figures for the acceptance of the Commission.]

6. Substitution of Calorific Power for the Illuminating Power of Gas.—Some colleagues believed that the Commission should express its opinion on this question. Dr. Bunte had held a conference in 1909 on the qualities requisite in gas of proper quality, and had stated finally that the calorific power expressed accurately the energy of the gas, and that the determination of illuminating power, in the actual conditions in which gas was used, ought thenceforth to be regarded as useless. Nevertheless, as no authoritative body had yet expressed an opinion on this important question, it would be particularly opportune for the Commission to make a pronouncement on the principle involved therein, while not fixing a minimum value for the calorific power, having regard to the different classes of coal used and the various systems of distillation in vogue in different countries. [Dr. Strache stated that he proposed to make a communication on the subject.]

7. Photometric Dimensions and Units.—The President had sent to all the members of the Commission the text of the proposals made by a Sub-Committee of the Illuminating Engineering Society in November, 1910, regarding photometric dimensions and units. The question had been discussed at the congress of electricians at Geneva in 1896, and the conclusions then arrived at had not been subjected to very great modification by the Sub-Committee of the Society in question. A communication by Herr Monasch, of Berlin, in the "Journal für Gasbeleuchtung" bore on this question; and the President had asked Dr. Bunte to give the Commission his opinion as to the answer to be made to Herr Monasch.

8. The International Standard of Light.

The Commission approved of the order of proceedings as indicated by the President.

Dr. Eitner then read his report on the photometric methods employed in Germany. A general discussion followed; and the sitting was brought to a close.

Next day, Mr. Butterfield read the communication to which reference has already been made; and he was thanked by the President. The paper, which gave rise to a discussion, will be

* This communication will be found on p. 288 of the present issue of the "JOURNAL."

included in the "Transactions" of the Commission. Just before the mid-day adjournment, the President proposed the admission of Dr. Ott; and he was duly elected. On the invitation of M. Weiss, it was decided to visit the gas-works of the Municipality of Zürich at Schlieren next morning. The discussion was continued in the afternoon; and it was followed by the consideration of the subjects relating to the constitution of the Commission mentioned by the President when indicating the order of proceedings. It was unanimously decided to give to each country represented the same number of votes.

On the resumption of the proceedings on Friday, the President directed attention to the spectro-photometer of M. Thovet; and Herr Eitner stated that he had constructed a similar instrument nine years ago. Herr Strache then read his communication; and, after a few remarks upon it, the members passed again to the consideration of the question of the constitution of the Commission. In the afternoon, the President gave the members particulars of the work of the Sub-Committees who had had under consideration the comparison of the Harcourt, Hefner, and Carcel standards of light, and the substitution of a calorific for an illuminating power test of gas; and the conclusions arrived at were unanimously adopted. The President suggested that the members should take up the question of the international candle; but Herr Eitner thought it would be better to go on with the matters relating to the constitution of the Commission. It was decided that the maximum number of delegates for England, France, Germany, and the United States should be six; and the countries that now send one delegate should have a maximum of three. The next subjects were the re-election of the delegates, and the expenses of the Commission. No decision was come to upon them; but a proposition to admit electricians was unanimously adopted. Other internal matters occupied the Commission for the rest of the sitting.

On Saturday morning, the members were occupied with the subject of the unit of intensity; and a Sub-Committee, consisting of the President and MM. Brodhun, Eitner, Laporte, and Dr. Colman, was nominated to deal with it. They expressed the opinion that it would be better to give to a unit common to different countries a name such as "*bougie normale*," "*bougie étalon*," or "*bougie décimale*," than to use the word "international;" and they thought the full title should be employed to avoid confusion. At the afternoon sitting, the President read the resolution proposed by the Sub-Committee. Herr Eitner thought the word "*étalon*" should be avoided, as it referred to an apparatus and not to magnitude. The President remarked that "*étalon*" was the translation of the word "standard." Dr. Colman asked if "standard candle" could not be employed. The President replied in the negative, as an English expression could not be introduced. Personally, he did not see any inconvenience in striking out the words "*bougie étalon*." He proposed that this should be done; and it was unanimously agreed to. The members then had their attention directed to a note by M. Blondel on the technical nomenclature of lighting; and a Sub-Committee, consisting of MM. Brodhun, Laporte, Kusminsky, Paterson, and Hyde, was nominated to consider the subject. After the transaction of other business, it was decided that the Commission should meet again three years hence.

In bringing the congress to a close, the President expressed his pleasure at the agreement which had prevailed among the members; and he thanked those who had contributed to the work. He thought they might hope to do even better at the fourth session. Herr Eitner said the success of the congresses was due to the desire of the members to achieve it, and to the labours of the President; and, in the name of all, he tendered him their thanks.

Repairing a Submerged Water-Main.—In a recent number of "Engineering Record," a correspondent described the process of repairing a submerged water-main at Galveston (Texas). It is 30 inches in diameter, and runs under Galveston Bay a distance of about two miles. At a point where an accident recently occurred, it is submerged about 8 feet. The opening in the main was triangular in shape, about 7 inches long and 4 inches wide. The cause of the break is not known; but it was probably the result of a very heavy weight being dropped on the main—the opening being larger on the inner than on the outer circumference of the pipe. A diver made the repairs by using what is commonly called a "crow-foot" and a cover with a rubber gasket between the cover and the outside of the main. The "crow-foot" is a piece of steel, 1 inch thick, 3 inches in width, and 15 inches long, curved to fit the inner circumference of the main, with a bolt-hole through the centre of it. After shutting off the water, the "crow-foot" was inserted in the opening, and placed at right angle to the axis of the pipe. The bolt was then drawn through the "crow-foot," through the hole in the pipe, and through the cover plate. After the nut had been partly run-down on the bolt, the water pressure was turned on, in order to scour out the shell and sand from between the plate and the outside of the pipe. The nut was then run-down hard upon the cover plate; closing the leak entirely. The work was a success in every respect. The diver was in the water for about an hour only; but the water supply was shut off for about five hours, on account of delay in opening and closing valves. The city is now constructing a duplicate main across the bay, so that the water supply will not be endangered by any accident that may occur to the submerged main.

THE GASLIGHT AND COKE COMPANY.

THE following is the report on the working of the Company during the six months ending June 30, which, with the accounts (an abstract of which appears on p. 308), will be submitted to the proprietors on Friday.

The accounts for the past half year show that, after providing for fixed charges, setting aside £15,000 towards the redemption fund, and contributing £20,000 to the insurance fund, there remains a profit balance of £456,129 4s. 11d. The amount brought from the previous half year being £625,688 7s. 4d., there is a total sum available for distribution of £1,081,817 12s. 3d., out of which the Directors recommend a dividend on the ordinary stock at the rate of £4 14s. 8d. per cent. per annum, which will absorb £382,467 10s. 8d., and leave £699,350 1s. 7d. to be carried forward to the credit of the current half year.

The sales of gas for the half year show an increase of 4½ per cent. compared with the quantity sold during the corresponding period of 1910.

There has been an increase during the six months of 10,343 consumers, and of 17,425 in the number of gas-stoves sold and let on hire.

The Bill for the amalgamation of the Barking Gas Company and of the Chigwell, Loughton, and Woodford Gas Company with this Company received the Royal Assent on June 29th last. These amalgamations are to take effect as from Jan. 1, 1912.

The Directors have pleasure in reporting that the coal purchases for the year ending June, 1912, have been completed at favourable prices. The market for residuals of all descriptions has been good during the half year.

The Court of Directors has been furnished by the several engineers of the manufacturing and distributing departments respectively with the usual certificates that all the Company's works and plant have been maintained in thorough efficiency.

CORBET WOODALL, Governor.

Horseferry Road, Westminster, S.W., July 18, 1911.

SOUTH METROPOLITAN GAS COMPANY.

THE following is the report of the Directors of the Company for the six months ended the 30th of June, which, with the accounts [see p. 309], will be presented to the proprietors at the ordinary half-yearly meeting on the 9th inst.

After payment of debenture interest and the sliding-scale dividend at the rate of £5 9s. 4d. per cent. per annum, there remains a surplus on the half-year's working of £34,371 to be brought forward to the current account.

Several causes have contributed to this favourable result; but the most important is the increased knowledge acquired in regard to the carbonization of coal. The effect of this is evidenced by the make of gas, which has risen to 12,044 cubic feet per ton of coal; the yield of ammonia is higher; and the quality of coke and tar has improved.

The consumption of gas shows the not unsatisfactory increase of 2·62 per cent. compared with the corresponding half year; and this affords very good testimony to the stability of the Company's business.

High-power gas is rapidly growing in popularity. It will not be long before this system of lighting, which would seem to be the last word in artificial outdoor illumination, will be available in most of the important shopping areas in South London.

The unsettled condition of labour in the coal trade is a subject of considerable anxiety to the Directors. One of the disturbing features of the unrest is the recent vote in Northumberland calling upon the Miners' Federation to declare a national strike against the working of the eight-hour shift system.

Fortunately the Company's relations with its own workmen have never been happier than they are to-day; and, in the words of one of them, "the roots of its co-partnership were never deeper or more firmly implanted." One testimony, among many others, to the spirit in which their work is performed has been the large diminution in the number of accidents to the employees. The provisions of the National Insurance Bill so adversely affect them that they are endeavouring to obtain the same principle of exemption for the Company's sick fund (which has been in existence since 1842, and has been of great benefit to all concerned) as was accorded in the case of the Workmen's Compensation Acts.

CHARLES CARPENTER, Chairman.

709, Old Kent Road, S.E., July 24, 1911.

Effect of Road Tarring on Trees.—The effect of road tarring on the growth of the trees in the Bois de Boulogne was the subject of a recent communication to the French Académie des Sciences by M. Gatin. He said that in certain cases only, where the road is much exposed to the sun, and where the traffic is heavy, could the tarring of the road be proved to have a marked deleterious effect on the trees. M. Edmond Perrier, however, in some remarks on the communication, directed attention to the serious damage done to trees in the Jardin des Plantes by the adjacent tarred road.

CORRECTIONS FOR THE EFFECTS OF ATMOSPHERIC CONDITIONS ON DIFFERENT PHOTOMETRIC FLAME STANDARDS.

By W. J. A. BUTTERFIELD, F.I.C., J. S. HALDANE, M.D., F.R.S., and A. P. TROTTER, M.Inst.C.E.

[A paper read at the Meeting of the International Photometric Commission at Zurich, July 27, 1911.]

The effects of variation of the pressure, degree of humidity, and vitiation (deficiency of oxygen and excess of carbon dioxide) of the atmosphere on the luminous intensity of flames cannot be determined from the variations naturally occurring in an ordinary photometric testing room, except perhaps by deduction from the data obtained in a very prolonged series of observations made with exceptional care concurrently with extremely accurate determinations of the composition of the air. But in ordinary circumstances large variations, especially of one condition independently of the others, are necessarily rare; and the majority of the observations thus made will be of little or no utility in the investigation. Hence the ultimate conclusions even in this case will rest chiefly on a comparatively small proportion of the observations, and therefore, unless the work has been extended over a very long period, on only a small number of them. The investigation may be carried out in a much shorter space of time, and with greater trustworthiness, if the observations are made in a room or chamber provided with means by which one set of conditions may be varied at will to any desired degree almost or wholly independently of the other two sets of conditions. The authors have made the investigations of which the results are reported in this communication in such a room or chamber.

THE STEEL COMPRESSION CHAMBER AND ITS EQUIPMENT.

The effects of variations in the atmospheric pressure on the light afforded by the Harcourt ten-candle pentane lamp, and by the Hefner amyl-acetate lamp, were first studied. For this portion of the work, and for some of the later investigations also, use was made of a steel compression chamber designed primarily for physiological research on "caisson" disease or diver's palsy and mountain sickness. This chamber, which had been presented to the Lister Institute of Preventive Medicine by Dr. Ludwig Mond, F.R.S., was kindly placed at the disposal of the authors by Dr. Martin, the Director of the Institute. It is a short boiler of $\frac{3}{8}$ -inch (16 mm.) plate resting on its side. The ends are slightly dished steel plates $\frac{1}{2}$ -inch (13 mm.) thick. Inside, it measures 7 ft. 6 in. (2.29 metres) in length by 7 feet in diameter (2.13 metres), and has a capacity of 336 cubic feet (9500 litres). In one end is an elliptical manhole, 24 inches by 15 inches (609 mm. by 381 mm.), the cover of which is secured by large bolts and can be readily fixed or removed from outside the chamber. In addition to four spring valves, the chamber is provided with three simple valves by means of which the pressure can be completely controlled either from inside or outside. The pressure is raised or reduced by a simple compressor driven by a gas-engine; and it can be raised when required at the rate of about 2 lbs. per square inch (about 0.133 kilo. per sq. cm.) per minute. The circulation of air maintained by the pump was sufficiently rapid to prevent serious vitiation of the air of the chamber when two observers were present in it. The Harcourt lamp, when used, was placed below a hood directly connected with the outlet air-way from the chamber, so that the greater part of the products of combustion of the pentane did not mix with the air in the chamber before they were extracted from it. The efficiency of the ventilation of the chamber was checked by a determination of the proportion of carbon dioxide in a sample of the air taken while each set of photometric observations was in progress. These determinations were made by means of the portable apparatus for the determination of carbon dioxide in air devised by J. S. Haldane [*vide* "Journal of Hygiene," 1901, I., 109]. In the subsequent investigation of the effects of atmospheric vitiation on the light afforded by the Harcourt and Hefner lamps, the proportion of oxygen in the air was also determined by means of the portable form of gas analysis apparatus devised by J. S. Haldane [*vide* "Journal of Hygiene," 1906, VI., 74]. When necessary, an electric fan was used in the chamber to keep the air well mixed.

The chamber was provided with electric light and electric heaters, and a telephone communicating with outside. There were small stout glass windows in the ends. Two benches were arranged in the chamber. On one of them the photometer, with an electric standard lamp and the flame standard, was set up; the other was used for the air-analysis apparatus and accessories. The degree of humidity of the air was ascertained by means of an Assmann hygrometer [*vide* "Zeitschrift für Instrumentenkunde, 1892, XII., 1], which consists broadly of wet and dry bulb thermometers, over which a regulated current of air is drawn by means of a clockwork fan. A simple U mercury manometer, one limb of which communicated with the outside, was used for measuring pressures above normal; and the pressures below normal were read on a standard mercury barometer inside the chamber.

DESCRIPTION OF THE ELECTRICAL APPARATUS USED.

A small electric lamp was used as a standard. It was mounted on a carriage guided by V notches. A rod attached to the carriage, as in the Gas Referees' photometer, was used to adjust the position of the lamp. A scale was carried on the rod; and an index was fixed to the photoped.

For setting the filament of the electric lamp as exactly as possible at a measured distance from the photoped, metal plates pierced with vertical slits were fixed on each side of the lamp. The lamp having been removed, a thin steel rule was passed through these slits to form a stop for a measuring rod 30 cm. long. The other end of the latter rested against the face of the photoped. The steel rule and the measuring rod having been removed, the lamp was set up between the slits, and its position was adjusted until the filament was as nearly as possible in the plane of the slits. This setting was inspected from time to time; but after about twenty sets of observations had been made, it was found that the filament had warped, and that the warping was introducing an uncertainty of about 2 per cent. in the later sets of observations of the first series.

As no large battery of accumulators was available during the first series of experiments for giving a steady supply to an electric lamp, portable accumulators were used, and an Osram lamp intended to give 10-candle power at 10 volts was tried, and was supplied by six accumulators controlled by an adjustable resistance. But a comparison with the pentane lamp showed that the colours of the lights differed too widely to make accurate photometry possible until the light of the electric lamp had been reduced to about one candle. It was hoped that a metallic filament lamp thus used would have an enhanced "life," or, in other words, would vary less by ageing than if worked at 10 candles. But the result was disappointing. It might have been better if the lamp had been worked at constant volts; but with the view of eliminating the effects of imperfect contacts, adjustment was made for working at a constant current. Another defect in the arrangement was the use of the electric lamp with the filament erect instead of hanging downwards. Notwithstanding the low candle power at which it was worked, the filament warped as has been mentioned.

The lamp took about 0.66 ampere. The exact value of the current was of no importance; but when once settled it was carefully maintained.

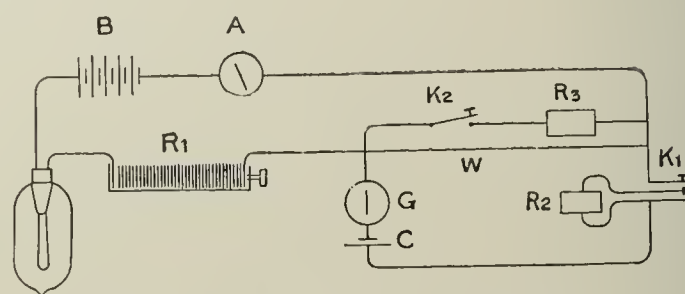


Fig. 1.—Diagram of Electrical Arrangements.

The arrangement used is shown in fig. 1. The lamp L was supplied with current from the five-cell battery B, the circuit was completed through an adjustable rheostat of carbon plates R, a manganin wire W of about 1.54 ohms resistance, and an ammeter A. In parallel with the wire W, a circuit contained a reflecting galvanometer G, a Weston cadmium cell C, and a double key K1. A light pressure of this key completed the circuit through the high resistance R2, which saved the cell from injury in case the lamp circuit was not completed. When an approximate adjustment of the current had been made, the key was pressed hard down and kept closed. Another circuit contained a resistance of 1000 ohms, R3, and a key K2. When the current was adjusted and the galvanometer G indicated zero, closing K2 gave a deflection corresponding to 0.35 per cent. difference of current. The current as a rule was kept steady within about one-tenth of this amount.

In the second series of experiments, a large battery being available, a Fleming-Ediswan photometric lamp standard was used, giving 10 candles at 60.05 volts with 0.7577 ampere. This gave no difficulty. The lamp-holder was double-wired, and the volts were measured with a potentiometer.

SCOPE OF THE INVESTIGATIONS.

The investigations were undertaken primarily to establish the corrections applicable to the Harcourt pentane ten-candle lamp when the atmospheric conditions were other than normal. It seemed desirable, however, while the arrangements for making such investigations were available, to extend them to the Hefner amyl-acetate lamp. Also a few observations were made on the effect of variations in the atmospheric conditions on the light afforded by the Metropolitan argand No. 2 gas-burner, by a flat-flame (slit or batwing) gas-burner, and by the English standard spermaceti candle. The results of these investigations, which were not so exhaustive as those on the Harcourt and Hefner lamps, will only be briefly mentioned at the close of this paper. Also the publication of detailed figures of the observations, and of certain deductions on the relations subsisting between the light

afforded by flames and the composition of the atmosphere, must be reserved for a subsequent communication.

PROCEDURE.

The procedure followed in making the testings was first to take photometric readings in the normal (or prevailing) conditions; and then to modify the particular atmospheric condition, the effect of variations in which it was desired to study, and take further readings. After several modifications of the same atmospheric condition had been made and readings taken, the original or normal conditions were, whenever possible, reverted to, and final readings taken therein as a check on the initial readings. In the earliest sets of observations, the readings thus obtained were corrected to normal in respect of variations in atmospheric conditions, other than those intentionally introduced, by applying Liebhenthal's or Paterson's formulæ, if available, or otherwise presumptive formulæ. The readings thus corrected were plotted on squared paper; and from the curve obtained therefrom the correction applicable to variations from the normal of the atmospheric condition which had been intentionally varied in the set of observations was deduced. This correction was applied in respect of the accidental variations in that atmospheric condition in subsequent sets of observations in which other atmospheric conditions were intentionally varied. By pursuing this procedure through a number of sets of observations in which first one and then another atmospheric condition was intentionally varied, the corrections applicable in each were gradually deduced with greater and greater freedom from uncertainty. Finally, the results of the whole of the sets of observations were re-calculated with the aid of the corrections so deduced; and the figures thus obtained were re-plotted, and any discrepancies thereby disclosed were examined. This procedure involved much tedious re-calculating of the results of the authors' observations; but it led ultimately to corrections being deduced, all of which were independent of the work or formulæ of other observers.

CORRECTIONS FOR VARIATIONS OF ATMOSPHERIC PRESSURE.

The experiments made to determine the corrections for variations of atmospheric pressure were all carried out in the steel compression chamber already described. The range of variation of pressure for the observations was from about 450 to 1000 mm. (or from about 17 $\frac{3}{4}$ inches to 39 $\frac{1}{2}$ inches). The results of the

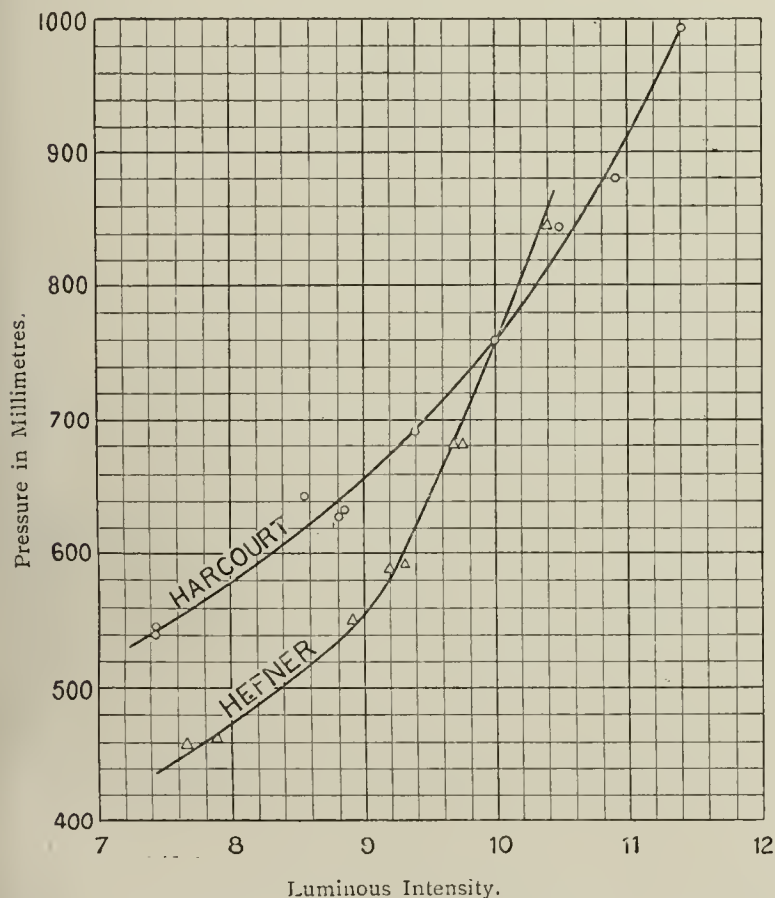


Fig. 2.—Effect of Variation of Pressure.

observations were ultimately corrected for the variations in the proportions of aqueous vapour and of carbon dioxide in the air (according to the formulæ referred to later), and the corrected figures thus obtained have been plotted and give the curves shown in fig. 2. The curves show that the relation between atmospheric pressure and the yield of light is not constant or expressed by a straight line. The falling off in the light with reduction of pressure is much greater at the lower than at the higher pressures.

Harcourt Lamp.—The curve for the Harcourt lamp is, however, nearly a straight line for the range of 700 mm. to 850 mm., and shows that within these limits the light increases or decreases by 1 per cent., with an increase or decrease respectively in pressure of 12.5 mm., or that a variation of 10 mm. in pressure is attended by a variation in the same sense of 0.8 per cent. in the light afforded by the lamp. These figures agree exactly with the correction deduced by C. C. Paterson ["Proceedings of the Institution of Electrical Engineers," 1907, Vol. XXXVIII, p. 280], which may

therefore be accepted as correct for variations of pressure at about the neighbourhood of normal. In regard, however, to the effect of variations of pressure elsewhere, the authors have failed to find a rational equation to the pressure curve for the Harcourt lamp,

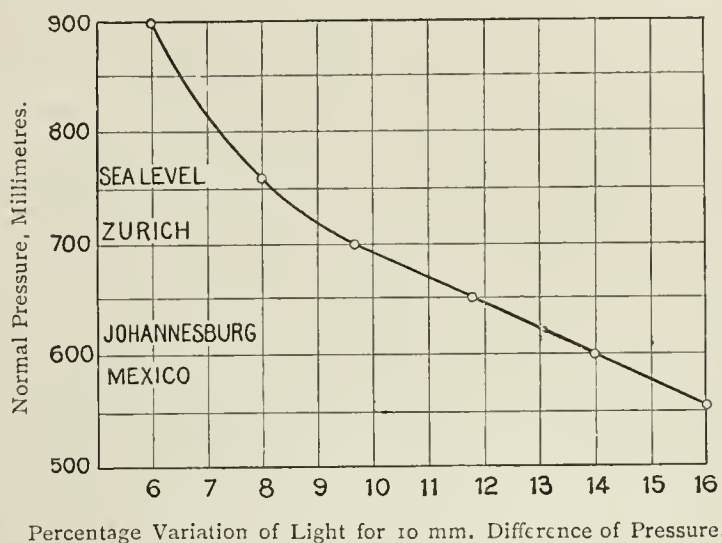


Fig. 3.—Curve of Correction Factor.

and prefer to give the curve of the differential coefficient (shown in fig. 3) rather than an empirical formula. By the use of this curve, the correction which should be applied to the Harcourt lamp for barometric variations at any place at which the mean barometric height is considerably below 760 mm. may be deduced.

Hefner Lamp.—The curve for the Hefner lamp is likewise nearly a straight line for the range of 700 mm. to 850 mm., and shows that within these limits the light increases or decreases by 1 per cent. with an increase or decrease respectively in pressure of 25 mm., or that a variation of 10 mm. in pressure is attended by a variation in the same sense of 0.4 per cent. in the light afforded by the lamp. These figures differ from the correction deduced by Liebhenthal from observations of the variation of the light of the Hefner lamp, caused by the natural fluctuations of the barometer between 735 mm. and 775 mm. Liebhenthal had adopted a formula according to which a variation of 10 mm. in pressure is attended by a variation of only 0.1 per cent. in the light. ["Zeitschrift für Instrumentenkunde," 1895, Vol. XV, 157, and "Praktische Photometric," p. 121.] Paterson mentions that he found for 10 mm. variation in pressure 0.2 per cent. variation in the light. The authors have therefore found that, about the neighbourhood of normal, variation of pressure has only half the effect on the light of the Hefner lamp which it has on that of the Harcourt; but, on the other hand, that it has for the Hefner lamp four times the effect shown by Liebhenthal's formula, which has been very generally accepted. The facts that the effect of small barometric changes—such as Liebhenthal had available—is small compared with the effect of the unavoidable changes in the proportions of aqueous vapour and carbon dioxide in the air, and that the proportion of the latter was not ascertained by Liebhenthal, indicate that his formula for the correction to be applied to the Hefner lamp for variations of barometric height does not rest on acceptable data. The authors ascertained the proportions both of aqueous vapour and carbon dioxide in the air during the observations, and applied corrections to eliminate their effects, while the greater range of barometric change which they had at their disposal reduced the effect of unavoidable errors of observation on the final result. For these reasons, they believe that their figure of 0.4 per cent. should now be accepted in preference to Liebhenthal's 0.1 per cent. for the effect on the light of the Hefner lamp of a change of 10 mm. in barometric pressure in the neighbourhood of 760 mm. In regard to the effect of variations of pressure in other regions of the barometric scale, the curve found by the authors coincides fairly well with the results of observations made by Liebhenthal in a pneumatic chamber, in which results, however, he appears to have placed but little reliance, because of the presence of a number of disturbing factors.

CORRECTIONS FOR VARIATIONS IN ATMOSPHERIC HUMIDITY.

The experiments made to determine the effect of variations in the humidity of the air on the light afforded by flames were carried out partly in the steel chamber already described and partly in a small room at the Electrical Standards Laboratory of the Board of Trade at No. 8, Richmond Terrace, Whitehall, London. This room was 4.03 metres (13 ft. 2 $\frac{3}{4}$ in.) long, 1.975 metres (6 ft. 5 $\frac{3}{4}$ in.) wide, and 2.45 metres (8 ft. 0 $\frac{1}{2}$ in.) high. There was no pump for renewing the air of the room, but a hood attached to a flue-pipe passing through the wall of the room was placed over the lamp, the heated products from which created a strong draught through the flue-pipe. The proportion of aqueous vapour in the air was increased as required by passing steam into the chamber or room from a small boiler placed outside it. A large range in the proportion of aqueous vapour in the air was secured by choosing dry, cold days, on which observations of the light of the lamps when the humidity was low could be made. The chamber or room having been heated by electric heaters, the air was then nearly saturated with steam at the high temperature. The range of humidity thus secured was from about 1 per cent. to over 4 per

cent. by volume of aqueous vapour in the air. Sets of observations on the Harcourt lamp showed that a change in the temperature *per se* of the air from 8° C. to over 20° C. had no definite effect on the light afforded. The steam introduced was well disseminated in the air of the chamber or room by means of an electric fan. In one set of observations, greater initial dryness of the air was secured by exposing trays of granulated calcium chloride in the room for twelve hours, while circulation of the air over the trays was maintained by the fan. The results of observations were in all cases corrected for variations in the barometric height and in the proportion of carbon dioxide in the air. The results showed that the light of both the Harcourt and Hefner lamps decreases by 1 per cent. for an increase of 0.16 per cent. in the aqueous vapour in the air, or that an increase of 1 per cent. in the aqueous vapour in the air is attended by a decrease of 6.25 per cent. in the light of the lamps. Liebenenthal found 5.5 per cent. for both lamps ["Zeitschrift für Instrumentenkunde," 1895, Vol. XV., p. 157, and "Praktische Photometrie," pp. 118 and 128], while Paterson has found 6.6 per cent. for the Harcourt and 6 per cent. for the Hefner lamp ["Proceedings of the Institution of Electrical Engineers," 1907, Vol. XXXVIII., pp. 276, 277] as the decrease in the light caused by 1 per cent. increase in the aqueous vapour in the air.

CORRECTIONS FOR VITIATION OF THE ATMOSPHERE BY COMBUSTION.

Experiments made to determine the effect of different degrees of vitiation of the atmosphere on the light afforded by flames were made on air vitiated, partially by breathing and partially by the combustion of pentane or illuminating gas. The ratio of carbon dioxide produced to oxygen consumed differs according to the composition of the fuel consumed, and the composition of vitiated air will, therefore, differ according as the vitiation arises wholly or mainly from breathing, from the combustion of a hydrocarbon body such as pentane, or of the mixture of a number of combustible gases, in which hydrogen predominates, which constitutes ordinary town illuminating gas. In the experiments made by the authors, the proportions of both carbon dioxide and oxygen in the vitiated air were determined by analysis, and the somewhat complex results obtained will be dealt with more fully in a subsequent communication. But taking the proportion of carbon dioxide in the air as the sole measure of vitiation caused partially by breathing, but mainly by combustion of paraffin hydrocarbons or town gas, it was found that 1 per cent. decrease in the light of the Harcourt lamp was caused when approximately 0.035 per cent. of carbon dioxide was present in the air, and in the light of the Hefner lamp with 0.045 per cent. Or the presence of 0.01 per cent. of carbon dioxide in the air was attended by a reduction of 0.29 per cent. in the light of the Harcourt, or of 0.22 per cent. in the light of the Hefner lamp. In the experiments on which these figures for the Harcourt lamp are based, the proportion of carbon dioxide in the air ranged from 0.09 per cent. to 2.54 per cent., and of oxygen from 20.80 per cent. to 17.40 per cent. With 2.54 per cent. of carbon dioxide and 17.40 per cent. of oxygen, the flame of the Harcourt lamp was blue and practically non-illuminating. The diminution in light is fairly uniformly proportional to the increase in the amount of carbon dioxide up to about 2 per cent. of the latter—*i.e.*, the curve given by the figures is nearly a straight line to that point. The experiments on the Hefner lamp were not made over so wide a range as those on the Harcourt lamp.

Some observations were made in an atmosphere in which the carbon dioxide was gradually increased by combustion to 1.87 per cent. while the oxygen in the air was maintained approximately at the normal percentage by a supply from a cylinder of compressed oxygen. These observations have no direct bearing on the effect of an ordinary vitiated atmosphere on the light of the lamps; but the results are interesting from a scientific standpoint, and will be published later.

GENERAL FORMULÆ FOR CORRECTIONS.

The corrections found for the Harcourt and Hefner lamps may be applied thus—

Let A = the accepted normal percentage of aqueous vapour in the air.

„ C = the accepted normal percentage of carbon dioxide in the air.

„ P = the accepted normal pressure of the air in millimetres.

„ a = the prevailing percentage of aqueous vapour in the air when the lamp is in use.

„ c = the prevailing percentage of carbon dioxide in the air when the lamp is in use.

„ p = the prevailing pressure of the air when the lamp is in use.

Then the actual light (I') of the lamp at the time, expressed in terms of its light (I) in normal conditions, will be found with sufficient accuracy for all practical purposes from the equations—

For the Harcourt lamp:—

$$I' = \frac{100 - \left(\frac{a - A}{0.16} + \frac{c - C}{0.035} - \frac{p - P}{12.5} \right)}{100} I$$

For the Hefner lamp:—

$$I' = \frac{100 - \left(\frac{a - A}{0.16} + \frac{c - C}{0.045} - \frac{p - P}{25.0} \right)}{100} I$$

EFFECT OF VARIATIONS IN THE ATMOSPHERIC CONDITIONS ON THE LIGHT OF GAS AND CANDLE FLAMES.

The results obtained in the observations made on the flames of the No. 2 "Metropolitan" argand, and the Bray $\frac{G}{L} 5 \text{ ft. } \frac{15}{10}$ slit flat-flame gas-burners, when consuming the gas supplied in Chelsea and Westminster by the Gaslight and Coke Company, and on the flame of the English parliamentary standard spermaceti candle, must not be accepted as so trustworthy as those given for the Harcourt and Hefner lamps, because they are based on fewer observations. These results are therefore given with reservation in the following tabular statement:—

One per cent. decrease of light is caused approximately by the following changes from normal.			
	Pressure.	Aqueous Vapour.	Vitiation expressed by % CO ₂ .
No. 2 "Metropolitan"			
argand gas	— 25 mm.	+ 0.20 per cent.	+ 0.03 per cent.
Flat-flame gas	— 5 mm.	+ 0.11 "	+ 0.035 "
Spermaceti candle.	— 20 mm.	+ 0.50 "	+ 0.04 "

These results indicate that small variations in the atmospheric conditions of a gas-testing room will not appreciably affect the results of photometric comparisons in which the Harcourt or Hefner lamp is used as the standard of light, and that these standards will give as accurate results as are anyhow practically obtainable in determinations of the illuminating power of gas if they are used in all ordinary circumstances without correction for any divergence from normal atmospheric conditions. In other circumstances, however, as in the testing of electric lamps by a flame standard, corrections are called for.

DIVISION OF THE WORK OF OBSERVATION.

The whole of the work involved in the investigations has been carried out by the authors personally. The work of making the observations was shared in this way: Mr. Butterfield remained in the experimental chamber or room and made all the photometric readings and a few air analyses, &c.; Dr. Haldane was also in the chamber or room except on a few occasions when the ventilation was inadequate and the presence of a second observer would have caused undesirable vitiation of the air. He made nearly all the analyses of air and readings of the hygrometer and other accessory apparatus in the chamber or room, controlled the atmospheric conditions therein, and generally directed the course of the investigations. Mr. Trotter had entire charge of the electric standard lamps used and controlled them from outside the chamber or room. When variations in the light of gas-flames were being investigated, Mr. Trotter also made, simultaneously with the observations proceeding in the experimental room, observations of the illuminating power of the gas on a photometer which had been set up outside the room, in order that due allowance might be made for fluctuations in the illuminating power of the gas.

Use of Tar for Road Making.

In the course of a paper on "The Construction, Maintenance, and Repair of Highways," submitted by Mr. W. Astley Norris, the Surveyor to the Swaffham Urban District Council, at a meeting of the Eastern District Section of the Institution of Municipal Engineers at Yarmouth last Saturday, he said the most successful system of treating roads is that of tarring furnace slag. The method of preparing this road material, as in most cases of tar macadam, is to thoroughly dry the stone by heating, and then to apply hot tar and mix thoroughly. Limestone was very extensively used at first, and selected for tar macadam, on account of its absorbent properties; while dense blast-furnace slag of best quality—a harder and comparatively better wearing material—has since been largely adopted. Mr. Norris expressed the opinion that where roads have a good face, and it is possible to tar-wash the surface at least once every four months, tar as a surface binder will undoubtedly be a success. It will not, of course, make a weak road, subject to disintegration from below, a strong one. The failure of tar macadam has been in great measure due to inability to get the tar to adhere to the material to be tarred.

Gas Coke in Germany.—In a recent paper on gas coke, by a German author, it is stated that there are still great differences in the methods of calculation employed in modern gas-works, as the extremely divergent figures for the yields of coke indicate. The results from a few towns are quoted in illustration by the "Iron and Coal Trades Review." The coke produced from Silesian and Saar coal is as follows: Munich, 66 per cent. by weight; Nuremberg, 77 per cent.; from English coal, Copenhagen 76 per cent., Königsberg 66 per cent.; and from Ruhr coal, Cologne 75 per cent., Elberfeld 70 per cent. Breslau, which works with Silesian coal only, and should therefore have one of the lowest productions, stands, with 73 per cent. by weight, far in front of Berlin, which gasifies a preponderance of English coal, and attains only to some 71 per cent. yield of coke. At the end of the last and the beginning of the present century, the production of gas coke increased much more rapidly than the population; and there was great depression in prices. In time, this was changed by the diminution of the amount of coke brought on to the market, owing to its use for water-gas production and by steaming in vertical retorts, while the quality was improved.

THE FLOW OF GASES IN PIPES.*

THE work by Dr. Viktor Blaess, of the Technical College at Darmstadt, which is now before us, deals in a comprehensive manner with the subject of the flow of gases in pipes and the calculation of the dimensions of extensive systems of tubes and passages. Installations for the supply and removal of air, for the ventilation of mines, for the transport and distribution of gas, and of pneumatic tubes for conveying goods, are included in the treatment which Dr. Blaess gives to the subject.

The work comprises a small volume of text with 72 illustrations, and a large volume of diagrams. There is a separate diagram for every size of pipe, commencing at a diameter of 70 mm. ($2\frac{3}{4}$ inches) and rising by 10 mm. ($\frac{3}{8}$ inch) to 500 mm. (20 inches). From 500 mm. to 800 mm. (20 to 32 inches), there is a separate diagram for each size, rising by 20 mm. ($\frac{1}{2}$ inch) increase in diameter. Sizes differing by 50 mm. (2 inches) have each a separate diagram for diameters of all pipes ranging from 800 to 1200 mm. (32 to 48 inches). Above 1200 mm. (48 inches), there is a separate diagram for each size, increasing by 100 mm. (4 inches) to a diameter of 2000 mm. (about 6 ft. 7 in.). From the latter diameter, up to a diameter of 4000 mm. (13 feet), the intervals between the sizes for which a separate diagram is given are 200 mm. (8 inches). There are thus in all 85 plates intended to facilitate the calculation of the dimensions of plain, jointed, and ramifying systems of pipes and passages for conveying gases, and air in particular.

The first chapter of the book of text is devoted to a short historical review of the fundamental ideas underlying the treatment of the subject of the flow of gas in pipes. The second chapter deals with the principal experimental results. In it the value of λ , which in the earliest works on the flow of gas was assumed to be a constant, is discussed. The formulæ for determining the value of this coefficient propounded by Weisbach, Blochmann, Grashof, Rietschel, Biel, and Pctit are quoted; and the author finally adopts a formula based on investigations of his own, which agrees well for pipes of large sizes with Rietschel's formula, and for pipes of small sizes with Biel's formula. This formula is:

$$\lambda = 0.0125 + \frac{0.0011}{D}$$

The value given by this formula has been worked out for each size of pipe, and is stated at the head of each diagram.

The author states that this value may be taken as an average answering well for all practical conditions. The loss of pressure, H , in a pipe, expressed in millimetres of water, then becomes:

$$H = \lambda \frac{l}{D} \frac{\gamma v^2}{2g}$$

in which the diameter (D) and the length (l) of the main are in metres, the velocity of flow (v) is in metres per second, γ is the specific gravity of the gas stated in kilogrammes per cubic metre, and $g = 9.81$ metres per second.

The third chapter discusses the size of a stretch of main in relation to industrial conditions—i.e., whether a small main with a high fall of pressure or a large main with a low fall of pressure should be employed. The question of interest charges, hours of use per diem, &c., are shown to be important factors in deciding the size of main. The fourth chapter describes how to determine the equivalent cross section of a pipe. The loss of pressure due to friction is shown to depend only on the square of the velocity of the gas in the pipe for the same length and size of pipe. The size (F_{ae}) of a smooth, conical mouth which will pass the same volume of gas (Q) in cubic metres per minute as would go through the pipe under consideration is found from the formula:

$$Q = 60 F_{ae} \sqrt{\frac{2gH}{\gamma}}$$

For atmospheric air at normal temperature, the value of γ is 1.226; and hence it is found that for air:

$$F_{ae} = \frac{Q}{240 \sqrt{H}}$$

Each diagram has a curve from which the value of F_{ae} in square metres may be directly read off for any length of pipe for the diameter to which the diagram refers.

The value of F_{ae} may refer to the pure friction equivalent F_{ρ} , which bears to the cross section F_r of the pipe the ratio:

$$\frac{F_{\rho}}{F_r} = \sqrt{\frac{D}{\lambda l}}$$

From this it appears that, if the pipe is of infinite length, the value of F_{ρ} is zero, and that with short lengths of pipe it may even be greater than F_r .

The next chapter relates to the geometry of flow in pipes. In it the effect of a contracted end of the pipe on the flow is discussed, and an expression is found for the equivalent, in square metres of cross section, of the effect. Two primary cases are considered—viz., (1) that of a simple pipe with an outlet of different size; and (2), the resistance due to a sudden change in the cross section. The equivalent F_{ae} then refers to the sum of

the resistances due to friction and the contraction or successive contractions.

Two examples quoted from the explanatory matter will make the use of the diagrams in these respects clear. In the first case, let it be assumed that there is a pipe 200 mm. (about 8 inches) in diameter, and 14 metres (46 feet) in length. The equivalent F_{ρ} of the resistance due to friction for a pipe of this size and length is found at once from the curve on the corresponding diagram to be 0.0280 square metre (0.3 square foot). Ignoring resistances at the ends of the pipe, if there is a pressure of 25 mm. (1 inch) of water, the pipe will transmit water gas of specific gravity $\gamma = 0.71$ kilogrammes per cubic metre at the following rate, according to the formula:—

$$Q = 60 F_{\rho} \sqrt{\frac{2gH}{\gamma}}$$

$$\therefore Q = 60 \times 0.0280 \times \sqrt{\frac{2 \times 9.81}{0.71} \times 25}$$

$$= 44.1 \text{ cubic metres (1557 cubic feet) per minute.}$$

In the second case, a pipe 410 mm. (about 16 inches) in diameter and 50 metres (164 feet) in length is contracted at the outlet to a cross section of 0.1 square metre (1.076 square feet). On referring to the intersection in the diagram for pipes 410 mm. in size of the figure 0.1 on the scale of ordinates and the figure 50 on the scale of abscissæ, it is found to be traversed by a curve which gives the value 0.07 square metre (0.75 square foot) for F_{ae} , the equivalent of the effect of the contraction. If it is desired to transmit through this pipe 120 cubic metres (4240 cubic feet) per minute of gas having a specific gravity equal to 0.45 kilogramme per cubic metre, then inserting the value of F_{ae} found from the diagram in the formula:

$$H = T \left(\frac{Q}{60 F_{ae} \sqrt{\frac{2g}{\gamma}}} \right)^2$$

$$\text{the result is } H = \left(\frac{120}{396 \times 0.07} \right)^2 = 18.8 \text{ mm. (= 0.74 inch).}$$

Therefore, the fall of pressure in transmitting gas at the rate stated in these conditions will be 7.4.10ths of an inch of water.

The sixth chapter of the text refers to the calculation of branch pipes when the pressure is positive; and the seventh, to when it is negative. The eighth chapter relates to pipes or conduits of other than circular cross section, and in particular to rectangular passages. The ninth chapter is a short one on the theory of mine ventilation. The tenth chapter deals in a comprehensive fashion with the behaviour of branch pipes when various modifications are introduced in the system. The eleventh chapter refers to the theory of branch pipes in relation to economic laws; while the twelfth chapter deals with the determination of the sizes of pipes for a new distributing system—whether for the transport of gas, or for ventilating, or for the pneumatic carriage or removal of materials.

The practical use of low-pressure mains is the subject of the thirteenth chapter. It is discussed chiefly in regard to the pneumatic transmission of spheres of different materials, and of dust in various industries. The theory of fans is reviewed in the fourteenth chapter; while the fifteenth and last chapter in the book of text relates to the measurement of pressure and velocity in pipes and conduits.

In regard to the use of the diagrams, it is pointed out that it is often advantageous to introduce into the calculation in place of the actual length of pipe that length *plus* an addition which represents the equivalent of some special resistance, such as that offered by bends. The length (L_{ae}) of pipe equivalent to a normal bend is found from the expression $l_{ae} = 10D$, in which l and D represent length and diameter of main in metres. Another case in which an equivalent length may with advantage be introduced into the calculation is when the coefficient of friction (λ) of the gas is other than the average value (λ) which is applicable in most cases. The equivalent length (l_{ae}) which is then introduced is found by the formula:

$$L_{ae} = \frac{\lambda l}{\lambda}$$

Another case in which the equivalent length is of service is when a pipe is to be used for the pneumatic transmission of material. The proportion of material to air, and the ratio of the specific gravity of the material to that of air enter into the formula from which the equivalent length is deduced in this case.

We have said enough to indicate the general scope of Dr. Blaess' valuable work. We know of no modern treatment of the subject of the flow of gases in pipes, &c., which is at once so comprehensive, exhaustive, and withal so concise and practical. It is not written for the gas engineer in particular—his use of the formulæ and diagrams is, indeed, only one out of many to which they may be put, and he would perhaps have preferred to have the others excluded from consideration. But the general treatment, based on fundamental laws and crucial experiments, which Dr. Blaess has adopted, is, after all, of greater general utility; and the distributing gas engineer will not find that it involves him in much extra trouble. To apply the formulæ and diagrams forthwith the English engineer will, of course, have first to convert his measurements into their metric equivalents; but when this has been done, he will have at his disposal the results of the latest theories and experiments on the flow of gases embodied in convenient formulæ and well-arranged diagrams.

* "Die Strömung in Röhren und die Berechnung weitverzweigter Leitungen und Kanäle" von Dr.-Ing. Viktor Blaess. Two Vols. R. Oldenbourg, Munich and Berlin; 1911.



A Side View of the Gas Company's Exhibit.

A GAS DISPLAY IN NEW ZEALAND.

Wellington Gas Company's Striking Exhibit.

IN Wellington (N.Z.) there is being held an Industrial Exhibition, in two brick-store buildings belonging to the Harbour Board, together with a temporary building connecting them. The lighting of the smaller of the two buildings was entrusted to the Gas Company, and that of the larger building and annexe to the Electrical Department of the City Council, who adopted Osram lamps internally and flame arcs externally. The Gas Company fitted the Keith high-pressure system of lighting for their building, and ordinary lighting under 3-inch pressure for their stall and cooking. Externally, the entrance to the building is lit by one 4500 and two 1500 candle power Keith lamps.

The building lighted by the Gas Company is 260 feet long by

70 feet wide, with a gallery all round, leaving a central well-hole 32 feet wide. The building is lit inside by five lamps of 1500-candle power hung in the roof, two lamps of 500-candle power suspended under the gallery at each end of the building, and rows of 100-candle power inverted burners spaced about 14 feet apart—one series below the gallery level and hanging from the front of it, and another series spaced centrally above the gallery. Mr. William Ferguson, the Managing-Director of the Gas Company, has forwarded a series of daylight photographs illustrating the Company's stall, which is in the centre of the building, with an adjacent stall under the gallery for the compressing-machinery. The moving machinery is placed apart from the main stall, so as to obtain facilities for drainage and ventilation through the outside wall. The stall holds a Keith compressor, a gas-engine driving a rotary compressor as a stand-by, ventilating fans, &c., and an exhibit by the Welsbach Company of mantle-making.

The central stall (47 feet by 19 feet) is divided into a cookery



A Side View of the Gas Company's Exhibit—Showing the Bath-Room Corner.



End View of the General Stall.



The Compressing Machinery.

demonstration theatre seating 36 people, a corner of a kitchen, a corner of a bath-room, and a corner of a sitting-room, together with open space for general exhibits. Above the roof of the four triangular rooms is built a pyramid of gas-cookers manufactured by the Company. These cookers ("W.G.C.") are made in the Company's workshops from local castings, and have sheet-steel sides lined with asbestos board. They have four burners on the open top, with enamelled top plate and a large oven; and they are supplied and fixed on a tiled base in Wellington for £2 10s., or are fixed on hire at 2s. per month. A gas-circulator is fitted up in the kitchen, from which hot water is laid on to the sinks in the kitchen and demonstration-room and to the bath and lavatory basin. The Company make copper bath-water heaters of several types; and one of these is fitted up with a glass cylinder to explain the action to the public. Electric gas-lighters of various patterns are installed on several lamps; and high and low pressure laundry irons are on exhibit—demonstrations of laundry work being held at intervals. There is also an exhibit in another part of the building by a laundry, where high-pressure gas-irons are used and other gas-heated laundry appliances are in daily use. The Company are exhibiting their own manufacture of a large cooker for hotel purposes and appliances for pastry-cooks. The stall has been made as attractive as possible by the display of plenty of plant in motion—as, for instance, a gas-mantle tester, gas-flashing signs, gas burning under water in a Smethurst burner, water-heaters, glass meters in action, &c.

Mr. Ferguson informs us that the Keith high-pressure gas-lighting installation has been most satisfactory in every way—the internal lights more especially. Owing to the shape of the building, with heavy gallery, and no windows below the gallery, the private stall-holders have had to provide special lighting, which the Company have carried out with 100 and 300 candle power inverted high-pressure lamps as required by each stall-holder. The large lamps are lit by a bye-pass off the low-pressure service, which service was previously in position and supplied the Lucas lamps suspended in the roof which normally lit the store. In Mr. Ferguson's opinion—and he believes in that of many of the general public—the gas lighting has compared more than favourably with the electric lighting. The Corporation have a large stall, and show cookers, toasters, boiling kettles, and hot-plates, with radiators and other appliances; but, though exhibiting these, and holding cooking and baking demonstrations, they have not, so far as can be learnt, made public any tests as to the quantity of current used.

As the Corporation supply the electrical street lighting, the Gas Company cannot expect to profit much from the exhibition of high-pressure gas; but they have at present a large proportion of the external lighting of shop fronts by one, two, and three light upright mantle lamps placed under the verandahs. It is therefore possible that some of these lamps in selected positions could be replaced by a system of high-pressure parade lighting. The Company have at present in hand the supply of part of a suburban borough by a high-pressure system, with a small quantity of street lighting. They are also negotiating with two suburban bodies for the supply of gas by means of a high-pressure system, which, if the arrangement can be completed, will enable the Company to show what can really be done for both street and domestic lighting.

At Hyde Chapel, Gee Cross, a few days ago, the marriage was solemnized of Mr. Philip C. Potts, son of Mr. Charles Potts, the Secretary and Manager of the Hyde Gas Company, and Mrs. Potts, of "Braehead," Hyde, with Miss Edith Cheetham, daughter of Mrs. Fred W. Cheetham, of Windsor House, Hyde. After the ceremony, there was a reception at the residence of the bride's mother; and later in the day Mr. and Mrs. Potts left for North Wales. In anticipation of the happy event, Mr. Potts was presented by the employees at the gas-works with a pair of engravings, framed in satinwood, in token of their regard for him.

PROPOSED REGULATIONS FOR PITCH-WORKERS.

A QUESTION put to the President of the Local Government Board last week by Mr. Haydn Jones, the Labour Member for Merionethshire, on the subject of the possible injury to the health of pedestrians and others by the tarring of road surfaces, revealed the fact that the medical authorities of the Home Office have drafted some regulations to be applied to people engaged in the manufacture of patent fuel with the addition of pitch. Mr. Jones said these regulations showed that workers with pitch made from gas tar were particularly liable to cancer; and he wished to know what precautions had been taken to prevent the possible spread of this disease in the way he mentioned. Mr. Burns informed the honourable member that the proposed regulations were intended to minimize the risk of constant working in connection with tar. But he had not seen any evidence that risk was incurred in walking or driving over tarred roads; and he did not believe in the likelihood of any such risk. In view of this incident, it may be of interest to record the circumstances which gave rise to the drafting of the regulations.

It appears that one of the diseases added to the third schedule of the Workmen's Compensation Act, on the recommendation of the Committee on Compensation for industrial diseases, was a form of cancer, or ulceration of the skin of the corneal surface of the eye, occurring in the handling or use of pitch, tar, or tarry compounds. The Committee found that men engaged in unloading pitch from vessels or railway trucks, in the manufacture of briquettes, or in handling coal oil in making grease, were liable to suffer from warty growths which ulcerated, and occasionally became the seat of the form of cancer specially in question. Particles of pitch striking the eye tended to set up severe inflammation of the conjunctival mucous membrane and cornea; and it was stated that where injury occurred to the eyes by pitch, they generally did very badly. The Committee explained that "a breach of surface caused by the chemical action of the pitch particle gives entrance to bacteria which induce a septic inflammation involving the cornea and other structures of the eye; so that danger of loss of sight is considerable." Indeed, they saw a case of blindness which had resulted in this way. There was a general consensus of opinion that the cancerous condition here referred to could be prevented by scrupulous cleanliness—indeed, ablution of the body was an almost certain safeguard against the more malignant form of the disease among briquette workers, whose habits were closely investigated.

The subject was fully dealt with in a special report presented to the Home Office by Dr. T. M. Legge, His Majesty's Medical Inspector of Factories, who drew up the series of regulations to which reference was made in the question put to the President of the Local Government Board. They are to apply to all factories and workshops in which the manufacture of patent fuel with the addition of pitch is carried on, except those in which "no pitch other than blast-furnace pitch is used in the manufacture of briquettes." The regulations are divided into two parts—those in the first to be observed by the occupiers, and those in the second by the employees. They are as follows:

PART I.—Duties of Occupiers.

1.—There shall be provided and maintained in a cleanly state and in good repair (a) suitable bath accommodation (douche or other), in the proportion of at least one bath for every five persons employed on a shift, including hot and cold water or warm water laid on, and a towel and soap for each such person, the towel to be washed and renewed when necessary; (b) a lavatory with a sufficient supply of clean towels, renewed daily, and of soap and nail brushes, with either a trough with a smooth impervious surface, fitted with a waste-pipe without plug, and of such length as to allow at least 2 feet for every five persons employed on a shift, and having a constant supply of warm water from taps or jets above the trough at intervals of not more than 2 feet; or at least one lavatory basin for every five persons employed on a shift, fitted with a waste-pipe and plug or placed in a trough having a waste-pipe, and having either a constant supply of hot and cold or warm water laid

on, or (if a constant supply of heated water be not reasonably practicable) a constant supply of cold water laid on and a supply of hot water always at hand when required for use by persons employed; (c) suitable overall suits for all persons employed, which shall be washed or renewed at least once every week; (d) a suitable place or places for the deposit of clothing taken off during working hours and for the storage of overall suits.

2.—All disintegrating machines and elevators, conveying the mixture of coal and pitch to the pug-mill or stove, shall be encased, except at the point where charging is done.

3.—There shall be provided and maintained in good condition wire goggles, or other equivalent protection for the eyes, for persons employed in unloading, digging, breaking, or crushing pitch.

PART II.—Duties of Persons Employed.

4.—Every person employed in unloading, digging, breaking, or grinding pitch or in the manufacture and actual handling of briquettes shall take a bath at the works at least every alternate week day; and persons employed in any other work in briquette factories than that defined shall take a bath at the works at least once a week: Provided that this regulation shall not apply in the case of a workman who is unwell or who can produce a medical certificate stating that such bathing would involve risk in his then state of health.

5.—Every person employed shall (a) provide himself with two suits of clothes, one of which shall be worn at work and the other when leaving the factory; (b) wash before leaving the works for meals or at the end of the day when a bath is not taken; (c) wear the overall suit provided under Regulation 1 (c), and deposit it, and clothing put off during working hours, in the places provided under Regulation 1 (d).

6.—Every person employed in unloading, digging, breaking, or crushing pitch shall wear the means provided under Regulation 3 for protecting the eyes.

7.—No person, unless duly authorized, shall remove from the works any article provided under Part I. of these regulations.

GAS AND SMOKE.

Mr. H. RIDDELL (a Belfast Town Councillor) contributed a paper before the Engineering Section at the Royal Sanitary Institute Congress at Belfast last Friday.

He remarked that the chief offender against the clear sky is the domestic hearth, although the small factory and the chemical and other industries employing furnace heat are factors. In the generation of steam double the coal is used that is needed; but in the private house, six times. Many contrivances have been invented to enable ordinary bituminous coal to be consumed smokelessly; but the complication and consequent trouble and expense will always prevent such inventions coming into general use. The employment of some form of smokeless fuel appears to be the only remedy likely to be useful; and this fuel may be either solid or gaseous. The liquid fuels may all be left out of account for domestic use.

The difficulty arises from the composition of coal and the nature of its combustion under ordinary circumstances. Coal may be regarded as a mixture or loose chemical union of carbon with hydrocarbons of the order of the paraffins, together with compounds of carbon, hydrogen, and oxygen of the class of cellulose or its polymers, and accompanied by some rather complex nitrogen compounds of considerable value as bye-products in the manufacture of coal gas. The proportions of the volatile matters vary very much; so that coal cannot be represented by any chemical formula. But the following (in which the numbers are only approximate) may be taken as a typical analysis of a strong gas-producing fuel:—

C	O	H	N	S	Ash
79	9	6	2	1	3 = 100

When coal is heated in mass, and the temperature rises gradually, there first passes off a mixture of hydrogen and the heavier hydrocarbons carrying also quantities of finely-divided carbon—possibly itself derived from some very loosely bound compound of carbon and hydrogen. As this mixture is given off at temperatures far below ignition-point, it passes unburned to the flue, and appears as dense smoke. As the temperature increases, the proportion of loose carbon falls. The hydrocarbons are of a somewhat lighter type. Carbon monoxide also passes off; and the smoke fades through various shades of brown to grey, and finally disappears. It is not carbon alone which reaches the atmosphere and taints it, but carbon monoxide, ammonia, sulphuretted hydrogen, and various unburnt hydrocarbons. The loss of heat is enormous. When one pound of carbon is fully burnt to carbonic acid, there is developed about 14,500 B.Th.U. of heat; but if carbon monoxide alone is formed, the heat produced will only be about 4400 units. Thus 70 per cent. of the available heat of the carbon in this reaction is sacrificed, while a highly poisonous gas is delivered into the air. It cannot be too strongly emphasized that carbon dioxide, or carbonic acid, is harmless if not present in such quantity as to prevent the due access of oxygen to the lungs. It may, without the slightest injury to health, be present in ten or twenty times the normal amount. But carbon monoxide is a deadly poison, which the blood will greedily absorb even if present in only small quantity in the air inspired.

There are two classes of solid smokeless fuel available for ordinary use—anthracite coal and coke. The former has lost by natural means the greater part of its volatile constituents, and may be regarded as essentially carbon and ash. It is very diffi-

cult to ignite, and impossible to burn in an ordinary grate. There are many circumstances in which anthracite stoves are useful; but a living-room is not one of them. Direct radiation from a glowing bed of fuel plays but a small part in their heating effect, depending as it does so largely upon convection of the heated air and dark radiations from the metal of the stove. It seems certain that direct radiation from an incandescent mass is the most sanitary and comfort-giving method of heating. It is not meant that only the shorter-wave radiation is useful; rather should it be understood that a proper combination of radiation and convection is to be preferred—the heat varying in proportion from the two sources as circumstances are best suited. For comfort in an ordinary living-room, the greater part of the heating effect is best obtained from radiation; and there is good reason to believe that from a sanitary point of view the same has to be said. The radiant heat from glowing fuel passes freely through the air of the room without materially raising its temperature. It falls upon the walls and the furniture; warms their surfaces; and thence the air is warmed. When convection alone is depended upon, the walls of a room remain at a low temperature in comparison with that of the air, and there is a chilling exchange between the body and surrounding objects. It may be noticed that the temperature of a room heated by convection requires to be kept much higher than where radiation is the chief source; and certainly in this country nothing but a fireplace deriving most of its effect from radiation has any chance of general adoption.

Ordinary gas-coke presents a like difficulty with anthracite, but in less degree. It is difficult to ignite; but when the draught is good, and the bed of fuel fairly thick, it burns well in an ordinary grate if once ignited. There are some special cokes, produced by stopping the carbonization before all the volatile matters have been driven off; and these will ignite almost as easily as coal, and burn as freely and as brightly. In Belfast, however, no more coke is produced than is sufficient to meet the demand from trade uses; and none is available for the private dwelling. It may be that certain developments in progress will allow of the Gas Department experimenting in the production of a coke cooled without water and in the absence of air, by which means a very freely burning fuel is obtained. At present, however, the especially useful and available smokeless fuel is town gas. It is, of course, impossible for private dwellings to manufacture gaseous fuel; so that a supply, if required, must be drawn from town mains.

There has of late years been a great advance in the use of gaseous fuels, both for heating purposes and the generation of power. So great has been the effect upon the production of ordinary gas, that at present a very large proportion of any supply is absorbed for such purposes. Only in a very few places have separate mains been laid for the distribution of gas for heating and power as distinct from the lighting supply; and it seems probable that in future—considering that illumination now depends almost solely on flame temperature—a service of high-pressure mains may well supply both purposes.

A very great advance has been made in the construction of gas-stoves of all kinds; and they are steadily becoming extremely popular. In Belfast, the Gas Department have sold or supplied on hire no fewer than about 20,000 stoves; and their number is steadily increasing. There are three classes of heating stove in use—those depending solely upon convection for their efficiency; those which combine radiation with special arrangements for convection; and those which depend mainly upon radiation from a glowing mass for their heating power. In the first class must be placed all the flueless stoves, which deliver the products of combustion, with or without condensation of the water vapour, into the air of the room. These are altogether unsuited to a living-room, or to any place which is not very freely ventilated. They are used with advantage in halls and corridors, or in shops where the ventilation is large; and they attain a high economy, as practically all the available heat of combustion is made use of. In the second class must be placed those stoves which have special gills or heating chambers provided—warming air and distributing it into the room, as well as providing radiation from an incandescent mass. In many cases these stoves are most useful. Pure air can be drawn from outside the house and delivered in continuous supply into the room, so that a constantly pure breathing atmosphere can be obtained.

For bedrooms, where a mild temperature is called for in winter, such stoves are very valuable and economical. Even if the convection effect predominates to such an extent that the walls of the room are slightly colder than the air, it matters little. The coverings can be easily suited to prevent any heat exchanges from the body, and the temperature can be accurately maintained for hours at the same degree. For very large rooms, such stoves seem also to be suited; but for ordinary living-rooms those which depend upon direct radiation are greatly to be preferred. There has been much improvement the last few years in the efficiency of stoves of the latter class; and experiments conducted with great care in the laboratories of Leeds University have made it certain that stoves are at present being produced which pass 50 per cent. of the heat of combustion by direct radiation into the air, while only a comparatively small proportion passes away among the escaping flue-gases. In an ordinary coal-fire fully 75 per cent. of the heat of combustion is carried off in the flue-gases; while, for cleanliness and convenience, the gas-fire is unquestionably much superior.

Gas-Fire.								Coal-Fire.							
Time.	Gas. Cubic Feet per Hour.	Thermometer Readings.						Time.	Fuel Used.	Thermometer Readings.					
		5 Feet above Floor.			At Ceiling.					5 Feet above Floor.			At Ceiling.		
		Dry.	Wet.	Humid- ity.	Dry.	Wet.	Humid- ity.			Dry.	Wet.	Humid- ity.	Dry.	Wet.	Humid- ity.
11 a.m. . .	22	39	37	84	39	37	84	11 a.m. . .	7 lbs.	39	37	84	39	37	84
11.30 a.m. .	"	41	39	84	42	40	85	11.30 " . .	(1 lb. sticks)	43	40	78	42	39	78
12 noon . .	"	44	41	77	45	42	78	12 noon . .	7 lbs.	45	42	78	45	42	78
12.30 p.m. .	"	44	41	77	45	42	78	12.30 p.m. .	"	45	42	78	44	41	77
2.30 " . .	"	48	44	73	50	45	68	2.30 " . .	7 lbs.	47	44	79	47	43	73
3 " . . .	"	48	44	73	50	45	68	3 " . . .	"	46	43	79	45	42	78
3.30 " . .	"	49	45	73	51	46	68	3.30 " . .	"	50	45	68	51	45	63
4 " . . .	"	50	46	74	53	47	64	4 " . . .	"	52	47	69	53	48	69
5 " . . .	"	51	46	68	53	48	69	5 " . . .	"	51	46	68	53	48	69

Very exhaustive experiments were conducted in Glasgow in the winter of 1909, in which heating of rooms of exactly the same position, dimensions, and other circumstances was done both by gas and coal, and the effect carefully observed. As representative of the results, the above pair of records taken at random may be cited.

It will be seen how closely the temperatures and the humidity of the air correspond in the two cases. This experiment does not show, as do some of the others, the immense advantage in quickness of action and regularity of the gas; yet the absence of oscillation is perceptible. As to comparative economy, 21 lbs. of coal at 13½d. per cwt. amounts to 2'53d.; 132 cubic feet of gas at 2¼d. per 1000 cubic feet, equals 2'74d. So that at Belfast prices there is ½d. against the gas. But no allowance has been made for the sticks. As to comparative convenience and cleanliness in the room, nothing need be said; while as regards the contribution to atmospheric pollution, the following figures are decisive. In the flue-gases from the coal-fire, certain impurities were present in the proportion per million cubic feet of 13'58 lbs. of carbon and other solid matters, with 5'4 lbs. of unconsumed hydrocarbons. There were also present 24'17 parts per 100,000 of CO, and 1'36 parts of SO₂, with some quantity of ammonia. In the flue-gases from the gas-stove not a particle of solid matter was found, and only traces of the other impurities. As regards the air of the room itself, purity was maintained; ventilation was good; and the humidity was quite satisfactory.

There is no doubt that the gas consumption in many fires has been too large; but modern stoves are showing distinct advance in this respect, while care in setting will allow a greater effective result from the same consumption of gas. For example, there has been too great readiness to close-up all openings into the chimney, except through the flue of the stove. This is in general a mistake, as there is caused thereby an intensity of draught much greater than is necessary to carry away the products of combustion—thus drawing an undue proportion of cold air across the radiating bed, and cooling it unnecessarily. The burner must be properly adjusted to both quality of gas and pressure. It, therefore, follows that it is a prime necessity in modern gas supply, where even the lighting effect depends upon flame-temperature, that the gas should be delivered to the consumer constant both in composition and in pressure. It is impossible to properly adjust a burner which deals with gas requiring varying proportions of air for proper combustion. Means of adjusting the supply to requirements are too often omitted. It is not economical to adjust simply by turning down the gas. It is much better to cut out one or two of the burners altogether, and leave the remainder acting under proper conditions.

As regards the use of gas for cooking, there is no doubt that this is always economical in ordinary circumstances; and as the use of a cooking-stove is only occasional, and it is generally placed in a well-ventilated position, the provision of a flue is seldom necessary. Where, however, the stove is to be in constant and large use, a flue is essential. Many stoves are provided with an economizer arrangement, utilizing waste heat for warming water; but for heating on any large scale, one of the special heaters of the geyser class, with a proper flue provided, is both efficient and suitable.

One of the most convenient uses of gas in the household is in the domestic iron. Nothing is more wasteful in a coal-fire than the metal heater for a box-iron; while the small consumption of gas and the speed and ease of preparation of a good gas-iron are clear and great advantages. Nearly all the thousands of irons in use in the large laundries in Belfast are heated by gas.

While the domestic fire is the chief in our list of sinners, the small factory still contributes a portion of the smoke nuisance—a portion gradually decreasing. Where the power employed is small, or where it is intermittent, as in the passenger lifts in our large buildings, electricity supplied from a central station very perfectly meets the difficulty. There are also many cases where considerations other than mere economy are in operation, which are well suited by a central electric supply; but in our large factories the economy of the production of power, and possibility of perfect combustion, are usually much better than in an ordinary electricity supply station. For moderate powers, the suction-gas producer, with a good gas-engine, has come into considerable favour; yet the combination has some disadvantages of its own.

At the present high price of anthracite, there is a great reduction in its economy.

It is true that some plants are at work upon bituminous coal, or upon ordinary gas-coke; but the sum of experience on them has not yet been quite satisfactory. Until the producer can be completely depended upon with the fuels mentioned, there will not be the same prospect of rapid increase in use. In any case, the extra capital cost, the expense of water, the labour, and the dirt, make it possible to compete by town gas if price be adjusted slightly to the circumstances. Of Belfast gas a good gas-engine will use 14 cubic feet per horse-power-hour on the brake. This corresponds to a cost for gas of about ¼d. per brake-horse-power—a rate which can usually compete with any method of power production. In most cities now a differential rate for gas has been arranged; and from a rather exhaustive study of this point, I am of opinion that it will always pay a gas authority to provide a differential rate—making an abatement for all gas used for power or heating purposes.

There are many uses for gas in which its heating properties are concerned, as Mr. A. W. Onslow showed by his successful work in Woolwich Arsenal. An account of some of his methods and results is given in a paper read by him in March, 1910, before the London Section of the Society of Chemical Industry, and many valuable lessons can be drawn therefrom. He says:

Many years' experience have led me to the conclusion that the methods commonly employed [for the application of gas to furnace heating], taking the gas from the town mains and using it in a bunsen burner, were not only wasteful, but quite incapable of giving anything like a constant temperature, or of heating-up an oven or other apparatus to the like temperature in the same time for consecutive operations. With an ordinary burner and gas of the same composition, the time of heating-up a furnace to a certain temperature may vary in succeeding days as much as two hours, through the pressure and air supply constantly changing.

He uses high-pressure gas, working up to about 120 inches of water, with the air supply at atmospheric pressure. The pressure is maintained absolutely constant. For a temperature of 2600° Fahr., about 100 inches is maintained; for 2000° Fahr., 70 inches; and for 1000° Fahr., 35 inches will suffice. Under similar conditions, the same temperatures will always be reached in the same time. Temperatures in furnaces or crucibles can be controlled to a nicety. Mr. Onslow says that at 1s. 3d. per 1000 cubic feet, gas is as cheap in furnace-heating as coke at 15s. per ton; while for many operations in the treatment of special steels, where a few degrees difference in the temperature of the furnace means success or failure, high-pressure gas is incomparably better than any other fuel. Thus, in towns where certain industries are carried on, it is possible a low-priced gas at high pressure may provide the condition for the success of many an industry.

In corroboration of such statements, I may quote Dr. Hodgkinson, who can keep a small furnace going all day without a variation in temperature of more than 2° or 3°. But the most valuable testimony comes from Colonel Sir Hilary Barlow (of Woolwich Arsenal), who says that he uses furnaces heated by high-pressure gas for annealing shell and for other treatment before hardening. He says: "It is no exaggeration to say that for certain steels a difference of only 60° C. means either good results or exceedingly bad ones. Taking a 12-inch armour-piercing projectile which must penetrate 12 inches of Krupp steel with hardened face and tough back, and come out on the other side unbroken, the problem can only be solved with certain steels within a temperature of 50° C.; and this can be had with ease and certainty by the use of high-pressure gas."

I shall not do more than mention the scheme for the distribution of Mond producer gas at high pressure for industrial purposes. It lies outside the plan of this paper, and can only be dismissed with good wishes for a successful solution of a difficult problem.

Projected International Gas Exhibition.—In the "JOURNAL" for the 30th of May last, reference was made to the exhibition which is announced to be held, under the direction of Mr. Thos. Cordingley, from the 11th till the 23rd of November, in the Royal Agricultural Hall, Islington. The prospectus has now been issued; and it sets forth that the exhibits, which will be grouped under nine sections, will include "every kind of apparatus and appliance for the production and use of coal gas."

INVERTED GAS ARC LAMPS.

By WALTER M. BLINKS, of Kalamazoo (Mich.).

[Extracts from a Paper read before the Iowa District, U.S.A., Gas Association.]

The triumph of the inverted gas arc lamp is most convincingly shown in the fact that it has united all lamp makers in advocacy of a high-power unit. The last rock-ribbed fortress of single-mantle lamp advocacy among the gas companies has bowed to the honour and glory of the inverted gas arc.

In the introductory days of the inverted arc, I ventured the statement that the successful lamp could not depend alone on the natural tendency of the inverted mantle to throw its light downward, but that there must also be real increased efficiency per cubic foot of gas burnt, that the mechanical features must be practical, and the design attractive. Lamps combining these features have met with great success. It is possible to get a much more compact construction in the building of inverted arcs. The elimination of the reflector shade is a decided advantage in looks and in attention required in cleaning. Doing away with the globe-holder and all metal work below the mantles is a positive improvement in looks and efficiency.

LIGHT-GIVING POWER.

Candle-power figures are largely a matter of advertising ability in giving results without particularizing on method. The system began in the days when an open-circuit electric arc lamp was called 2000-candle power. The automobile head-lamp, with its powerful concentrated beam of light, shows how a source of small power may be magnified. It would be manifestly unfair to make a photometer reading of this beam, and report it as the value of the acetylene flame. On this account, I shall not clutter my paper with a lot of photometer readings, but simply say that the inverted arc of the best class on normal pressure will run from 25 to 30 candles per cubic foot throughout the 75° zone below the horizontal, while the upright mantle arc with shade gives about 20 candles. Possibly some misunderstanding may have arisen on account of reports giving results beneath a shade—really concentration. In many phases of outdoor lighting, the only effective light needed is that in the lower horizontal plane. Hence figures showing values of 50 candles to the cubic foot are entirely legitimate to offer a customer as the service available.

While on this subject, it may be interesting to recount an experience where a purchaser of inverted gas arcs sent hurriedly for a representative of the producing house, demanding an explanation of how a single burner, on $3\frac{1}{2}$ cubic feet consumption, was able to produce results on an illumination curve in excess of those given by a three-mantle arc. He was shown that the results plotted on the curve were intensified beams, not widely distributed light. Still not entirely satisfied, it seemed desirable to demonstrate to him just how an inverted arc would show up under like conditions. He was invited into the testing laboratory, shown a few readings to prove the accuracy of those to which he objected, and then the lamp was fitted with a mirror reflector, and candle-power readings, from 3500 at 0° to 1700 at 15°, were taken in the zone of reflection. A five-mantle lamp gave results at zero up to 4500 candles—the limit of the instrument's recording power. The doubter saw the point.

I do not want to be understood as belittling scientific tests of illuminating agents; but it is against the cleverly phrased and illustrated combination of science and commercialism that one has to guard. There is, I believe, very little, if any, actual misrepresentation of results in photometer work; practically all the figures one sees being true under test conditions. Busy gas men, more especially in the smaller works, have not the time to study all the relations between the test conditions and those of the actual situation he must meet.

Passing by the more complex problems involved in reducing to practical form and working conditions, here is a simple instance showing how easily one may be misled if guided solely by theoretical knowledge gained from printed reports. The Humphrey four-mantle upright arc lamp (A), as tested in the Electrical Testing Laboratories of New York, compared with the figures from the same source for the three-mantle inverted arc (B), are as follows:—

	Consumption Per Hour. Cubic Feet.	Candle Power and Angles.						
		0°	15°	20°	35°	60°	75°	90°
Lamp A . . .	19 ..	266	312	310	365	376	396	376
„ B . . .	11 ..	238	265	271	288	306	291	266

Readings under more favourable conditions have shown considerably higher candle power for each lamp; but I use these because they were taken under identical conditions. Here we see that in no direction is the three-mantle inverted arc shown to give as strong an illumination as the four-mantle upright arc; and on the figures one might hesitate to attempt the substitution of one for the other. Still in my city we have changed scores of installations, lamp for lamp, with the invariable verdict from the user that his store is better lighted than before. The stores with the three-mantle lamps are not so light at the ceiling and upper shelves. This is noticeable to me, but has never been commented upon by the merchants. Probably if we rely on the photometer, there is not so much light anywhere; but if the consumer is pleased, and his gas bill is reduced in the proportion of 11 to 19, what more can be

asked as a selling argument for gas? If our electric friends had a snap of this kind, it would not trouble them a moment. They would promptly invent a scientific hypothesis that would be published in every newspaper in the land, showing that certain rays unmeasurable on the photometer, but plainly evident to the human eye, were produced in this startling lamp.

CHOICE OF THE INVERTED UNIT.

I refer to the three-mantle lamp more particularly because it is the one that has been found to take the place of the four-mantle upright arc; and as we are all perfectly familiar with what the lamp has done, it serves better as a basis of comparison. I do not want to be understood as recommending its use to the exclusion of higher-power units. The prime object of the gas arc, from the gas man's standpoint, is to sell gas. We want to sell just as much of it as we can, and at the same time keep our customer convinced that he is getting full value for his money. Careful study of conditions is recommended to determine whether the demand is for more light at the same expenditure, or for equal light at less cost. This is not so simple a thing to learn as it seems. Most consumers will promptly state, if such a question is even hinted at, that they want to cut down the cost of their lighting. Statements of this sort formerly fooled me; and our Company lost gas sales by it. In our zeal to do what the consumer claimed he wanted, we sought to keep the cost down, even at some loss of lighting power. The electric man would come along, wire him up for twice the light, charge three times as much, and get away with it. This man actually wanted more light, and was willing to pay for it; and the electric man's better discernment got him the business. Therefore, I repeat, be very sure you have the situation sized up. If it is a big store, and you think it should have more light, fearlessly advocate a five-mantle inverted arc, without regard to anything that may have been said about reducing the cost. Give the results, and payment will come easily. Costs never hurt any business so much as poor service. Use the lamp which you, in your better judgment, decide best answers the purpose. In churches and public halls, five-mantle lamps meet the demand.

EFFECT OF INVERTED ON OTHER ARCS.

The inverted gas arc lamp was not accepted without fear that it might be the means of driving out in large numbers the upright arcs previously in satisfactory operation. Gas men are much more conservative in these things than their electrical competitors, who have made a clean sweep in their lighting equipment, not once but several times, in their rather brief existence. I have always been a believer that it is to a gas company's best interest to retain ownership of arc lamps, and thus control maintenance, and also have exact knowledge at all times of the lamps on duty. Some managers take great pleasure in stating that they have sold 1000 gas arcs; but the man who knows he has 1000 in service is apt to please his stockholder better, even should he have several hundred back in the stock-room retired from dead locations. This bogie of lamps in the stock-room has cost gas companies more revenue than all their gasoline competition, much as the latter has hurt their pride. It has come up in the introduction of the inverted arc more strongly than ever before, and doubtless has made some of my friends wonder if my advice to retain ownership of the upright lamps was well founded. I maintain that it was. It will be an exceptional case where the upright lamp has not paid for itself in profit on gas sales; and your new business men are in better position to hold a dissatisfied consumer when they can offer to substitute, without expense, the improved inverted arc. Gas sales are the essential thing; and the plan that puts the lamps in use in the quickest time, and keeps on selling gas year in and year out, permitting the substitution of the most modern devices without the customer feeling that he is being burdened with obsolete material, is the one to follow. There are, however, always a large number of people who change slowly. What was good enough last year will suffice for several years to come. A rental of 25c. per month for upright lamps is preferred to 50c. for later improvements; and this acts as a balance-wheel steadying the demand for the newest types. As the advantages of inverted arc lamps are better understood, they will unquestionably displace the upright ones.

COST OF MAINTENANCE.

Inverted arc lamps were originally more complicated than they are now, and seemed to require greater mechanical ability in the men in charge of them. This is no longer the case. Fluctuations in the pressure and quality of the gas, while always things to be avoided in the ideal gas plant, will occur; and at first they were rather marked in their effects on inverted arc lamps. Better understanding of conditions has, however, practically eliminated all this. Maintenance costs with upright arcs have been thoroughly proved by years of service to run from 20c. to 25c. per month, on an average; and accordingly this is no longer a debateable subject. When considering inverted arcs, there has been some apprehension that the upkeep would be higher. In fact, when all other arguments have failed, this contention has been brought out as justifying a refusal to adopt the inverted arc with its many admitted advantages. To get some exact data on this important point, I sent letters to about fifty representative gas companies, asking how their maintenance cost on inverted arcs was running. A number of companies stated that their figures were involved with other items of expense in such a way that exact data could

not be furnished; but they were entirely satisfied that the cost was reasonable. The lowest figures reported are from a company maintaining 564 three-mantle lamps in a widely scattered suburban district; the total cost per lamp per month being 13'81c., divided as follows: Mantles, 4'89c.; globes, 2'07c.; labour, 6'85c. A most significant thing is that this is a high-pressure plant which is enabled, with service regulators, to keep absolutely uniform pressure at the lamp. Other low costs average from 16c. to 20c. per lamp per month; the expense being about uniformly divided thus: Mantles, 6c. to 8c.; globes, 2c. to 3c.; labour, 8c. to 10c. The greatest number show monthly costs of from 20c. to 25c., with labour holding fairly steady at 10c. to 12c. per month—the mantles and globes making up the balance in about the same ratio as that above stated. The data received, combined with my own observation of experimental and actual working installations, prove conclusively to me that inverted lamps, for equal candle power, under intelligent and friendly supervision, cost less than upright lamps to maintain.

SUMMARY OF ADVANTAGES.

The inverted arc, like its forerunner, the upright arc, sells more gas for the investment required than any other fixture or appliance. Light for light, it gives a competitive weapon, operating on 12 cubic feet of gas per hour, that will replace a lamp requiring 18 to 20 cubic feet. Its increased efficiency per cubic foot of gas burnt makes it possible to give a vastly greater amount of illumination without extra cost for gas. It is a thoroughly practical lamp, the maintenance cost of which is only nominal. It is the most compact and attractive high-power gas-lamp ever offered to the public. It gives opportunity for ornamentation and adaptation to special architectural effects. It gets lighting business never before obtainable. It appeals to the man who has considered gas-lamps not quite good enough for his business place. It has enabled us in our gas-shows to make such striking displays that gas lighting has been dignified and advertised in a manner never before possible. It has demonstrated that gas lighting has advanced in keeping with present-day progress. It gives gas companies a lamp that is new, novel, and revolutionary, yet a proved success. Finally, it keeps gas lighting in an aggressive position; and we all know the aggressive fighter gets the decision.

ARTIFICIAL LIGHTING OF HOSPITALS.

At a Sitting of the Engineering and Architectural Section of the Royal Sanitary Institute Congress on Thursday last at Belfast Mr. JOHN DARCH read a paper on "The Artificial Lighting of Hospitals."

He said: In visiting the principal London and other hospitals, I have been keenly struck with the universal want of discrimination in lighting. There is a kind of trade orthodoxy which cherishes certain forms and fittings, and decrees their use, often in defiance of common sense. Take, for example, the ubiquitous plain 10-inch opal shade pendant, that does duty with equal impertinency in ward, kitchen, operating theatre, corridor, and consulting-room. It would be difficult to find a more irrational, inefficient, and indefensible fitting for most of the purposes to which it is applied, while it can hardly lay claim to be a thing of beauty. The shade affords no protection to the eyes of patients or nurses against the sting of the glowing filament; and from the fact that thousands of cardboard "eye-screens" have been sold to patch up this so-called "shade" for the necessary protection of the eyes of the healthy and vigorous in office and shop, it must be obvious that it is unsuited to a hospital. Again, the shade darkens the ceiling, and, by preventing reflection from its large white surface, practically darkens the room.

Another token of orthodoxy is the swan-neck bracket, which, with its popular form of "shade" that shades nothing, and its bare light, has been described as "nothing less than an instrument of torture." In some hospital wards the brackets have been mercifully placed lower and closer to the walls. Much more might be said to show the need of reform.

It is not so much a question of gas v. electric or any other illuminant as that of the art of illumination which regulates the arrangement of the lighting units after they are brought into the room. I do not propose, therefore, to enter into a comparison of the merits of the various lighting media, although some plain statements from one unbiassed by any of the conflicting commercial interests might prove useful. I will only say that whether electricity, coal gas, acetylene, petrol-air gas, or even oil-lamps be employed, it should be possible to successfully illuminate every department of a hospital with either.

Light (and in that term radiation both visible and invisible must be included), like any other form of power, may become an agent of destruction or a minister of health and blessing precisely in accordance with the wisdom shown in its application; and it is the duty of the professional adviser, be he architect or engineer, to understand all that pertains thereto before he can pretend to satisfactorily invest his buildings with the instruments of such a force.

There are to be avoided, on the one hand, the evils of glare, and particularly that which, in a ward patient, would enter the lower part of the eye; the evils of excessive brilliancy; of violent contrasts of light and shade; and of the injurious and troublesome

rays of heat and actinism. There is also to be avoided the risk of eye-strain consequent upon insufficient light or upon the effort to see in the face of misplaced lights. On the other hand, there is to be sought the comfort of a soft and well-diffused light so arranged that vision may be both easy and pleasant, which, after all, is the proper object of lighting.

The value of illumination depends, not on the amount of light that is shed throughout a room, but on that which is reflected from visible objects. An essential part, therefore, of any scheme of illumination is the colouring of walls and ceilings, the strength of which must be properly balanced with the amount of light available. Dark colours eat-up the light, and are therefore wasteful. White ceilings, cornices, and friezes, not glossy, with pale tinted walls and slightly darker dados, will best serve the hospital and its inmates.

Let us proceed to consider some practical methods of dealing with the subject, and begin with

THE HOSPITAL WARD.

The average ward unit (of, say, twenty beds) should be provided with two kinds of illumination—viz., (1) general, (2) local. The general lighting need be no more than enough to see clearly about the room—say, 0'5 foot-candle. No sources of light, nor any illuminated surfaces exceeding 0'1-candle-power per square inch (14-candle power per square foot) should be exposed to the patients' or nurses' eyes; whereas the intrinsic brilliancy of the

Gas mantle averages . . .	30 c.p. per sq. inch.
Acetylene flame	40 " "
Electric carbon filament .	400 " "
" metallic "	1000 " "

Direct illumination, useful enough in lofty out-patients' hall or elsewhere, is, therefore, quite unsuited to a hospital ward.

Direct lighting lamps may, however, be used if provided with proper shades; but everything depends upon the word "proper." Glass shades and all transparencies are inadmissible. Nor should any partial translucency exceed the above-named limit of brightness; while any shade that is used should effectually screen the eyes without materially darkening the room. Such a shade is a ring of semi-opaque material so adjusted that it will fully illuminate ceilings and walls, while protecting the eye in all its normal positions. If bracket lights are used for general lighting, a half-circle shade should be used, so as to illuminate the wall. The practical result of all this is a soft all-over illumination which is very pleasing.

High-placed ceiling-lights will prove equally successful with a carefully calculated shading.

Indirect lighting by means of the inverted electric arc is deservedly gaining favour; but although it would serve well in many parts of a hospital, I could not recommend it for the ward, as the ceiling would be too dazzling for those who have to lie on their backs.

Steadiness is an essential condition of good sanitary illumination; for fluctuation and flicker are not only very disturbing but may amount to permanent injury. This trouble may arise (a) from the glow lamp when used on an alternating current whose frequencies are below (say) 35 per second; (b) from an arc lamp when the light varies in intensity and colour, due to unsuitable or impure carbons, or when it "pumps," due to defective feed mechanism; (c) from the gas-mantle, due to an ill-regulated air supply, accumulated condensation in pipes, or the wind from the open windows of the ward; and (d) from all flame-burners by the two last-mentioned causes.

Gloss is frequently as troublesome as bare lights; and yet the majority of hospital wards have shiny ceilings. There should be no difficulty in getting a diffusive or dead-surface as sanitary as that of the objectionable gloss.

OPERATING THEATRE.

The operating theatre needs good artificial light and plenty of it; for there is a large proportion of surgical work done after dark. It should have a separate general illumination, with screened lamps over the sinks and sterilizers. The ceilings and walls should be completely reflective.

The illumination of the operating table is, of course, the leading consideration. The light should approximate to the colour, the perfect diffusion, and the high intensity of broad daylight. Both the nuisance of overhead heat and the septic risks of dust collection should be avoided; and the fittings and glass employed should be plain, smooth, and easily cleansable.

It is important that the lights should not all be clustered together, forming deep and troublesome shadows, nor be situated directly over the table to worry the surgeon with the shadows of his own head and hands, or that would necessitate the frequent shifting of the table. Yet these are the arrangements most commonly met with.

Every hospital has its own pattern of operating light (scarcely two are alike), while many of them are very curiously contrived. The following may be taken as typical of the more usual arrangements: 1. One or more plain shade pendants of the common type, sometimes with a dust-raising counterweight and pulley. 2. A cluster of from two to twenty glow-lamps under a large opal shade. 3. A rectangular trough, 4 feet long, with opal sides, full of lamps and sometimes with a sheet of opal glass underneath. This gives an excellent light; but the heat is intolerable.

Professor Siedentopf has invented an ingenious arrangement

for lighting the operating table by means of isolated beams of light which are not only ample, but entirely avoid the dust question. There are two forms of it: 1. The single, in which a 20-ampere projector, or search light, is placed outside the theatre, and about 7 ft. 6 in. high, from which a parallel beam of light is directed through a hole to a small mirror, thence to the table, or through a second mirror to the table. This beam is controlled by an iris diaphragm and smoked glass. It is best suited to the gynecological and throat theatres, where it is necessary to have good general lighting. 2. The compound form is more satisfactory. A projector lamp, as before, but of 25 to 30 amperes, directs the light through an aperture from the side to a thin metal disc on which are placed small distributing mirrors which divide the main beam into a number of smaller ones, and which are separately projected to receiving mirrors placed around the room. These mirrors re-unite the light on the table in a many-sided form, free from shadows.

Emergency Lights.—Electric fuse-wires have a knack of "going" at most inopportune moments; while a breakdown on the part of a supply company is not unknown. It is, therefore, essential to have a reserve for such an emergency. The fusing trouble is more common on branch circuits. One excellent precaution, therefore, will be found in wiring glow-lamp fittings from two separate main branches, either of which failing, enough light may be left to work by.

To provide against failures on the main there are two methods: (1) A gas-lamp with an inverted mantle, as at the West London Hospital, which should be lit during operations. (2) An electric accumulator, from which a small emergency lamp should be kept alight during operations, and in connection with which it should be possible to immediately switch on sufficient light from the accumulator to complete an operation. Separate lamps would be required for this purpose unless it would be convenient to have the voltage of the accumulator equal to that of the circuit. Some hospitals keep oil-lamps ready to hand. Hand and standard electric lamps of a variety of patterns are to be found in all operating theatres.

DISPENSARY.

This is usually the worst served of any department. It is, in London, frequently to be found in the basement or in some other part of the building lacking daylight, while the artificial illumination is commonly so inadequate that it sometimes becomes a difficulty and a worry to read the prescriptions. Many of the bottles abide in gloom; while the poison cupboard, which (with its small bottles) needs a particularly good light, often fares no better. Happily, the busy dispenser acquires habits of caution, and mistakes are rare. But when a dispensary has to make up from anything to 500 bottles of medicine daily, it is surely worth the cost of better lighting to minimize the risk, to say nothing of avoiding injury to the eyes of the dispenser.

A properly shaded light yielding 4 or 5 foot-candles is required to each man on the dispensing benches. The shelves should be illuminated with screened lights to facilitate visual acuity—in fact, no bare lights should be visible. Undoubtedly, the inverted arc lamp with a white ceiling would afford the best illumination, while the running cost of it should compare favourably with that of glow lamps.

Where is the dispensary or laboratory that provides facilities for reading the graduated measuring glasses? Nothing is more productive of eye-strain than the effort to decipher any kind of graduated scale; but with the faint lines of a glass measure in the twilight of the average dispensary held up to a patchwork background of bottles, the strain is increased. It would save time and afford comfort if small white screens were fitted up (one in front of each man) and adjusted to catch the chief incident rays from a skylight or window at such an angle that they reflect towards the dispenser. The same screen could be used under an artificial light or in a permanently dark situation, or there should be an illuminated panel of either reflected or transmitted light.

The commercial mind has realized that the health of the worker is the wealth of the employer, and that the extra cost of better illumination is repaid a hundredfold in time saved and better work produced. Hospital authorities might do well to look at it in this light, if no other.

I have dealt only with the three characteristic departments of hospital service, and regret that space has failed me to treat of such equally needy subjects as the proper illumination of sight-testing types, the lighting of the consulting room, the out-patients' departments, the corridors, staircases, and general service rooms.

In the discussion that followed the reading of the paper,

Mr. GASTER said it was gratifying to find that the subject of lighting was beginning to receive due attention from the point of view of sanitarians. Until recently, methods of lighting by gas and electricity were sharply divided; but in the last few years developments had brought them very close so far as expense was concerned. The selection of any illuminant had now to be considered from the hygienic aspect. Until, however, they satisfied themselves as to what the effects of light were upon the eyes, there would be a lot of speculation. The Society of Illuminating Engineers offered a platform on which the doctor, the architect, and the engineer could exchange views without fear or favour. About a month ago, the French Government appointed a Committee (composed of doctors, architects, and engineers) to inquire into the conditions of different illuminants and their hygienic aspects, and

to report to the Public Health Department. Attempts had been made to get the Home Office in this country to do something, but they worked very slowly indeed. He hoped, however, that engineers would stimulate the Government to do something.

Major BLACKMAN urged that the lighting of barracks was a most important matter, for the soldier was often driven out of the dark rooms to the brightness of the gin palace, and that was a matter in which the Government ought to take some step.

A vote of thanks was accorded the author of the paper.

REGISTER OF PATENTS.

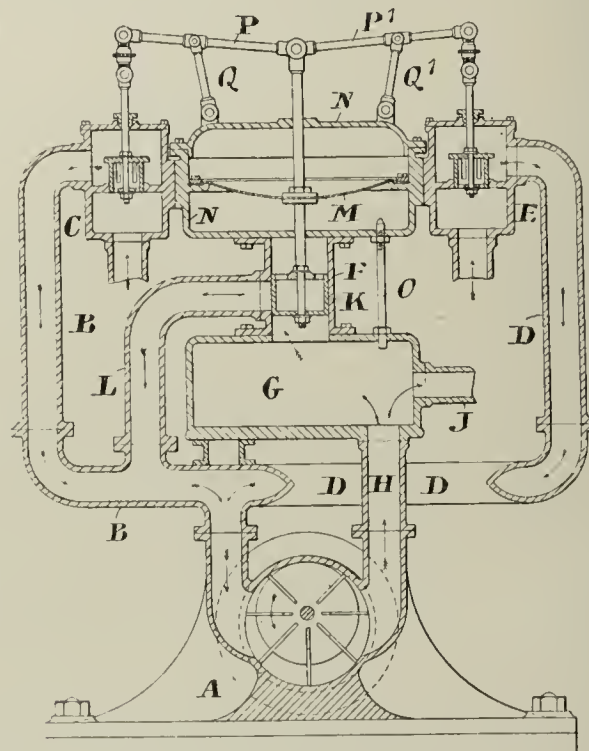
Mixing Gas and Air.

DOCKING, A., of Nottingham.

No. 18,130; July 30, 1910.

This invention relates to the mixing of (say) gas and atmospheric air, for lighting or heating purposes, and refers more particularly to apparatus of the kind in which the two gases are drawn in and compressed to the pressure required by the service, by means of a rotary compressor. The means employed control "the supply of gas and air to meet the varying demands of the service, and at the same time maintain the proportions of the gas and air constant, under all the different demands."

Apparatus is already well known, the patentee points out, in which a varying supply of gas and air in correct proportion, has been regulated by the pressure on which the service side of the compressor, the exhaust side, and in some cases both have been utilized; but "owing to the fact that the effective pressure in this class of apparatus is very low, and that the valves have hitherto worked one independently of the other, trouble has been caused by one or more of the controlling valves sticking and either cutting off the supply altogether or failing to give the proper proportions of gas and air under all conditions." In the present arrangement, the bye-pass and inlet controlling valves are positively connected by mechanical means one to the other, and automatically and simultaneously adjusted by the service pressure. Being all mechanically connected together, they must move together, and such movements must always be proportionate one to the other, as is predetermined by their mechanical connections, irrespective of any influence which may be separately exerted upon the valves by the velocity of the gases, or by the suction at the inlets.



Docking's Gas and Air Compressor.

An ordinary compressor A of rotary type is employed. The inlet (at the left) is connected by a pipe B to a gas inlet valve casing C, and by a pipe D to an air inlet valve casing E; both being fitted with valves automatically adjusted to admit the proper portions of gas and air required to meet the varying conditions (by means hereafter described). The mixed gases are compressed to the required pressure into a service chamber G, connected to the outlet of the compressor by a pipe H. From the chamber G the gases are conveyed to the required points by service pipes J connected to it.

The inlet valve casings are divided between their inlets and outlets by horizontal partitions; and the valves (of the cylindrical type) work in circular openings of the same size in the respective partitions. The valves, which are closed at the top and open at the bottom, are provided with ports in their cylindrical walls, so that the effective area of the actual inlet openings can be varied by raising and lowering the valves more or less through the intermediary of their respective valve stems which are carried through stuffing-boxes at the top of the casings C and E, in the usual manner.

Above the service chamber G is a bye-pass casing F, fitted with a bye-pass valve K of the piston type. The lower end of the casing is open to the service chamber G, while a port in its side, which is normally closed by the valve K, is connected by a pipe L to the pipe B in connection with the inlet of the compressor. The stem of the bye-pass valve is carried up and is attached to a flexible diaphragm M, in a

chamber N carried above the bye-pass casing F. The space in this chamber on the underside of the diaphragm is connected to the service chamber G—preferably by means of a pipe O having a restricted opening, so that the action of the diaphragm M, which is controlled by the pressure in the chamber G, shall be steady under sudden changes of pressure.

The stem of the bye-pass valve K is carried up above the diaphragm M and out through an opening in the top diaphragm chamber N. Its upper end is connected by levers PP¹ and links to the stems of the inlet valves, which are for convenience situated on opposite sides of the chamber N.

The arrangement is so disposed that the inlet valves are lowered and thus closed to a more or less extent, when the bye-pass valve K is raised. The amount of closing movement imparted to the inlet valves relatively to the opening movement of the valve K, is in each case determined by the disposition of the fulcrums on the levers P and P¹, which are carried by the upper free ends of arms Q, Q¹, pivoted to the top of the casing N. Means may be provided for adjusting the position of the fulcrums of each of the levers at any point in the length of the latter.

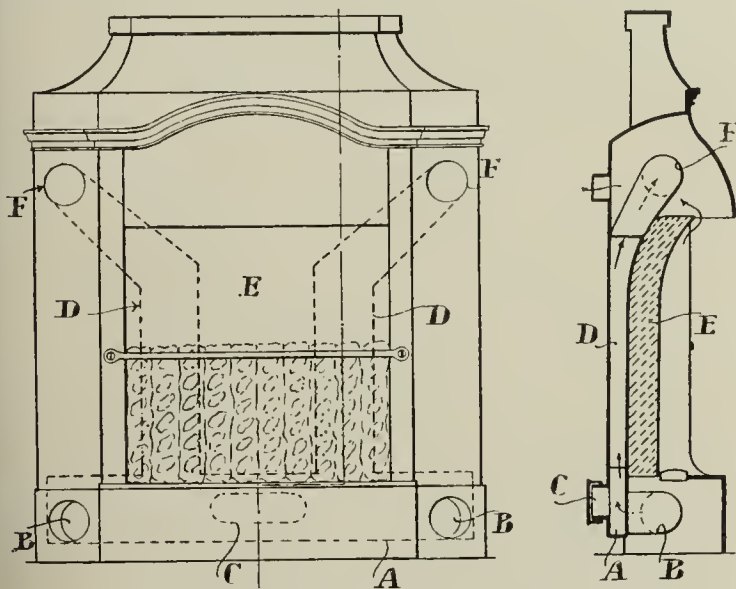
The operation of the apparatus is as follows: The diaphragm M, in connection with the bye-pass valve K, is weighted according to the pressure required in the service; and when this pressure is exceeded—owing to the demand being less than the supply from the compressor A—the diaphragm and valve are raised, thus permitting the surplus mixture to pass by way of the pipe L back to the compressor A. At the same time the bye-pass valve is opened, the inlet valves are closed to an extent determined by their connections, so that they will only admit sufficient gas and air to maintain the pressure in the chamber G, while the mixed gases in the apparatus above and beyond the demands of the service for the time being, are constantly circulated by the compressor as usual—passing from the chamber G into the bye-pass casing F, and then from the latter, by way of the pipe L, back to the compressor again.

Gas Heating-Stoves.

CREASEY, H. H., of Tulse Hill, S.W., and ADAMS, S., of Willesden, N.W.

No. 18,370; Aug. 3, 1910.

In these gas heating-stoves, the flues or passages that convey the warmed air into the room, and which are separated from the flame by the material of the deflecting tile or back, have no heated surfaces upon which dust can collect within the flues or passages and become baked.



Creasey and Adams' Gas Heating-Stoves.

The horizontal flue A has openings B at the sides; while C is an inlet adapted to connect the horizontal flue with the outside air. D are flues passing up behind the deflecting tile E. F are orifices whence the heated air is discharged into the room.

The patentees say they are aware that it has already been proposed to employ vertical air tubes or passages in air-heating gas-fires where the flames impinge directly on to the tubes, or the products of combustion circulate around them. They are also aware that it is not broadly new to provide air-heating passages behind a fire-brick back. But, by means of their invention, with stoves of the kind referred to, they claim that it is possible to supplement the ordinary heating effect of the stove by the discharge into the room of a gentle current of pure, warm air obtained by utilizing the heat of the deflecting tile or device without discharging into the room air laden with the smell of charred dust.

Incandescent Gas-Lamps.

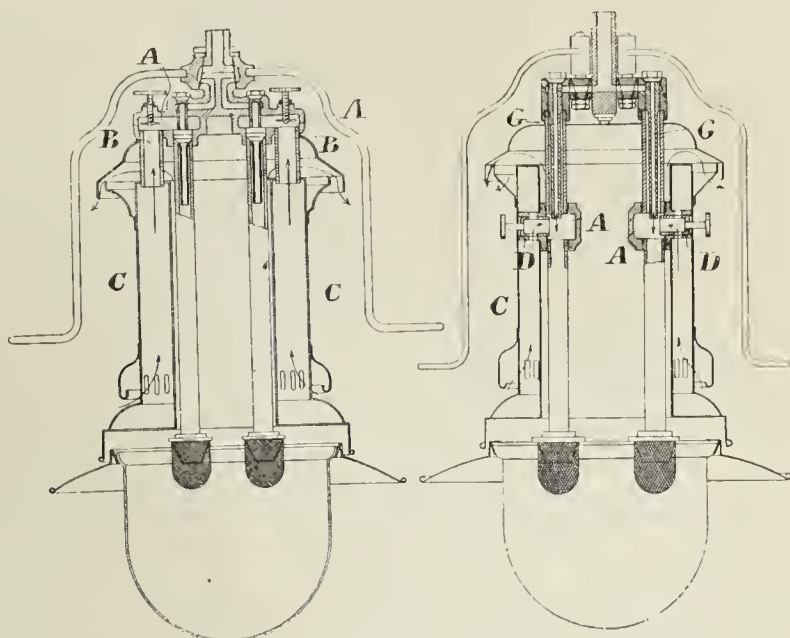
EHRICH AND GRAETZ, of Berlin.

No. 24,973; Oct. 27, 1910. Date claimed under International Convention, Oct. 29, 1909.

This invention relates especially to inverted incandescent gas-lamps intended to work with pressure gas or pressure air, wherein the volume of air required for combustion is proportionately large. It is a modification of patent No. 10,945 of 1909; and its object is to provide improved means for preheating the air required for combustion in such a lamp.

In the first of the two forms of lamp shown, the air required for combustion is admitted to the chamber A, where it mixes with the combustible gas, by way of tubes B which open into an annular chamber

C, heated by contact with the hot gases from the burners. By arranging the tubes B within the lamp casing and not in the open air, the incoming air is "considerably heated" by the waste gases and, as the chamber C is of proportionately large volume, the air passes only slowly through it, thereby giving sufficient time for it to be heated. In the first construction, a preheating chamber is shown, common to all the burners, but if desired the burners may each be provided with separate preheating chambers.



New Forms of Graetzin Lamps.

In the second construction shown, the mixing-chambers A are within the lamp casing and in the path of the hot waste gases, so that any possibility of the air drawn in being cooled is obviated. The air in this case is admitted to the mixing-chambers A by way of connections D in the preheating chamber and communicating therewith. The connections are provided with rotatable or slidable valves, having hand means projecting through the lamp casing whereby they may be operated.

The nozzles E, by which the gases are led to the chamber A, are here lengthened to a corresponding extent, so as to enter the mixing-chamber and thereby ensure proper delivery of the gas to them. Gas is supplied to the nozzles in the usual manner by way of the main pipe above, which branches into gas supply passages leading to the nozzles.

In lieu of the construction shown, the lamp may be so arranged that the air preheating chamber is arranged in the inner part of the lamp and be surrounded by the waste-gas chimneys.

Gas-Washer.

STOLTE, A., of Zweibrücken in Pfalz, Germany.

No. 23,948; Oct. 15, 1910.

This rotating gas-washer comprises not only a revolvably mounted drum, on which a fan is secured, but also a casing surrounding the fan and two stationary casings encasing the drum—the casings extending up to that of the fan and being provided at their two ends away from the fan-casing both with inlet openings for the gas to be purified and also with inlet openings for the liquid used for purifying the gas.

In fig. 1 (p. 300), the first embodiment of the invention operates as follows: The liquid used for purifying the gas is introduced into the chambers or spaces enclosed by the stationary drum-casings A, A¹ through the branches G, G¹ and the gas to be purified through the branches E, E¹. The gas and water move parallel to one another in the spaces which are formed by the blades of the wash-drum and rotate with the drum D. Since, however, the gas is not able to take up all the liquid, even at the commencement of the washing process, a portion of the water is thrown against the casing owing to the centrifugal force; and the motion of the gas is imparted to the particles of liquid rotating in the casings. The particles are not only rotating in the casings, but at the same time move on in the direction in which the gas is moving—i.e., parallel to the axis of the wash-drum. When the gas and liquid have passed the wash-drums, the film of liquid moves on into the fan-blades C. Now, however, the pressure of the gas passing with the film of liquid between the blades of the fan is sufficient or is increased to such an amount that the gas penetrates the concentric film of liquid, and is therefore again both intimately mixed therewith and thereby subjected to a thorough purifying operation. During this operation, the gas and water fill up the spaces most distant from the axis of the wash-drum, whereupon the purified gas, together with the portion of the water which still remains, passes to, and issues from, the outlet branch F.

The form illustrated in fig. 2 principally differs from that just described in that the inlet branches G, G¹ for the washing liquid open into perforated annular pipes R, R¹, and each end of the drum D is provided in such a manner with a flange attached by the smaller end to the drum and surrounding the shaft that the water admitted through the pipes R, R¹ impacts against the flanges, slides over the latter in the direction of the dotted lines, and forms a conical film of water extending above the inlets E, E¹ for the gas to be purified. Further, some of the utilized water is led away at M, M¹, and some escapes through the branch F, which also serves for leading away the purified gas. Each of the drum-casings A, A¹ having internal rough surfaces is shaped like the frustum of a cone, the wider end of which adjoins the casing Z of the fan. Otherwise this embodiment is the same as fig. 1.

The mode of operation of this second form is as follows: The gas to be purified enters at both sides through the branches E, E¹ and im-

as the spring is compressed, and then passes through the centre itself (fig. 5). It then produces only a certain amount of friction upon the shaft without tending to cause the member to rotate in either direction; but when (owing to the continuation of the movement of rotation) this neutral point is exceeded, the thrust of the spring changes its direction. Instead of acting as before in the direction opposite to the movement of rotation of the roller, it is exerted in the direction of this movement; and as the member A carrying the roller is loose upon its shaft, it is necessarily displaced by the sudden extension of the spring. The result is an instantaneous passage from one figure to the other, seeing that the several parts are arranged in such a manner that the fraction of a revolution thus suddenly effected by the member A under the influence of the spring is that during which it actuates the first series of figures.

At the end of a certain time, the member A continuing its rotation, the roller again comes in contact with the spring, which again becomes compressed, and then extends in order to produce a second sudden displacement of the figures, which action is produced at each revolution of the roller.

To sum up, the spring stores up at each revolution of the member A a force which is utilized for producing the sudden movement of the drums, discs, or other parts carrying the series of figures.

Horizontal Regenerative Coke-Ovens or Retort-Furnaces.

DEUTSCHE HÜTTENBAU-GESELLSCHAFT M.B.H., of Düsseldorf, Germany.

No. 1706; Jan. 23, 1911. Date claimed under International Convention, Jan. 31, 1910.

This invention relates to regenerative coke-ovens, retort-furnaces, or the like of the type wherein the direction of the heating flame always remains constant; the supply of air to the individual heating flues of the adjacent retorts or chambers being effected through sole flues or conduits extending in the longitudinal direction of the retorts, below the latter, while the waste gases are discharged through sole flues or conduits disposed above the air-supply conduits and also arranged in the longitudinal direction of the retorts.

The object of the invention is to ensure the supply of air, as well as the discharge of the waste gases within the sole flues or conduits always taking place in the same direction, and in this way to produce uniform draught conditions within the individual heating flues and so obtain uniform working of the furnace.

According to the invention, groups of air-supply or discharge flues or conduits are connected to common preliminary chambers which communicate each with the corresponding regenerators by two conduits provided with valves or the like to change over the regenerators; the cross-sectional area of the individual air supply or discharge conduits being adjustable by valves disposed in the conduits.

Washer and Scrubber for Gases.

HOLMES, W. C., AND CO., LIMITED, and HOLMES, E. D., of Huddersfield.

No. 2581; Feb. 1, 1911.

The kind of apparatus or machine to which this invention refers is of the vertical type wherein the gas enters at the bottom and leaves at the top, and the water or liquid enters at the top and leaves at the bottom—such machine comprising an elevated series of chambers open to each other at the centre, and centrally and vertically through which revolves a shaft carrying brushes or beaters. The invention combines in such a machine a trough or well formation within the bottom of each compartment to overflow at the central opening, and a revolvable ring-brush carried by the shaft to dip in the well or trough of each compartment, whose back is imperforate, and whose bristles are set at an angle; and, further, the provision in the compartments of a segmental spiral baffle to assist, with the inclining of the bristles, in lifting the liquid from the well or trough into the extreme upper portions of the bristles of the brush.

Fig. 1 is a vertical section of the apparatus. Fig. 2 is a topside plan. Fig. 3 is an enlarged part sectional elevation of a portion of fig. 1 (with the brush in the lower compartment not shown). Fig. 4 shows the invention when a rotor or wire brush is used.

With reference particularly to figs. 1, 2, and 3, a vertical series of washing and scrubbing compartments is provided at A, C, D, E, F, G within an outer casing, centrally in respect of which is provided a revolvable shaft H. The compartments open to each other at the centre only by an annular portion I, which is concentric with the shaft and so provided as to form an opening between each compartment, and also an annular trough or well J, at the bottom of each compartment, wherein the liquid collects and from which it overflows into the compartment beneath. Such openings form the only passage for the gas and water through the machine, although from each compartment there are pipes L to take off the liquid from any compartment when desired.

Mounted upon the shaft to revolve with it is a brush M for each compartment. This brush is of ring formation—that is to say, it is a ring of bristles concentric with the shaft, and is arranged to always dip well into the liquid contained within the trough J. The ring of bristles forms an imperforate disc or plate lying in the horizontal plane and cutting off direct communication between any two compartments, so that the gas in its passage through the one compartment to another must take a path through the bristles of the ring-brush and over the periphery of the disc or back plate. The bristles of the brush are set at an angle so that on rotation the liquid in the trough or well is displaced to rise upwardly into the roots of the bristles, so that those portions of the bristles not normally dipping into the well or trough are always well wetted with liquid so long as the machine is in operation, although the

depth of the annular portion may be varied to provide a deeper well or trough in the compartment. The construction of the back of the brush being imperforate, compels the liquid overflowing from the compartment above to flow to the exterior of the brush below, and therefore in the path of the gas.

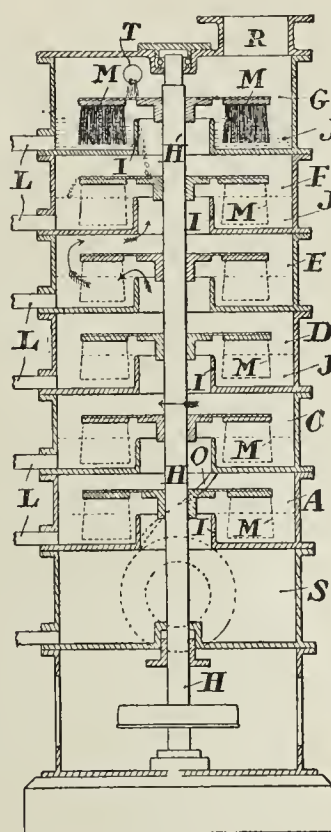


Fig. 1

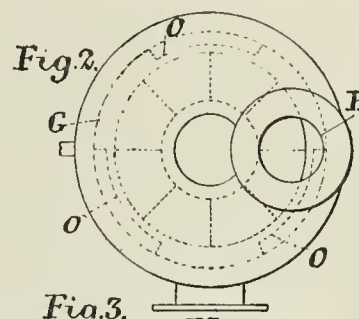
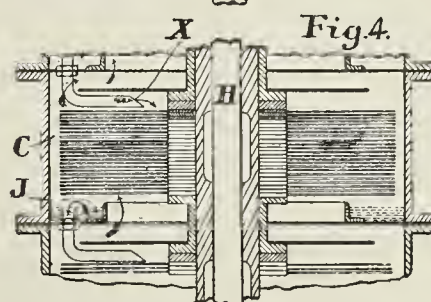
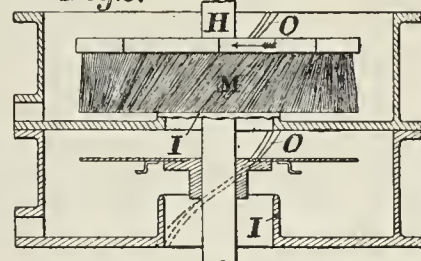


Fig. 2



Holmes's Washers and Scrubbers.

To cause a further agitation of the liquid in the trough or well, each compartment may be provided with a number of spiral segments or baffles O, up which, by the movement of the brush, the liquid is forced so as to lift itself—in this way providing additional means to ensure the whole of the bristles of the brush being thoroughly wetted at all times.

The gas is taken off from the upper compartment G by way of an outlet R, and enters the machine by way of a passage into an under compartment S. The liquid enters the upper compartment G at T, and leaves by one of the pipes L—it being understood that in working the whole of the troughs or wells J are always full and overflowing.

The crude gas first comes in contact with the strongest liquid, which has been gradually strengthened up by its passage from the top of the machine, and the liquid passes out of the machine strongest. As a consequence, gas leaving the top compartment of the machine becomes cleaner by meeting the less saturated or cleaner liquid. The flow of liquid is shown, and the direction of the flow of the gas is indicated by arrows in fig. 1. It will be seen that the whole of the gas must pass through the bristles of the ring-brush, and is "thereby thoroughly well beaten and intimately mixed with the washing liquid."

In fig. 4, the construction differs somewhat. The brush is a wire one, constructed and applied to the central shaft H in accordance with Burstall's patent No. 10,442 of 1908. It revolves in (say) the compartment C, in a similar way as the brush arrangement, but sometimes at a greater rate of speed—particularly if the apparatus is specially built for the recovery of tar, but at a less rate of speed in the case of a washer for the extraction of ammonia. A trough or well J is provided in the compartment, but not so deep as before; and above the radially arranged wires of the rotor is secured an imperforate plate which has the same function as the back of the brush in figs. 1 to 3. The liquid from the trough or well J is conducted to the centre of the rotor X by an overflow pipe, so that there is a full and free supply of liquid at the centre of the rotor. The rotor is built up in accordance with Burstall's patent—namely, with numerous wires mounted radially upon the hub, and which centrifugally beat the gas and liquid "and form a considerable thickness through which the gas has to flow."

APPLICATIONS FOR LETTERS PATENT.

- 16,496.—EHLERT, A., "Igniting-device." July 18.
- 16,512.—ROYSTON, E. R., "Gas-producers." A communication from A. J. Rickie. July 18.
- 16,582.—HOLLING, L., "Pipe-joints." July 19.
- 16,615.—TEALE, L. H., "Grates suitable for gas or coal." July 19.
- 16,629.—COLLETT, E., and ECKARDT, M., "Production of ammonium sulphate." July 19.
- 16,643.—KITSON, A., "Valve and analogous apparatus." July 19.
- 16,683.—KIRKHAM, HULETT, AND CHANDLER, LTD., and BLAKE, E. W., "Apparatus for filtering gas." July 20.
- 16,706.—CARPENTER, C., and CHANDLER, D., "High-pressure incandescent gas-lamps." July 20.
- 16,710.—SPARKS, E., "Incandescent burners." July 20.
- 16,713.—WILTON, G., "Pumping air or gases, or purifying, washing, measuring, or carburetting the same." July 20.
- 16,825.—DEMPSTER, R., AND SONS, LTD., and TOOGOOD, H. J., "Gas-retorts." July 22.
- 16,835.—HELPS, G., "Gas-lamps." July 22.
- 16,863.—STONE, J., AND CO., LTD., and JAKEMAN, G. E., "Nipples for connecting service-pipes." July 22.

CORRESPONDENCE.

[We are not responsible for opinions expressed by Correspondents.]

Early Public Installations of High-Pressure Gas.

SIR,—In the paper which I recently submitted to the Institution of Municipal and County Engineers on the subject of "Street Lighting" [see *ante*, p. 169], I stated that "Experiments with high-pressure gas lighting were conducted as long ago as in 1903—indeed, to West Bromwich belongs the distinction of possessing one of the first, if not the first, public lighting installation on this system." The date of our first public experiment was February, 1902; and Mr. J. G. Newbigging has written to me pointing out that he put up two very extensive installations of high-pressure lighting in Whitworth Street and Piccadilly, Manchester, in the years 1901-2. I should therefore be grateful if you would give publicity to this fact.

HAROLD E. COPP, Borough Gas Engineer.

West Bromwich, July 24, 1911.

Automatic Lighting of Public Lamps.

SIR,—I was interested in reading the paper on "Street Lighting, from a Practical Point of View," read at the annual meeting of the Institution of Municipal and County Engineers [see *ante*, p. 169], more especially the portion of it referring to the automatic lighting of street gas-lamps. Having some idea of what his pressure conditions are, I do not wonder at Mr. Copp's preference for the clock system of automatic lighting.

Hitherto the pressure system has been in a very elementary position, as few, if any, of the many pressure lighters placed on the market could meet more than one of the innumerable sets of pressure conditions prevailing at the gas-works. It was therefore necessary to alter the conditions to suit the lighter, or put up with a clock system, or do without automatic lighting. The various troubles were, among others, the use of mercury, with all its attendant evils; the effect of vibration on the apparatus caused by the wind or the street traffic; the accidental variations of pressure caused by consumption; the corrosion of the mechanism of the apparatus through working in a gas atmosphere; and the failure of the pilot-light to work satisfactorily.

The ordinary pressure apparatus can be adjusted by means of weights to work on any level and at any pressure. It generally requires an inch of pressure to operate it—sometimes more. Assuming that the mechanism is engaged—i.e., in a position ready to work—an increase of an inch of pressure operates it. This inch may be termed the "range," which is a fixed quantity, under conditions, and cannot purposely be altered. This range is caused by friction. If the gas engineer can give this extra pressure above his maximum working pressure, the apparatus ought to work; but supposing he cannot give more than half an inch, then trouble comes in.

Perhaps the maximum working pressure is reached an hour before lighting time; and though it is half an inch below the operating pressure, the weather may be stormy, and cause the lamp to vibrate. This vibration neutralizes the friction, the mechanism operates, and the lamp is lit. By-and-bye, before lighting time, the consumption causes a lowering of the pressure, which allows the mechanism to become engaged. Then when the wave of pressure is put on to light up, those lamps which are already lit are extinguished and have to be relighted by hand. The same thing happens during the evening when consumption ceases. In the morning, when the lamps are extinguished, the operation is performed so quickly that in many cases the pilot-light is not lit before the burner flame goes out; and the wind is blamed for blowing it out. It is curious that while this happens to the pilot light it does not happen to the burner—possibly, it may be, on account of there being a larger supply of gas to the burner.

My object in writing this letter is to bring before the notice not only of the audience who heard the paper read, but also of the larger audience of readers of the "JOURNAL," that all this is now altered, and that these various difficulties have been overcome by a combination of the two systems—a "pressure clock lamplighter." I will not trespass on your space by giving details of the "Automaton," which has so frequently been described in your columns,* but will briefly explain how it overcomes the difficulties.

There are two sets of weights controlling the diaphragm, which act on the mechanism, and start it into operation. Screwed on to the end of No. 2 wheel of the clock motor is a cam, which has a twofold duty to perform—(a) to turn the plug of the gas-tap, and (b) to lift off, or partly lift off, one of the sets of weights from pressing against the diaphragm. To make this quite clear, there is always a certain pressure on the diaphragm, and always a certain aggregate weight on the levers. It is therefore only a question of balance between the diaphragm and the weights. Of course, you can make the weight what you like; you can divide it equally between the levers, or you can put more on one lever than on the other.

Suppose the aggregate weight to be equal to 40-10ths, then when this gas pressure is on the diaphragm the one balances the other, and nothing takes place, because it requires a certain pressure to release or lift the locking lever, which equals half an inch, so that at 45-10ths it operates and at 40-10ths it engages. It must be noted that this half inch, or range, is not caused by friction, but by having to lift the locking lever, the weight of which equals half an inch of pressure, which does not react on the diaphragm, and is not in any way affected by vibration. This operation is performed by No. 1 cam, which is a plain disc having a pin for moving the plug of the gas-tap.

No. 2 cam has a circumferential ridge which causes one of the sets of weights to be partly lifted off. Both of these weights have to be lifted to light or extinguish, while only one is in operation to engage. For example: Weight A is free, and represents 20-10ths; weight B is affected by the cam, and also equals 20-10ths; L is the locking lever, and represents 5-10ths. $A + B + L$ requires 45-10ths to operate the

apparatus; while $A + B + L - B - L$ requires 20-10ths to engage. Supposing $A = 25$ -10ths, and $B = 15$ -10ths, then $A + B + L = 45$ -10ths to operate, and $A + B + L - B - L = 25$ -10ths to engage. By this means the range may be increased indefinitely to overcome the accidental variation of pressure caused by consumption.

Now, let us suppose there is sufficient pressure to light up, but towards extinguishing time the gasholder becomes uncupped, thereby reducing the pressure below that required to operate the lighter. Unlike the other lighters, the "Automaton" rises to the occasion. No. 3 cam has two peaks, and in the process of lighting lifts one set of weights entirely off, which in the process of extinguishing is returned to duty. $A + B + L$ requires 45-10ths to light; $A + B + L - B - L$ requires 20-10ths to engage; and $A + L$ requires 25-10ths to extinguish. As B is returned to duty during extinguishing, the mechanism automatically becomes engaged, and is ready for the next operation.

No. 5 cam also has two peaks, with a circumferential ridge between them. In lighting up, the pressure has to lift $A + B + L = 45$ -10ths to light; $A + B + L - B - L = 20$ -10ths, to engage; $A + L = 25$ -10ths, to extinguish, and when extinguished is not engaged. So it requires $A + B + L - B - L = 20$ -10ths to engage. This allows a high mid-day pressure to be used without operating the lighters, which can be engaged after the big mid-day pressure is taken off.

In both of these cams the pin for operating the tap-plug is behind one of the peaks. If this be placed between the two peaks, the lighting will be $A + L = 25$ -10ths and the extinguishing $A + B + L = 45$ -10ths.

By the use of No. 9 pin, so named from the patent specification, the lighting pressure of 45-10ths may be put on (say) one hour before lighting time. This unlocks the mechanism, which is instantly relocked by the action of the No. 9 pin. A slight reduction of pressure withdraws the pin, and lighting takes place. This is an adjustable pin, requiring a reduction of 2-10ths to 2 inches as may be adjusted.

No. 7 cam is so made as to neutralize the action of No. 9 pin in extinguishing only. This enables the lamps of two districts to be lit and extinguished at different times. For example, X lamps, having a No. 1 cam, are lit at sunset and extinguished at sunrise; L lamps, having a No. 7 cam and a No. 9 pin, are lit half an hour later, and extinguished half an hour earlier. Or X lamps having a No. 1 cam and L lamps having a No. 5 cam can both be lit together. X lamps may be extinguished at midnight and relit at early morning, and at daybreak X and L lamps can be extinguished together. Or, if desired, X lamps may not be relit in the early morning. To recapitulate, the lamps may be lit and extinguished at the same pressure and on a rising or a falling pressure; they may be lit at a high pressure and extinguished at a low one, lit at a low and extinguished at a high pressure, or lit on a fall and extinguished on a rise of pressure.

It may be thought that an apparatus that will perform such a variety of things must necessarily be complicated. On the contrary, it is simplicity itself. The engineer may ask himself: "Where am I to get a man who will understand all this adjustment of cams and weights and levers and pins?" This is equally simple. The apparatus is completely adjusted before it leaves the works, and only requires fixing, the time for which ought not to exceed five minutes.

GEO. ROBSON.

39, Victoria Street, S.W., July 24, 1911.

Corrosion of Service-Pipes.

SIR,—In reply to Mr. Hole's letter in your last issue, in which he somewhat disingenuously ignores the main point of my last letter to you (wherein I pointed out that it was quite open to him to supply or instance cases opposite to my conclusions that subsoils of an ashy character gave an alkaline reaction so far as my tests went), the right or wrong of this matter is apparently of much less moment to him than his personal dignity. Mr. Hole further takes a portion of my definition of an acidiferous subsoil, and carefully omits the last portion of the definition, in which I clearly say "and which will give an acid reaction when partially dissolved in water." He therefore deliberately misquotes me. He might indulge in a little frankness, and say whether he was aware or not that the ashy subsoils he terms acidiferous give an alkaline reaction or not.

It would have been more in keeping with his reputation to have refrained from writing at all on this matter. But quite evidently he entered on this correspondence in a moment of irritation, due to the fact that a lesser-known individual dared to question a term used by him in "Gas Distribution"—a work which everyone, including myself, views with respect. Respect, however, surely need not bar criticism.

JAMES M'LEOD.

Greenock, July 26, 1911.

New Issues of Gas and Water Capital.—Referring to the paragraph on this subject on p. 237 of the "JOURNAL" last week, Mr. William Richards (Messrs. A. & W. Richards) points out that the authorities of "The Times" (from a table in which paper the figures given were taken) only deal with new issues which are advertised in the prospectus columns of their journal, and do not take note in their summary of the large amount of gas and water capital advertised in the ordinary way, nor have they any record of the capital which is issued locally by provincial concerns. This being the case, to mention £31,000 as the amount issued during the six months ending June 30, for gas and water supply projects is, our correspondent submits, somewhat misleading.

Moorland Water Supply for Domestic Use.—At a recent meeting of the Paignton Urban District Council, a letter was read from the Teignmouth Council stating that they required that the whole of the water supplied to them by Paignton from the Holne reservoir, on Dartmoor, should be passed through Candy filters. The Paignton Council therefore decided to order a fourth filter, and agreed to accede to the request. The Medical Officer of Health produced an analysis of water taken from the filters on the 26th of June, in which he said the water was exceedingly soft, with natural reaction, which practically had no action on lead. It did not exhibit any signs of pollution, and was well adapted for all domestic purposes.

* See "Register of Patents" in the "JOURNAL" for the 25th ult., p. 239.

LEGAL INTELLIGENCE.

A RAILWAY SIDING AGREEMENT QUESTION.

RAILWAY AND CANAL COMMISSION.—Friday, July 28.

(Before Mr. Justice A. T. LAWRENCE, the Hon. A. E. GATHORNE HARDY, and Sir JAMES WOODHOUSE.)

South Metropolitan Gas Company v. South Eastern and Chatham Railway Managing Committee and South Eastern Company.

Sir A. CRIPPS, K.C., said this was an application under the Act of 1904 to amend the law relating to private sidings, which raised a short, but very important, point. The Gas Company wished for a junction between the line of the Joint Committee and certain premises at Greenwich, and an arrangement had been come to; but some difference had arisen with regard to one clause of the agreement. The Committee said they would not allow the junction without a certain provision being made as to the rates to be paid on traffic delivered at the junction. The Gas Company said the Committee had no right to bring in the rate question; that the rate was to be left to ordinary agreement; and that the Committee were not entitled to insist that the Gas Company should be put under special disability as to rates in connection with the junction.

Mr. C. A. RUSSELL, K.C., for the respondents, said when people were dealing with an agreement they did not agree clause by clause; and the Committee would only make the agreement provided the clause as to rates was inserted. It was a question of a bargain as a whole.

Sir A. CRIPPS said his contention was that the Committee could not include in a bargain of this kind a special arrangement as to rates. All he asked for was reasonable facilities for a siding; and it was for the Court to say whether such a clause as that asked for should be inserted in the agreement.

Mr. Justice LAWRENCE said if the Court was to be asked as a matter of law to decide whether a rate clause should be inserted, they must hear Mr. Russell; the Court could not go into any bargaining between the parties.

Sir A. CRIPPS said there was no question between the parties that the junction was a "reasonable facility."

Mr. RUSSELL said there was no doubt the rock on which the parties had split was the clause as to rates.

Mr. Justice LAWRENCE: If you cannot establish that a rate clause should be imposed, we shall have to hear the whole case.

Mr. RUSSELL thought that was so. He was in the unfortunate position of not having his clients present in court, owing to their having to be present at the half-yearly meeting of the Company.

Mr. Justice LAWRENCE suggested that between now and October the siding might be constructed.

Mr. RUSSELL said the siding would not be completed for some time yet.

Mr. Justice LAWRENCE: But the construction might go on without prejudice to this question.

Mr. RUSSELL said he did not suppose the Gas Company wished to incur further expense until they knew whether they could get the junction on their own terms.

Sir A. CRIPPS suggested that the application should stand over until after the Long Vacation, and, if necessary, it could then be restored.

Mr. RUSSELL said he did not assent to the view that the Court could not in any case say that a rate clause ought to form one of the terms on which an order for reasonable facilities should be given. The Court, in considering whether the granting of a junction was a reasonable facility, would look at what offer was made by the trader.

Mr. Justice LAWRENCE, in directing the application to stand over until after the Long Vacation, said the Court did not decide anything at the present time.

LIABILITY FOR DEFECTIVE STOPCOCK BOX.

SUPREME COURT OF JUDICATURE—COURT OF APPEAL.

Saturday, July 29.

(Before Lords Justices WILLIAMS, MOULTON, and BUCKLEY.)

Batt v. Metropolitan Water Board.

This was an appeal by the defendants from the decision of the Divisional Court reversing the judgment of the County Court Judge. The plaintiff, Florence Batt, while walking along Amery Place, near the Old Kent Road, caught her foot in a stopcock box which had been allowed to get out of repair, and, in consequence of its defective condition, she fell, thereby sustaining injury. The box in question was used in connection with a communication pipe through which water was supplied by the defendants, and contained the spindle by which the supply of water to the house could be regulated. The box had originally been fitted with a lid, which had, however, disappeared. The result of the absence of the lid was that an unprotected hole was left in the pavement, measuring about 4 inches square by 6 inches deep. Defendants contended that the obligation to repair the box did not rest upon them; for, even if it had done so previously to 1907, it had, by reason of section 8 of the Metropolitan Water Board (Charges) Act, been transferred to the owner of the house. The County Court Judge held that the section was retrospective, and applied to existing communication-pipes as well as to pipes to be thereafter laid. This decision was reversed by Justices Ridley and Ivory. Section 8 provided that the Board should, at the request of the owner or occupier of any house in a street in which any service main of the Board was laid, furnish to such owner or occupier, by means of a communication pipe—the necessary and proper apparatus to be provided and laid down and maintained by him and at his cost—a sufficient supply of water for

domestic purposes at a rate not exceeding 5 per cent. of the rateable value of the house. The Divisional Court held that the section, in so far as it imposed an obligation upon the householder to repair the communication pipe, was not retrospective, and did not apply to communication pipes in existence at the date of the passing of the Act.

Mr. C. A. RUSSELL, K.C., and Mr. ROSS BROWN appeared for the appellants; Mr. SIMNER represented the respondent.

Their LORDSHIPS held that the section was retrospective, that there was a statutory obligation upon the owner or occupier to maintain and keep in repair the stopcock box, and that there was no obligation on the defendants to maintain that which did not belong to them. Under these circumstances, the decision of the County Court Judge was restored; the appeal being allowed, with costs.

Mersea and District Gas Company, Limited.

The petition presented by Mr. J. A. Drake and others for the winding up of this Company, which has been standing over for some time with a view to a settlement, came before Mr. Justice Neville last Tuesday. Mr. Ashton Cross stated that the creditors had been satisfied, and it had been arranged that the petition should be dismissed; the Company paying the taxed costs. His Lordship dismissed the petition.

Debentures of the Mid-Oxfordshire Gas Company, Limited.

Last Tuesday, the case of *Burrows and Others v. Mid-Oxfordshire Gaslight and Coke Company, Limited*, came before Mr. Justice Neville, in the Chancery Division of the High Court of Justice, upon a motion for judgment in default of defence. Mr. Bovill said the case related to debentures to the amount of £21,000 which the Company had issued in addition to various special debentures. The plaintiffs, the holders of the debentures, asked for the usual accounts and inquiries, with a direction that they should not be prosecuted until after a certificate had been made in the Bernstein action, where similar accounts were being taken. His Lordship made the order as asked.

A London Magistrate on Prepayment Gas-Meters.

"The gas companies, with their automatic gas-meters, do more to make criminals than we can do to stop the making of them," said Mr. Chester Jones when presiding over the Children's Court at Old Street last Friday, during the hearing of a charge preferred against a boy named William Harris, 15, of stealing 5s. 11d., the money of the Gaslight and Coke Company, from a prepayment meter at Guinness's Buildings, St. Luke's. Mr. Humphreys, solicitor, who appeared for the Company, said the case was a peculiar and a sad one. The boy lived with his father, who was respectable but poor. When a collector called at the father's home to remove the money from the meter, he found the box had been broken open and the money missing. When spoken to, the boy admitted the theft, but said he had done it as he had lost his situation, and did not wish that the home should suffer because he had no money to bring in. In the witness-box, the father said his son had paid him the money, but he had no idea that it was not his weekly wage. The boy's character was said to be good; and the Magistrate bound him over, under the Probation Act, for twelve months.

Claim by a Beckton Workman.

At the Woolwich County Court last Wednesday, an arbitration under the Workmen's Compensation Act was held by Deputy-Judge Layman, with Dr. Gooding as Medical Assessor, in which a claim was made by Henry Hodson, a gas stoker, against the Gaslight and Coke Company in respect of an accident sustained by him last October. While engaged in clearing ascension-pipes, he fell through a coke-hole into the basement of the retort-house, and sustained a fracture of the femur of the right leg. He was taken to the Seamen's Hospital, where he remained until the middle of December. The Company paid him half his wages, which were £2 a week, until the 17th of April; and on the following day he was given some light work. At the end of the month, he was told his pay would be stopped; but he submitted that he was still unable to work. In support of the claim, it was stated by Dr. MacDermott that the applicant's leg had been greatly impaired through being shortened by the accident. Sir George Hastings and Dr. Finucane, on the other hand, said the shortening was only apparent, and was the result of the use of a stick by the applicant. They considered that a little light occupation would have been good for him; and they thought he might in a short time go back to his work as a stoker. Dr. Gooding having examined the applicant, his Honour expressed the opinion that at the time payment was stopped Hodson was able to do ordinary work; and that if he had persevered with the light work given to him he would now have been able to resume his usual duties. The award would therefore be in favour of the Company.

A Gas Suffocation Case.—In the course of an inquest at West Ham, on the body of Charles Greenwood, who was found in bed in a moribund state owing to coal-gas poisoning, deceased's son said that, hearing a noise in his father's room, he entered and found him in an unconscious condition. The room was full of gas. He opened a window, and then found that a gas-ring used by his father had the tap partly turned on. Over the ring was a mug filled with water, which his father was evidently going to heat. Apparently deceased got up to light the gas, and finding none (it having run out the previous night), got back into bed, leaving the tap on. About 7 a.m., a daughter put a penny in the slot-meter for the kitchen gas, but did not go into her father's room. Dr. Kennedy said deceased did not recover consciousness, and death was due to coal-gas poisoning. The Jury returned a verdict of "Death from misadventure."

MISCELLANEOUS NEWS.

A CO-PARTNERSHIP CELEBRATION.

The Benefits of the System—The Price of Gas in the South Suburban District.

Last Thursday was the date fixed for the annual dinner in connection with the co-partnership schemes of the South Metropolitan and South Suburban Gas Companies; and, as is usual on these occasions, a thoroughly enjoyable day was spent by the guests of the Directors of the two Companies. The Crystal Palace—to which this year the Festival of Empire has lent much additional attraction—was again chosen for the gathering; and the large party who had been invited to dine in Lyons's Restaurant included the Co-Partnership Committees, some of the foremen, and a number of other employees who had been a certain number of years in the service of one or other of the Companies, and who held not less than a stated amount of stock. In all cases, too, the wives were also invited. At the close of the dinner, there were a number of speeches—brief, but to the point, and all in one way or another referring in terms of praise to the beneficent system in celebration of which the dinner took place. The afternoon was spent in the beautiful grounds; and then the party assembled again in the restaurant for tea. Those present included the Chairmen of the South Metropolitan and the South Suburban Companies; Mr. Frank Bush and Mr. John Mews, Directors of the South Metropolitan Company; and all the Employee Directors of both Companies.

Mr. Charles Carpenter, the Chairman of the South Metropolitan Gas Company, presided at the dinner; and after the Loyal Toast had been duly honoured, he asked those present to rise in their places and drink silently to the memory of their dear departed friend, the late Sir George Livesey. Few men in any sphere of life, he remarked, could have left behind them such a valuable heritage as Sir George had done in co-partnership; and he certainly thought that no man in his sphere of life had ever left behind him such a valuable one. What they owed to Sir George was impossible to express under these or any other circumstances. Co-partners lived a different life, owing to the blessings which Sir George had brought within their reach; and they must all use their best endeavour to maintain and to carry on the wonderful tradition of co-partnership which he raised so high in the industrial world. This tribute of respect to the memory of their late Chief having been paid, Mr. Carpenter said he had been asked a little while before whether he did not feel anxious about the conducting of this gathering, and whether he would not with some relief welcome the completion of the function. But his answer was "No," because fortunately on this occasion numerous kind friends were going to do the speech-making for him. Before asking them to do so, however, he wished to allude to one or two letters and messages which had been sent by friends who unhappily found themselves unable to attend. He had a letter from Mr. Jabez Light, the Deputy-Chairman of the South Suburban Company, who expressed great regret at his inability to be present. Sir Fortescue Flannery had telegraphed saying how sorry he was at being detained elsewhere, and remarking that "co-partnership will regenerate social conditions everywhere." He sent his best wishes. Mr. J. Boraston, another Director of the South Suburban Company, had also written expressing regret at having to be absent owing to an important meeting. He said: "I trust you will convey to my fellow co-partners of both Companies an expression of the sincere regret with which I forego an experience which year by year becomes more interesting to me—an opportunity to renew old friendships and to make new ones, which under ordinary conditions I shall always gladly seize. The co-partners who will be present must have noted with great satisfaction the steady advance during the past year of the principle which they have done so much to popularize. It is my earnest hope that this encouraging result may continue to develop until co-partnership, as distinct from mere profit-sharing, is universally adopted by organized industries. There could be no nobler monument to the memory of the leader and friend to whose inspiration we are under so great and lasting an obligation." He concluded with all good wishes for the success of the dinner. Then he had a telegram from Mr. Frank Jones, the youngest member of the Board of the South Metropolitan Company, who was sorry that he was kept at Westminster on parliamentary business. The next letter was one of special interest, coming, as it did, from one of the South Metropolitan Directors who had throughout been a sincere supporter of co-partnership. The gentleman he referred to was Mr. John Ewart, who (after stating that he had two meetings to attend that day) sent the following message: "In these days of labour, strife, and turmoil, it is a matter of unbounded satisfaction that co-partnership pursues the even tenour of its way, to the great benefit of all concerned—employees, shareholders, and the public. With all good wishes." Mr. Robert Morton, another member of the South Metropolitan Board, and one of the sincerest advocates of co-partnership, was also, greatly to his regret, prevented from being present.

Mr. Charles Hunt, the Chairman of the South Suburban Company, submitted the principal toast of the day—"Success to Co-Partnership." He remarked that he esteemed it a great honour to be entrusted with this toast; but on the present occasion he would ask permission to be brief, and he would do so for what he thought were good and sufficient reasons. In the first place, it was an exceedingly fine, not to say hot, day; and he was sure they would be glad to get into the grounds to see the exhibition as soon as possible. In the next place, he had quite expected, almost until the last moment, that his friend Mr. Boraston would be present, and that he might be persuaded to take up this toast, for the reason that, in the slightly altered words of Mark Antony, "I am no orator, as Mr. Boraston is." The third reason was that he did

not know until an hour or two ago that he was to be asked to propose it. The fourth was one which, like Aaron's rod, swallowed up all the rest. It was that "Good wine needs no bush." The co-partnership system stood on so sure a foundation to-day that no words of his, or of any other speaker, could assist it further. It was in their own hearts and in their own minds that they had the carrying of it to further success. If their South Metropolitan friends would bear with him for a moment, he would like to say what the little South Suburban Company had achieved. He found that in 1894—which he thought was the commencement of the scheme—the total bonus was the modest sum of £946. In 1904—ten years afterwards—it had risen to £2500. In 1911—the year just ended—it was £3539. And it would be fairly safe to predict, having regard to the reduction in the price of gas which had just been determined on, that the bonus for 1912 would exceed this amount. Treating the figures as a whole, he found that the total amount of bonus distributed since 1894 was £40,453; and the amount of stock held by 503 co-partners was £31,641, to which had to be added the large amount on deposit—making a total of £38,629. It was true that part of this amount represented savings by co-partners in addition to the bonus which they had received from time to time; but there was a set-off against this in the fact that there were pensioners—ex-co-partners—who held stock of the value of £3588. He thought these were very creditable figures indeed, considering that it represented the working of a comparatively small Company. Now, apart from what co-partnership had done for the two Companies there represented, he felt that they might congratulate themselves upon the great growth of the movement during the last few years. For a time, it seemed to be confined to the South Metropolitan Company and the South Suburban Company. But only a year or two before Sir George's death, the movement spread rapidly; and it now extended, he might almost say, throughout the length and breadth of this Metropolis—from north to south (he begged pardon, from south to north), and from east to west—not to mention the many provincial companies who had adopted it. He had said that the future of co-partnership was in the men's own hands. There was a saying in literature—he believed it was attributed to Dr. Johnson—that "no man was ever written-down but by himself;" and if they applied this to every walk in life, they would see how very much indeed depended upon their own conduct and their own attitude. Their destinies were in a great measure in their own hands, if they applied the real principle of co-partnership. The aim of co-partnership was to instil into everyone an intelligent interest in the work that he had to do, and to secure the goodwill of all employees. If this object be achieved everything else must follow. A great deal could be done by co-partners in furtherance of the common interests, however humble their sphere in life. They had recently experienced in the South Suburban Company what could be done by intelligence and skill directed to the process of gas making. In the management of one part of this process alone, there had been saved during the last two years an income to the Company of not less than £2500. Now, he did not say that every co-partner had it in his power to do likewise; but each one could do something for the Company, and the Scotch had a saying that "Mony a mickle maks a muckle." It was these little savings that mounted up; and the employees had got to consider that, in making them, they were practically working for themselves. It would not be possible for the South Metropolitan or the South Suburban Company to reduce the price of gas from time to time if the cost of manufacture were not to be lowered. It was by the various savings that had been effected that they were able to make these reductions. There was one other matter to which he would like to refer. He had been lately looking through Sir George Livesey's many addresses and papers on this subject; and he wished very much that they could be collected together and bound in one volume, for they formed a fairly connected history of the movement. He noticed in the earlier addresses how extremely anxious Sir George was that the bonus given—that was, what was called the withdrawable half—should not be withdrawn except for really urgent needs; and time after time he entreated the members to exercise thrift. In reality, he compelled many against their will to be thrifty; and no doubt they came to be thankful for it. Gradually Sir George saw the beneficial effect of these entreaties. He lived to see the beneficial effect of them in a greatly improved state of things; and his later addresses were almost entirely congratulatory ones. He (Mr. Hunt) trusted that they would continue to be able to congratulate the co-partners on their thriftiness. It was a pleasure to see their friend Mr. Henry Austin with them that day. He had always listened with keen interest to Mr. Austin's addresses on this subject; and he felt sure that he would bear him out in saying that the exercise of thrift brought its own reward.

Mr. Frank Bush, the Deputy-Chairman of the South Metropolitan Company, remarked that he felt quite sure on this day of all days they were specially remembering the founder of co-partnership. They would all remember with what irrepressible zeal he fought for the cause. Whenever he thought of Sir George and the noble work that he had performed, he was reminded of Longfellow's fine words—

So when a great man dies, for years beyond our ken,
The light he leaves behind him lies upon the paths of men.

Mr. Carpenter and himself were told by a Cabinet Minister some three or four years ago that with the passing away of Sir George co-partnership would cease. It was a bold statement, and he would use no other term for it. But he could positively say that to-day co-partnership stood stronger than it ever did before. It rested with the co-partners to maintain it at its present high standard; and not only to maintain it but to improve it. He happened a short time ago, when looking over his papers, to come across a very able article which appeared in the "Builder" some three years ago. The writer so aptly and happily expressed himself that he would read to them a paragraph which particularly appealed to him: "Sir George Livesey has given to the world a practical demonstration on a large scale of the methods by which operatives of all classes may be induced to take a lively interest in their own work and in that of their fellow-workers, and by which, as a result of their own labour, they may pass in to the ranks of capitalists. Truly, a notable achievement." He would like to say a word or two on the question of selling stock—a subject very near his heart. Transfers came up to the Board table, to be seen by the three Trustees; and in one corner was written the reason why

the co-partner was selling. In many cases, they saw notified "going abroad." Numbers of their young men had gone to the Colonies; and they all heartily wished them success in their new careers. With determination and energy, he felt quite sure they would get on. He wanted now, however to mention particularly another class of men who sold their stock and then took a small business. With regard to most of these cases, he could safely say, after having made inquiries, that the money had been lost. Only that morning he had heard of an instance where a man sold stock amounting to nearly £90. It had gone in three weeks; and it had taken him four years to get it. And they must remember the rule was that when a man sold his stock and left the Company, he could not be taken on again. There he would leave the matter; but he hoped they would believe he spoke in all friendliness when pointing out the risk men ran in buying little businesses. One thing more. Employing, as the Company did, 5000 or 6000 men, death unfortunately was more or less with them; and he thought he would like to know the number of widows who were co-partners. There were on the register as holders of stock 133 of them; and they held nearly £8500 of stock. How they must bless the name of Sir George Livesey, and his co-partnership scheme!

Mr. W. G. Waller, a Workman-Director of the South Suburban Company, said it had been very gratifying to him to hear the remarks of their Chairman, Mr. Hunt, with regard to the successful half year the Company had experienced. Without a doubt this result would have been impossible of accomplishment if all the co-partners had not put their backs into the work. So long as this sort of thing continued, co-partnership would flourish and succeed abundantly.

Mr. C. W. Sackett, an employee of the South Metropolitan Company, proposed a hearty vote of thanks to the Chairmen, Directors, and all concerned for their kind invitation. It was, he said, a treat they all thoroughly appreciated. Co-partnership was one of the most practical things going. It was a system that had succeeded, where other systems had failed, in bringing employer and employee together in a bond of unity and friendship, which was so much to be desired. The results of the system were so splendid that there was really no need for words.

The proposition was seconded by Mr. W. T. Luther, a South Suburban employee, who remarked that at the last Committee meeting the question of the withdrawable bonus came up. It was decided by the Directors to leave the matter where Sir George had left it. Mr. Hunt had told them that the Company were going to reduce the price of gas 1d. per 1000 cubic feet. He thought this would be the lowest price—2s. 4d. per 1000 cubic feet—ever charged by the South Suburban Company; and it would mean that the employees would get 7 per cent., instead of 6½ per cent., which would be the highest bonus ever declared by the Company. He wished both Companies even greater prosperity in the future than in the past.

Mr. W. Kinnear, another South Metropolitan employee, in supporting the vote of thanks, also expressed his pleasure at being present, and said that if any one had asked him when he entered the service of the Company less than ten years ago what was farthest from his mind, it would have been that he would be present there that day as a member of the Co-Partnership Committee representing the men at Vauxhall. They needed no further proof of the interest taken by the Directors in the employees than the fact that they were assembled there at their invitation. One of the men had said to him: "I do not think, if it had not been for co-partnership, I should have had so many farthings as I have shillings at the present time." This defined the position of every employee in the Company. But they did not forget that it was brought about by the persistent efforts of the late Sir George, and of their present Chairman, who was following in his footsteps. They also realized that Mr. Carpenter had the hearty support of the whole of the Directors.

Mr. H. C. Sims, the Secretary of the Co-Partnership Committee of the South Metropolitan Company, said he had a few interesting figures which he would like to read. At the last distribution, £36,100 of stock was applied for, at a cost of £43,320 to co-partners. The total of the bonus credited last year was £41,387; so that the amount of purchased stock exceeded the bonus by nearly £2000. Now, most people would say they ought to be satisfied. He hoped, however, they would take his advice and not be satisfied, but as year succeeded year let each be a record one.

Mr. Jones, the Secretary of the South Suburban Co-Partnership Committee, followed, and expressed the pleasure that he felt in helping to administer the co-partnership branch of his Company. He could only repeat what he had said in the room before—that he hoped every co-partner would do his level-best to ensure the prosperity of the Companies; and each year when the bonus was declared, and he looked into his pass-book and saw the amount credited to him, might every man be able to say: "I have done my very best to earn this sum." Mr. Hunt had announced that the South Suburban Company intended to reduce the price of gas 1d. per 1000 cubic feet, which would give the co-partners ½ per cent. more bonus, and make it 7 per cent.—the highest they had had.

Mr. W. Doig Gibb, the Chief Engineer of the South Metropolitan Company, who was then called upon by the Chairman, said that, with regard to co-partnership, he described himself at last year's dinner as a "baby in arms;" and if this were true then, he could not claim yet to have reached "the years of discretion." He had, however, had more experience of co-partnership now than was the case a year ago; and he found that, while the Directors were exceedingly kind and thoughtful towards the men—as instanced by the lobbies and institutes that had been put up—the men also had consideration and kindly feeling for the Directors and the officers. In the North, he had had varied experience in connection with negotiations with workmen. But, on coming South, he had always found that in adjusting little difficulties about prices of piecework, and little things like that, the men could be talked to as friends. They all seemed to be endowed with one desire—to come to fair terms—which would be straight and good, both from the Directors' point of view and that of the men. This rendered life very pleasant. He had made a great many friends, and hoped to make more.

Mr. Carpenter said they must have a few words from Mr. Shoubridge—a fervent and through-and-through admirer of Sir George.

Mr. S. Y. Shoubridge, the Chief Engineer of the South Suburban Company, said it was quite true that he yielded to none in his admiration for Sir George, and for the immense good he had done, not only for their two Companies, but for labour generally throughout the country. That co-partnership in the South Suburban Company continued to flourish was proved by the fact that in the half year just ended they had obtained the greatest amount of profit that had ever been made in the history of the Company. As a result, the gas consumers would benefit by a reduction in price, the shareholders would benefit by an increased dividend, and the employees would benefit by a larger bonus. The results were not, of course, all due to the employees. A great deal was owing to the markets. Much, however, was due to the co-partners; and if they continued to work together in the future as they had done in the past, they would make fresh records very soon. They would have an opportunity that evening of seeing the latest effort of co-partnership in the lighting of the Palace grounds. As most of them knew, the Directors had arranged a large scheme of lighting; and the work had been carried out in the true co-partnership spirit by all engaged in it. The result had been admitted by the authorities themselves to be a great credit, not only to the gas industry, but to the Festival of Empire Exhibition.

Mr. F. M'Leod, the Secretary of the South Metropolitan Company, remarked that, as Mr. Gibb had pointed out, co-partnership not only put money into men's pockets, but put brains into their heads and blessed them with reasonable tempers.

Mr. Charles M. Ohren, the Secretary of the South Suburban Company, having emphasized the guests' appreciation of the kindness of the Directors,

The Chairman briefly acknowledged the vote of thanks; and the Company then dispersed.

THE GAS PUBLICITY SCHEME.

Manchester Corporation Gas Committee's Decision.

The Gas Committee of the Manchester Corporation had under consideration at Friday's meeting the question of contributing to the scheme of the Publicity and Special Purposes Committee of the Institution of Gas Engineers. The members had before them a mass of information on the subject supplied from headquarters, supplemented by further details from the Chairman of the Committee (Alderman Gibson), and the Engineer (Mr. J. G. Newbigging, M.Inst.C.E.). Ultimately a resolution was adopted to the effect that Manchester should contribute to the scheme on the basis of 2s. 6d. per million cubic feet of gas made, subject to the Gas Department being "satisfactorily represented" on the Publicity Committee, and to the question of the basis of contribution being brought forward at the expiration of three years for consideration, and for revision if necessary. This resolution is, of course, subject to confirmation by the City Council, who will hold a meeting to-morrow (Wednesday).

As explained in the "JOURNAL" last week (p. 246), Manchester's contribution on the 2s. 6d. basis meant upwards of £700 per annum. The Salford Town Council, it may be remembered, at their last meeting approved of the Gas Committee's recommendation that their contribution to the scheme should be on the 2s. 6d. basis, without any special qualification.

INCOME-TAX ALLOWANCE FOR DEPRECIATION OF PLANT.

Appeals of the Barmouth, Dolgelly, and Dysynni Gas Companies were heard by the Special Commissioners in London last Wednesday. The claims of the Companies were for a deduction in respect of wear and tear of plant and machinery; and they were put forward by Mr. W. A. Schultz, F.C.A. The Commissioners decided to allow 2 per cent. on the value of gasholders, and 5 per cent. on all other plant, including stoves and meters. As there are other cases pending for a decision in the question as to whether meters and stoves are machinery and plant within the meaning of the Act, the representative of the Crown formally declared his dissatisfaction with the decision of the Commissioners.

We have received the following particulars in regard to an appeal by the Merthyr Tydfil Gas Company.

On June 30, the local Commissioners for Merthyr Tydfil decided an appeal by the Gas Company for a deduction from their profits, in accordance with the circular issued by the Board of Inland Revenue, on account of the loss they had sustained from the necessity to replace their machinery and plant which had become worn out and obsolete. The experience of the Company in the matter has been sufficiently unique to make some reference to the circumstances interesting alike to the gas community and to users of machinery generally.

For some few years the Company had been allowed to deduct an annual allowance for depreciation; but on the issue of the circular referred to, this allowance was withdrawn. At the outset, it may, perhaps, be stated that the claim was disallowed; and the Company are in the position of having "scrapped" some thousands of pounds' worth of worn-out and obsolete machinery without having received practically a halfpenny for the depreciation to which they were legally entitled. The claim arose in this way: The existing plant had become worn out and unsuitable, and new plant had been erected at another site. A personal inspection was duly made by a responsible official of the Inland Revenue Department, who admitted the claim, and the allowance was duly made. Shortly afterwards, however, the Company received an additional assessment to cover the amount of the allowance which had previously been granted; while no explanation was tendered for this unusual procedure. Hence the appeal to the Commissioners.

At the hearing of the appeal, which was conducted by Messrs.

Humphreys-Davies and Co., the Consulting Surveyors to the Machinery Users' Association, the Surveyor of Taxes, acting upon instructions, objected to the claim, and urged that there was no legal right to any allowance beyond the wear and tear that the plant had sustained during the year. This is the legal position; but it was argued on behalf of the appellants that, having regard to the instructions contained in the circular that "no depreciation under any circumstances should be allowed" in the case of gas companies, such an objection ought never to have been raised on behalf of the Inland Revenue. However, as already stated, the Commissioners, after considering the case at some length, decided to dismiss the appeal. The Company are therefore appealing for an annual allowance for the depreciation of their machinery and plant.

This case should serve as a useful object-lesson of the risks users of machinery, and particularly gas companies, incur who have abandoned their legal claim to an annual allowance for wear and tear, and propose to claim an allowance for renewals as and when any expenditure of this nature is incurred. As far as can be reasonably judged, the claim of this Company was as strong as any. Moreover, an official inspection of the plant had been made and the allowance granted, only to be withdrawn presumably at the instigation of another official who had apparently never been near the works, and could not be nearly so well able to adjudicate upon the claim.

When it is remembered that an assessment can be amended or a further assessment made at any time within three years after the expiration of the year of assessment, it really comes to this, that any concession of the nature herein referred to must be accepted with reserve until the period during which it can be taken away again has elapsed.

PUBLIC LIGHTING OF THE CITY OF LONDON.

Annual Report of the City Engineer.

We have received from the City Engineer (Mr. Frank Sumner, M.Inst.C.E.) his report on the works executed by the Public Health Department of the Corporation of London during last year. It furnishes some interesting particulars as to the experimental lighting by gas and electricity in certain parts of the City.

ORDINARY AND HIGH-PRESSURE GAS LIGHTING.

The number of gas-lamps (including experimental lamps) paid for by the Public Health Department of the Corporation at the end of the year was 2659; being a decrease of 61 in the twelve months. The larger proportion of the ordinary burners (1873) consumed 4.25 cubic feet of gas per hour; the consumption of most of the high-pressure lamps being 10, 20, and 25 cubic feet. The high-pressure gas lighting in Fleet Street was satisfactorily maintained throughout the year. No stoppages occurred; and only a few defective lights were observed. There are (including experimental lighting) 115 other high-pressure Keith gas-lamps in City thoroughfares; making 132 in all. The number of low-pressure gas-lamps at the end of the year was 2527, principally consuming $4\frac{1}{2}$ cubic feet of gas per hour each; the illuminating power being 60 to 70 candles. Owing to the narrowness of the footways, the lamps are chiefly fixed on brackets from 60 to 70 feet apart on the diagonal, at a height of about 12 feet from the pavement level to the burner; the annual cost of each lamp, with gas at 2s. 2d. per 1000 cubic feet, being £3 5s. 7d., which includes maintenance of mantles, &c., but does not cover capital charges.

The number of defective gas-lights observed and reported upon during the year was 1763—viz., feeble lights, 1721; lights failed, 42. In addition, 117 defects in lanterns, burners, &c., were reported to the Gaslight and Coke Company and rectified. In accordance with the general instructions in force for many years past, the public gas-lamps were lighted whenever fog or unusual darkness occurred. This happened on 34 days during the year, and entailed an additional cost of £200 9s. 9d.

EXPERIMENTAL GAS AND ELECTRIC LIGHTING.

During the year, experiments were carried out with both gas and electric lighting on the lines of the conclusions contained in the report of the deputation of the Streets Committee who visited various cities on the Continent. These were: "(1) That, wherever possible, streets should be lighted by means of centrally hung lamps with lowering gear. (2) That open spaces should be lighted by means of lamps upon standards, fitted with lowering gear. (3) That high-pressure incandescent gas-lamps with inverted burners should be adopted as the illuminant; but where gas is impracticable, electricity, with open arc and flame arc lamps, should be installed."

Seven centrally-hung high-power gas-lamps, of 1500-candle power (nominal), were installed by the Gaslight and Coke Company in Cannon Street (between King William Street and Dowgate Hill), with gear to lower them to the footway, with winches, &c., fixed in the side streets where possible. The light is about 26 ft. 6 in. above the centre of the roadway; and the lamps are chiefly suspended at the junction of cross streets. The average distance apart is about 104 feet, and the width of the carriageway is about 50 feet. Two lamps have had to be fixed upon posts on the rests at the east and west end of the street, in which instances the light is about 22 feet above the roadway. For the purpose of supplying these lamps, a special 6-inch main was laid in King William Street and Cannon Street, and a compressing plant installed in a vault beneath the northern approach to London Bridge. This experiment complies with the first of the Committee's conclusions.

High-power gas-lamps, of 1500-candle power (nominal), were erected by the Company on three of the rests in the large open area constituting the Blackfriars Bridge approach. They were placed on standards; the height of the light being 17 feet above the roadway. The lamps are lowered by gearing attached to the column; the gas being supplied under pressure from the Company's compressing station at 70 to 80 inches water pressure. This meets the requirements of the second conclusion.

Six lamps on columns have been erected at equi-distant points on the footway in New Bridge Street (from Ludgate Circus to Queen Victoria

Street), with a nominal illuminating power of 1500 candles. The height of the light is 16 ft. 10 in. above the pavement, and the lamps are about 125 feet apart. This street averages 80 feet in width. The gas for these lamps is supplied from the Company's compressor-house in Tudor Street. In addition to these, a small 300-candle high-power lamp has been erected on the rest by Tudor Street, to facilitate vehicular traffic.

Another experiment is being carried out in Cheapside and the Poultry, between Lawrence Lane and Mansion House Street. It comprises eleven bracket lamps originally fitted with clusters of four low-pressure burners, having a claimed illuminating power of 300 candles. An additional burner was afterwards placed in these lamps by the Company—giving an additional illumination of about 75 candles each. The brackets are attached to the buildings, and project 7 ft. 6 in. over the footway; the light-source being about 13 feet above the pavement, with an average distance of about 55 feet between each lamp. The width of the thoroughfare between the frontages is about 50 feet. One lamp is on a post on the rest by King Street, 15 feet in height, and one is on the rest at the junction of Queen Victoria Street, containing four high-power inverted burners, 20 feet consumption of gas; the height of the light above the roadway being also about 15 feet.

In London Wall and Wood Street, there are 26 low-pressure inverted single-burner lamps, of about 90-candle power each (stated), and consuming $3\frac{1}{2}$ cubic feet of gas per hour per lamp, in square and circular lanterns, principally on brackets on the house fronts. The average distance apart is about 95 feet; the light averaging about 12 feet above the footpath. The width of these streets varies from 25 to 40 feet. These lamps take the place of the upright Kern burner incandescent gas-lamps, consuming $4\frac{1}{2}$ cubic feet of gas per hour.

Electric lighting experiments are being carried out by the City of London Electric Light Company, Limited. In Cheapside (between Peel's Statue and Lawrence Lane), there are 10 centrally hung 12-ampere Oliver oriflame magazine arc lamps of 2000-candle power (nominal), fitted with prismatic reflectors; the light being about 27 ft. 6 in. above the centre of the carriageway. Where possible, the lamps have been suspended at the junction of cross streets; their average distance apart being about 90 feet. The lamps are fitted with winches, &c., to lower them over the footpath. In the side streets, where possible, the lamps are run in two series, so that the whole can be in lighting until midnight or any time agreed upon. At present, every alternate lamp is switched off at midnight. One refuge-lamp on a post at the western end of Cheapside is fitted with a 200-candle power metallic filament lamp. This experiment complies with the first of the Committee's conclusions.

In Watling Street (including lanes and courts south of Cheapside), there is a combination of flame arc lamps and two high-power metallic filament lamps, made up of clusters, and suspended over the centre of Watling Street (between Bow Lane and St. Paul's Churchyard), principally where the cross thoroughfares intersect, assisted by 11 metallic filament lamps in globe lanterns on brackets attached to the fronts of the buildings in the small courts and lanes. The height of the centrally hung lamps is about the same as the lamps in Cheapside; while the light of the metallic filament bracket lamps is about 12 feet above the footpath. This partly complies with the Committee's first conclusion.

In Farringdon Street, the Company furnish an example of central road lighting; tall standards being placed on rests. Seven of these standards are fixed in the centre of the roadway; the illuminating value claimed for each lamp being 4000 candles. The lamps are held in position by special harps or holders, so made that the lamps may be lowered by self-contained automatic gear. They are fitted with semi-opalescent outer globes and with dioptric lenses; the height of the lamps being 25 ft. 6 in. from the roadway to the light centre. These are supplemented by three short standards, fitted with 50, 100 and 200 candle power metallic filament lamps on the north end of the lavatory by Charterhouse Street, the small rest by Seacoal Lane, and the small rest under the Viaduct respectively. The latter post is fitted with a double swan-neck with two globe lanterns, each containing a metallic filament lamp of 50-candle power, acting as a traffic lamp; while flame arcs have been substituted for the small enclosed arc lamps at the foot of Snow Hill and on the rest at the foot of St. Bride Street. To give sufficient illumination under Holborn Viaduct, and to avoid the dark shadows that would be thrown from the 12 pillars supporting the Viaduct if a strong light were placed between them, two metallic filament lamps of 200-candle power each, and two of 100-candle power each, are suspended from the under side of the Viaduct. The lamps are at an average distance of 175 feet apart; the width of the roadway being 100 feet. This complies with the second conclusion.

Paternoster Row is lighted by nine metallic filament lamps of 75-candle power in acorn-shaped globe lanterns, suspended on brackets on the house fronts at an average distance apart of about 86 feet, and 12 ft. 6 in. above the footway; the width of the street being about 20 feet.

ELECTRIC LIGHTING.

The lighting of most of the main thoroughfares by arc lamps was continued throughout the year. The number of the original type of "open" electric lamps in lighting at the end of the year, at a cost of £26 each, was 334, or a decrease of 32, accounted for by the substitution of new and cheaper flame arcs in West Smithfield, and their removal from certain thoroughfares in connection with the experimental lighting. In addition, there were 80 "Oliver" flame arcs (partly experimental) and 36 metallic filament lamps (experimental) in lighting during the year. These lamps were lighted on 27 days when fog or unusual darkness occurred, at a total additional cost of £182 12s. 11d. The number of defective electric lamps reported in the year was 89. For these failures, deductions were made from the accounts of the City of London Electric Lighting Company with respect to 80 of such failures, which amounted to £14 14s. 11d. during the year; the remaining nine failures being attributable to the experimental lamps of the Charing Cross Company in Cannon Street. The number of arc lamps in use on Dec. 31 last was 403; the price of the original "open" lamps being £26 per annum, and of the "flame" arc lamps £17 10s. In addition, there were 21 experimental arc lamps and 36 metallic filament lamps; making a total of 460 electric lamps.

HOLBORN PUBLIC LIGHTING.

Joint Tender Accepted.

At the Meeting of the Holborn Borough Council last Wednesday, the Works and General Purposes Committee (of which Alderman Max Clarke is Chairman) brought up a report on the question of lighting the thoroughfares of the borough by gas and electricity, on the joint tender of the Gaslight and Coke Company and the Metropolitan Electric Supply Company, Limited. It may be remembered that the question had been adjourned from the 14th of June, as reported in the "JOURNAL" the following Tuesday (p. 934), and the Works and General Purposes Committee had again considered the question, as the two Companies had insisted upon an increase of 10 per cent. upon their original figure of £6950 if certain clauses—viz., 28 and 35—were retained in the contract. The Council considered the former clause vital; and they recommended that it should be adhered to, as upon it depended entirely the question of their retaining any control over the efficiency of the lighting. Negotiations took place with the Companies, but without effect. The text of the clause is as follows:—

The candle power set against each lamp in the schedule shall be the minimum power as directly measured by the Council's photometrical apparatus placed at ground-level; and in the event of the same falling more than 10 per cent. below such minimum, the contractor shall be liable to a penalty not exceeding £5 for every occasion on which it is shown that the lamps are below the minimum candle power; the average of 30 lamps, taken on three succeeding nights, to be taken as the basis of calculating the candle power for this purpose. The term "candle power" referred to in this specification shall have the same meaning as that given in the Gas-Works Clauses Act, 1871.

The Companies suggested the following clause in lieu of the foregoing:—

The candle power as set against each group of lamps in such schedule shall be the minimum power as directly measured by the Council's photometrical apparatus placed at about 3 feet above ground-level; the said apparatus being such as shall be mutually approved by the parties hereto.

The tests shall be taken in such a manner as to ensure that glazing-bars shall not interfere with the results obtained. The candle power of each lamp tested shall be arrived at by taking the average of two readings in any position with regard to the light under test—one reading at an angle of 20° and a second reading at an angle of 50° to the horizontal; and in the event of the average candle power of any three adjacent lamps falling more than 20 per cent. below such minimum, the contractor shall, on the receipt of a written communication from the Borough Surveyor, carry out such work as may be necessary so that the minimum power as specified is registered; and in the event of the average of the lamps complained of failing to reach the standard of illumination at a second reading (to be taken at the expiration of 48 hours from the first reading), the contractor shall, unless he can prove to the satisfaction of the Borough Surveyor that the deficiency occurred through accident or other unavoidable cause, be liable to a penalty not exceeding 2s. in respect of each lamp tested and found to be deficient. And the Council shall be empowered to rectify the defect by its own tradesmen, and charge the cost of the same to the contractor, if the contractor fails to do so. The contractor shall be at liberty to be present at any photometrical tests by the Council's officers, and to check the readings when taken. The term "candle power" referred to in this specification shall have the same meaning as in the Gas-Works Clauses Act, 1871.

Complaints of defective lamps shall be sent by the Council to the contractor by messenger; and the receipt of the same shall be acknowledged by the contractor. In the event of any question or dispute arising between the Council and the contractor with regard to any of the provisions of the clause, the same shall be referred to an arbitrator to be agreed upon by the parties (or, failing agreement, to the President for the time being of the Institution of Civil Engineers), whose decision shall be final and binding.

Clause 35 provided that the contractor should adopt any subsequent improvement in burners, lamps, or appliances that might be made, without additional cost to the Council.

As the Council held to the original form of clause 28, the Companies increased their annual price from £6950 to £7645. The Council agreed to delete clause 35, as, in their opinion, it was too onerous, and could well be omitted without prejudice to the Council's interests.

In the course of their report, the Committee said:

The Companies in their tender undertake, for payment of a lump sum per annum, to make all the improvements, supply all the new lamps, fittings, and columns, and maintain a light of a certain gross candle power as required by the specification. The sum which the Company will expend in providing the new fittings (which will become the property of the Council) is not stated; but we are informed that it will amount to about £9000, payment of which will be spread over a period of ten years as part of the contract amount. This estimate has been carefully examined with the specification; and it has been ascertained that it represents the reasonable cost of supplying the new lanterns, fittings, and columns required to be provided, and of the work in altering and adapting part of the existing system to electric lighting.

During the past year, the lighting of the borough by the present system cost £6975; whereas if the improved lighting were in force it would have cost only £6745, after deducting £900, the proportion of this estimated capital charge. For the year 1901-2, the first complete year of the Council's existence, and before the adoption of incandescent gas lighting, the expenditure amounted to £7537; and the amount for the past year is the lowest figure that it has since reached. The difference in the amount of light proposed by the Companies, which is some 20,000-candle power in excess of that required by the specification, is accounted for by the increase proposed in the power of the lamps in certain main thoroughfares, which are partly in adjoining boroughs. This is considered desirable for the purpose of uniformity. If it were decided to retain the lamps in the side streets at the present candle power—i.e., 60—instead of the proposed 90-candle power, this would mean a reduction in the total candle power in such streets, which comprise 1390 lamps, from 125,100 to 83,400. It should be borne in mind, however, that this latter figure represents the minimum to which the mantles are allowed to run down; and a truer comparison would be made between 80 (the original power of the mantles when first installed) and the proposed 90-candle power. The difference in that case would amount to only 13,900-candle power.

Having regard to all the circumstances, we are of opinion that the tender is a favourable one to the Council, inasmuch as it provides for a greatly improved system of lighting without placing an undue burden upon the rate-payers for capital outlay in any particular year, and that the recommenda-

tion of the Committee of the whole Council, as amended by the addition of the words proposed by the Finance Committee, should be adopted. We therefore recommend—"That, subject to the consent of the London County Council being first obtained to the form and principle of the contract, the joint and several tender of the Gaslight and Coke Company and the Metropolitan Electric Supply Company, Limited, dated April 11, 1911, for lighting the streets of the borough for ten years for the sum of £7645 per annum, subject to the deletion of clause 35 of the specification and the amendment of the schedule of lighting as proposed by them, be accepted, and that the seal of the Council be affixed to the necessary contract to be prepared by the Town Clerk."

On the reception of the report,

Alderman C. E. GREEN opposed its adoption, as he did not agree with the schedule of lighting. He said he had visited the Crystal Palace with the Chairman of the Finance Committee to view the most modern types of up-to-date lighting, and reported to the Works Committee what he had seen. The Committee, however, refused to discuss the matter, as they said they had had the lighting question under consideration long enough. In his opinion, the contract was not in the interest of the borough; and he opposed the Committee's recommendation.

Alderman NOLAN GLAVE said the Committee had fully discussed the matter in a sitting lasting two hours. There were eleven members present out of fifteen; and they had given a large amount of time to the subject. He therefore supported the recommendation.

Without any further discussion, the Council adopted the report; only three members voting against it.

IMPROVED PUBLIC LIGHTING IN WANDSWORTH.

The Highways Committee of the Wandsworth Borough Council have submitted a report stating that they have had under further consideration the subject of the proposed revision of the charges for street lighting and the improvement of the lighting arrangements in the borough. They have been in communication with the various Gas Companies who supply gas in the borough, and have had before them their proposals showing the present charges for lighting and certain suggestions for contracts for five years and shorter periods. Having regard to the steps which are being taken for the improvement of public street lighting, the Committee do not think that contracts should be entered into for so long a term as five years; and after careful consideration, they have decided as follows: In the Wandsworth and Putney Gas Company's district, the existing arrangements to be continued at present; and also in that of the Brentford Company, except that the lighting hours be reduced from 4300 to 4200 a year, so as to make the number practically uniform throughout the borough. This will result in a saving of £4 19s. 2d. per annum. The offer of the South Metropolitan Gas Company to be accepted to convert the existing No. 4 upright burners into inverted burners for the sum of 3s. each, and to reduce the charge for the lighting and maintenance of these lamps from £3 2s. 10d. to £2 19s. 6d. each per annum. The total estimated cost of converting these lamps will amount to £121 10s.; resulting in a saving for the first year of £13 10s., and for the second and subsequent years of £135 per annum. As to the Mitcham and Wimbledon Gas Company's district, to accept the offer of the Company to convert the existing No. 4 upright burners into inverted burners for the sum of 5s. each, and to reduce the charge for the lighting and maintenance of these lamps from £4 5s. 4d. to £3 14s. 6d., and of lamps with No. 3 burners from £3 11s. to £3 3s. 3d. per lamp per annum; the contract to be for three years, and the charges for lighting, &c., to be changed according to any variation in the charge for gas to private consumers. The total estimated cost of the conversion is put at £29 5s.; and the saving the first year at £326 6s., and the second and subsequent years at £355 11s. per annum. As to the Gaslight and Coke Company's district, the Committee consider the Borough Engineer should be instructed to rearrange the lighting hours of the lamps (of which there are 11), so as to make the number the same as in the districts of the other Gas Companies. By the above-mentioned proposals, the Committee state that a total saving will be effected after the first year (when the cost of converting is to be borne) of £495 per annum.

The Committee also report that they have considered a letter from the South Metropolitan Gas Company relative to the suggested improvement of the lighting of the Streatham High Road, stating that if high-pressure lighting were adopted it would be necessary to have new lamps, at a cost of about £6 each column. The gas consumed would be a heavy item, as no high-pressure lamp consumes less than 15 cubic feet per hour; and as the existing high-pressure lamps at Streatham are extinguished at 10 p.m. by stopping the compressor, the public lamps could not be attached to this main at present. The Company suggest that a more economical and better way of lighting will be to replace each of the existing lamps with a two-burner inverted lamp similar to those in the main roads of Southwark (where the high-pressure system has been superseded) and other boroughs; and they offer to fix up half-a-dozen of these lamps in Streatham High Road on approval. The Committee have decided to accept this offer.

They further state that when the foregoing recommendations are carried into effect they consider that the roads in the borough will be well and sufficiently lighted. They propose to keep the general question before them, and should it be found possible to further improve the lighting of the streets at reasonable cost, they will report again.

Wages in the Bolton Corporation Gas Department.—At last Friday's meeting of the Bolton Corporation Gas Committee, consideration was given to an application made by the Bolton Gas-Workers' Association that the minimum wage to the gas-fitters employed by the Corporation during the first year after completing their apprenticeship be at the rate of 7½d. per hour. The Committee resolved that, for the first six months after completion of apprenticeship, the rate of wages be 7d. per hour, and for the remaining six months 7½d. per hour. It was also decided that the minimum wage for meter inspectors and cutters-off be 25s. a week; for prepayment meter inspectors, 33s. a week; and for ordinary meter inspectors, 32s.

STREET LIGHTING IN MAIDSTONE.

Cost of Electricity and Gas.

The report for the year to March 31 submitted to the Maidstone Electricity Committee by Mr. A. Warr King, the Chartered Accountant appointed to audit the accounts of the undertaking, stated that the total revenue for the twelve months amounted to £13,641, and the expenditure to £7824, leaving a gross surplus of £5817. Interest and principal repayments, however, absorbed £5976; so that there was a deficiency of £159, which had been charged against the unappropriated surplus brought forward from the previous year's accounts.

Alderman VAUGHAN, in moving the adoption by the Urban District Council of the Electricity Committee's minutes containing this report, said that the gross surplus of £5817 showed a percentage on the capital invested of between 9 and 10 per cent.; but this had all been absorbed in the payment of principal and interest.

Alderman CLIFFORD inquired what percentage would have been written off for depreciation if the undertaking had been in the hands of a private company.

Alderman VAUGHAN replied that the amount charged in the accounts in respect of repayment of loans was £3629, which in his opinion, was equivalent to a depreciation fund, and a very good one, too.

Mr. WAKEFIELD suggested that the Committee should take into consideration the question of street lighting. He had, he said, made inquiries, and had found that in 1901, before the electricity undertaking was established, the cost of street lighting, which was then carried out by the Gas Company, amounted to £2436. Last year, however, the total was £3341; being £631 for lighting by gas, and £2710 for the electric light. So that in ten years their lighting bill had gone up by £905. It was true that since 1901 eight additional streets had come under the control of the Council; but these could all be properly lighted for a total of £109, so there was still a sum of £796 unaccounted for. He knew there had been many questions raised as to improvements in street lighting; but he questioned whether they were lighted any better now than before. There were 67 arc lamps in use in the town; and he had been informed that the majority of these cost no less than £20 each. Therefore, in arc lamps alone, they had spent nearly £1200.

Mr. FOSTER CLARK said he understood that the cost of the small electric lamps was no greater than of the gas-lamps. It was the arc lamps which were so expensive; and he believed several members of the Council would like to see a reduction under this head.

Mr. MARTIN: A Committee has already been appointed to deal with the whole question of lighting.

Alderman MORLING remarked that, as one who was concerned in the installation of the electricity system in Maidstone, he was glad to see they were not all pessimists on this particular subject. He thought they ought to be proud of the undertaking. He wondered Mr. Wakefield did not go back to fifty or a hundred years ago, when Mr. Parkitt started the Gas Company, and tell them what they paid for the street lighting then. He hoped the town would continue to grow; and this, of course, would mean that the lighting would also increase.

Alderman VAUGHAN said he was surprised that Mr. Wakefield, who was elected by the ratepayers to look after their interests, was always so ready to run down an undertaking which the Council were anxious to make successful. In his opinion, they had one of the best electricity undertakings in the country; and, like Alderman Morling, he thought they should be proud of it. Electricity was the light of all lights; there was a wonderful future for it, not only as an illuminant, but also for domestic purposes.

The Committee's report was then adopted.

GASLIGHT AND COKE COMPANY'S ACCOUNTS.

[For the Half-Yearly Report, see p. 287.]

The accounts of the Company for the six months ended June 30, to be submitted with the Directors' report on Friday, consist of the usual statements, from which we take the following particulars.

The statement of capital (stock) sets forth that the total paid up is £10,264,980; added on conversion, £12,697,710—total amount authorized, £22,962,690. Deducting the amount redeemed, £139,725, the total amount of the Company's existing capital powers is £22,822,965. The statement of loan capital stands thus: Total paid up, £3,097,300; added on conversion, £1,564,405; unissued, £750,000—total amount authorized, £5,411,705.

The capital account shows receipts (with premiums, £1,669,476 8s. 5d.) to the amount of £29,154,146 8s. 5d. A sum of £18,845 was redeemed in the half year. The expenditure is shown in the following items:—

Expenditure to Dec. 31, 1910	£14,656 89 15 0
Expenditure during the half year to June 30, 1911—viz.,	
Buildings and machinery in extension of works	£7,926 6 1
New and additional mains and service-pipes	17,746 19 11
Do. do. meters	8,416 12 7
Do. do. stoves	11,562 14 8
	45,651 13 3
By sale of surplus land	£54,397 3 10
By depreciation of plant	17,184 2 6
By depreciation of meters and stoves	52,775 19 9
	124,357 6 1
Total expenditure	£14,577,485 2 2
Nominal amount added on conversion	14,262,115 0 0
	£28,839,600 2 2
Deduct amount of capital redeemed under Company's Act of 1903	139,725 0 0
	£28,699,875 2 2
Balance of capital account	454,271 6 3
	£29,154,146 8 5

The following is the revenue account:—

		Expenditure.	
June Half Year, 1910.		£ s. d.	£ s. d.
£562,493	Manufacture of gas—		
59,107	Coal, including all expenses thereon	609,388 13 11	
34,760	Oil less value of oil tar	45,120 2 7	
15,587	Coke and breeze used in the manufacture of carburetted water gas	39,135 16 5	
97,873	Salaries of Engineers and other officers at works	16,245 18 6	
7,992	Wages	96,602 4 7	
	Purification	13,904 1 6	
	Repair and maintenance of works and plant, materials and labour, less received for old materials, £7255 2s. 11d.	237,895 14 6	
184,259	Distribution of gas—		1,058,592 12 0
52,932	Salaries and wages of officers (including rental clerks)	54,061 9 5	
82,863	Repair and maintenance of mains and service-pipes, &c.	82,321 15 2	
74,247	Repair and renewal of meters	73,803 2 1	
68,291	Stoves	75,648 14 3	
35,201	Gas fittings, including labour (automatic meter supplies)	25,135 6 5	
22,217	Public lamps—lighting and repairing . . . . .	..	3,096 17 4
6,501	Rents, rates, and taxes—		26,424 0 7
148,556	Rents payable	6,790 18 3	
	Rates and taxes	154 870 17 0	
3,750	Management—		161,661 15 3
204	Directors' allowance	3,750 0 0	
9,452	Company's Auditors and Assistant	302 2 0	
25,411	Salaries of General Manager, Secretary, Accountant, and clerks	9,643 7 3	
7,162	Collectors and cashiers	25,626 14 0	
4,374	Stationery and printing	4,475 10 2	
	General charges	6,169 0 1	
			49,966 13 6
12,799	Co-partnership for year to June 30, 1911	32,545 15 4	
	Less on account	16,000 0 0	
416	Parliamentary charges . . . . .	..	16 545 15 4
2,583	Law charges . . . . .	..	1,200 0 0
1,388	Charges re Quinquennial re-valuations . . . . .	..	1,340 4 1
8,542	Bad debts . . . . .	..	149 19 3
	Depreciation fund for works on leasehold lands . . . . .	..	7,952 10 1
500	Annuities to officers and workmen, including contribution to officers' superannuation fund . . . . .	..	500 0 0
26,584	Retiring allowance, &c. . . . .	..	25,474 12 2
10,793	Workmen's compensation account . . . . .	..	1,635 2 0
2,315	Public officers—		
1,221	Gas Referees and Official Auditor	1,256 3 1	
633	Public testing-stations	550 16 4	
			1,805 19 5
£1,571 049			1,665,220 1 0
673,220	Balance carried to net revenue account		690,102 17 0
£2,244,269			2,355,322 18 0

Receipts.

June Half Year, 1910.		£ s. d.	£ s. d.
£1,553,948	Sale of gas—		
69,697	Per meter, at 2s. 7d. and 2s. 2d. per 1000 cubic feet	1,577,532 14 2	
	Public lighting and under contracts	63,573 17 5	
£1,623,645			1,641,106 11 7
61,410	Rental of meters . . . . .	..	67,638 17 11
52,315	Rental of stoves . . . . .	..	56,144 1 9
49,891	Rental of fittings . . . . .	..	58,157 7 3
£269,348	Residual products—		
19,017	Coke, less £36,758 9s. 7d. for labour, &c.	318,552 3 3	
55,146	Breeze, less £7707 19s. 2d.	23,632 11 9	
	Tar and tar products	67,240 8 4	
105,245	Ammoniacal liquor and sulphate of ammonia	117,900 0 11	
			527,405 4 3
£448,776			
£4,906	Rents receivable		4,556 0 3
326	Transfer fees		314 15 0
£2,244,269			2,355,322 18 0

The balance applicable to the redemption fund and to dividend on the ordinary stock is £1,096,817 12s. 3d.; and the following statement shows how it is proposed to appropriate it:—

June, 1910.		£ s. d.
£489,740	Net balance brought from last account	£625,688 7 4
440,150	Net revenue for the half year	471,129 4 11
£929,890		£1,096,817 12 3
10,000	Contribution to redemption fund	15,000 0 0
(£4 13s. 4d. p. ct.)	Dividend on the ordinary stock—	
£377,520	£4 14s. 8d. per cent. per annum on £16,100,600	582,467 10 8
£542,370	Balance carried to next account	£699,350 1 7

The three statements relating to the reserve, insurance, and depreciation funds stood as follows on June 30: Reserve fund, £58,823; insurance fund, £213,874; depreciation fund, £77,152.

The following statements relate to the working:—

Statement of Coal Used, &c.					
Description of Coal.	In Store Dec. 31, 1910.	Received During Half Year.	Carbonized During Half Year.	Used During Half Year.	In Store June 30, 1911.
Common	Tons. 230,369	Tons. 802,994	Tons. 944,062	Tons. 2,134	Tons. 87,167
Cannel	3,116	..	518	..	2,598
Total	233,485	802,994	944,580*	2,134	89,765

* In addition to this quantity of coal, 6,464,435 gallons of oil were used during the half year.

Statement of Residual Products.

Description.	In Store Dec. 31, 1910.	Made During Half Year.	Used During Half Year.	Sold During Half Year.	In Store, June 30, 1911.
Coke—tons	17,620	597,547	123,010	452,691	39,466
Breeze—tons	2,121	90,090	12,649	77,465	2,097
Tar, from coal only—galls.	1,205,374	9,035,196	8,415,737	515,303	1,309,530
Ammoniacal liquor—butts	26,417	316,641	321,012	..	22,046

Statement of Gas Made, Sold, &c.

Quantity Made.	QUANTITY SOLD.		Total Quantity Accounted for.	Number of Public Lamps.
	Public Lights and Under Contracts (Estimated).	Private Lights (per Meter).		
Thousands. *14,246,984	Thousands. 455,612	Thousands. 12,510,596	Thousands. 13,133,930	46,288
†13,521,085	454,229	11,921,145	12,528,098	49,526

* Including 2,581,879,000 cubic feet of carburetted water gas. † June half year 1910.

The remaining statement is the balance-sheet, which gives the value of the stores on hand at the close of the half year as follows: Coal, £58,086; oil and petroleum spirit, £38,023; coke, £24,476; tar and ammoniacal liquor and products, £95,267; and sundries, £265,059. The figures this time last year were: Coal, £85,309; oil and petroleum spirit, £29,500; coke, £10,876; tar and ammoniacal liquor and products, £76,648; and sundries, £249,586.

SOUTH METROPOLITAN GAS COMPANY'S ACCOUNTS.

[For the Half-Yearly Report, see p. 287.]

The following are the principal portions of the accounts of this Company for the six months ending the 30th of June.

The first two statements relate, as usual, to the stock and loan capital. The former sets forth that the standard rate of 4 per cent. is payable on £6,011,224 and £418,671 (Act of 1901) of stock; while the latter shows that the loan capital, the rate of interest on which is 3 per cent., amounts to £1,798,994 and £96,451 (Act of 1901). The third statement is the capital account. It stands as follows: Amount received, £5,328,820; nominal amount added by conversion (less premium), £2,996,520—total, £8,325,340. The items of expenditure are as follows:—

Capital account to Dec. 31, 1910				£5,070,487	7	8
Expenditure during half year to June 30, 1911, viz.—						
New and additional mains and services	£1,040	1	0			
New and additional meters	1,054	6	11			
New and additional stoves	1,093	8	3			
Purchase of land	600	0	0			
					3,787	16 2
Total expenditure				£5,074,275	3	10
Balance				254,544	16	2
				£5,328,820	0	0
Nominal amount added by conversion, less premium				2,996,520	0	0
Total				£8,325,340	0	0

The following is the revenue account:—

Expenditure.

Manufacture of gas—				
Coal into store, including £2713 for London Port and tonnage dues	£336,140	7	11	
Purification	25,826	18	9	
Salaries of Engineer and Officers at works	15,378	13	2	
Wages (carbonizing)	43,927	6	1	
Repairs and maintenance of works and plant, less £5103 13s. 3d. received for old materials	110,163	15	6	
		£531,437	1	5
Co-partnership for twelve months to June 30, 1911	£43,043	6	5	
Less on account	16,000	0	0	
		27,043	6	5
Distribution of gas—				
Repair, maintenance, and renewal of mains and service-pipes	£34,264	19	10	
Salaries and wages of officers, including rental clerks	21,035	1	10	
Repairing and renewals of meters	30,496	1	6	
Repairing and renewals of stoves	38,343	13	7	
Repairing and renewals of gas-fittings	48,656	0	7	
		172,795	17	4
Public lamps, labour and materials £16,313 10s. 1d., less £14,463 7s. 7d. received for the same		1,850	2	6
Rents, rates, and taxes—				
Rents payable	£1,116	15	5	
Rates and taxes	54,253	4	4	
		55,379	19	9
Management—				
Directors' allowance	£2,803	2	8	
Salaries of Secretary, Accountant, and clerks	4,527	9	6	
Collectors { Ordinary	5,808	11	0	
Slot meter	9,605	14	3	
Stationery and printing	3,2	0	7	
General charges	11,913	4	0	
Company's Auditors	112	10	0	
		38,030	18	5
Law charges	£1,763	9	1	
Parliamentary charges	188	6	8	
		1,951	15	9
Bad debts	1,572	13	4	
Stolen from 3791 slot meters broken open	290	11	3	
Pensions and officers' and workmen's superannuation, sick, and accident funds		7,408	14	0
Gas Referees and Official Auditor		353	17	2
Leasehold renewal fund		300	0	0
		£838,414	17	4
Total expenditure		242,379	10	9
Balance carried to net revenue account				
		£1,080,791	8	1

Receipts.

Sale of gas—				
Lady Day, at 2s. 2d. per 1000 feet	£394,409	13	6	
Midsummer, at 2s. 2d. per 1000 feet	274,783	11	9	
	<hr/>			
	£669,193	5	3	
Public lighting	17,304	4	2	
	<hr/>			
				£686,497 9 5
Company's meters at rent: Ordinary, 95,745; slot, 253,544	£39,881	0	6	
Company's stoves at rent: Ordinary, 79,204; slot, 206,779; fires, 29,231	31,966	14	6	
Gas-fittings	40,064	14	6	
	<hr/>			
				111,912 9 6
Residual products—				
Coke, less labour and cartage	£173,650	10	8	
Breeze, less labour and cartage	4,589	11	5	
Tar and tar products, less labour	37,397	12	5	
Sulphate of ammonia „ „	65,162	8	2	
	<hr/>			
				280,800 2 8
Rents receivable				1,489 11 6
Transfer fees				94 15 0
				<hr/>
Total receipts				£1,080,791 8 1
Total amount paid in salaries for half year, £40,601 10s. 8d.				
„ „ „ wages „ „ „	£282,209	16s.	4d.	

The net revenue account shows a sum of £295,331 3s. 4d. applicable to dividend on the ordinary stock. Following this are the statements relating to the reserve, renewal, and insurance funds. They show that the balances on June 30 were as follows: Reserve fund, £189,881; renewal fund, £32,240; insurance fund, £98,525. A sum of £203 is charged to this fund for loss on coal by heating.

The following statements relate to the manufacturing operations of the Company:—

Statement of Coal.

In Store Dec. 31, 1910.	Received During Half Year.	Carbonized During Half Year.	Used During Half Year.	In Store June 30, 1911.
Tons. 244,578	Tons. 446,491	Tons. 548,328	Tons. 999	Tons. 141,742

Statement of Residual Products.

Description.	In Store Dec. 31, 1910.	Made During Half Year.	Used During Half Year.	Sold During Half Year.	In Store June 30, 1911.
Coke—cwt.	200,540	6,774,075	1,486,911	4,899,904	587,800
Breeze—yards	7,599	119,418	53,587	67,830	5,600
Tar—gallons.	440,912	5,348,899	5,371,317	19,401	399,093
Ammoniacal liquor—butts	12,743	205,019	209,625	..	8,137

Statement of Gas Made, Sold, &c.

Quantity Made.	QUANTITY SOLD.		Total Quantity Accounted for.	Number of Public Lamps.
	Public Lights (estimated).	Private Lights (per Meter).		
Thousands. 6,604,125	Thousands. 174,471	Thousands. 6,281,468	Thousands. 6,538,374	24,329 incandes't 6 flat-flame

The remaining statement is the balance-sheet, which gives the value of the stores in hand at the close of the half year as follows: Coal, £86,786; coke and breeze, £20,071; tar, sulphate, and ammoniacal liquor, £32,597; and sundry plant and stores, £312,531. The figures this time last year were: Coal, £63,636; coke and breeze, £4514; tar, sulphate, and ammoniacal liquor, £31,964; and sundries, £298,473. A sum of £28,756, workmen's bonuses and savings, has been deposited with the Company; and the total of the officers' superannuation and guarantee funds is £55,345. The figures last year were £37,419 and £53,705.

A Dual Water Supply.

The report submitted by Mr. Cowley Lambert, at the meeting of the Seville Water-Works Company, Limited, last Wednesday, stated that the income of the Company amounted to £40,160. After deducting working expenses, the cost of laying on services, and the interest on debentures, the net profit for the year was £8826, as compared with £8853 last year. To this was added the unappropriated profit at March 31, 1910—£8556—making the amount standing to the credit of profit and loss account £17,382. The Directors recommended a dividend of 3 per cent. on the share capital for the past year, free of income-tax (absorbing £8133), also that £5000 be transferred to reserve, and that the balance of £4249 be carried forward. The Directors were pleased to be able to report that, after prolonged negotiations, a basis of agreement for increasing the water supply of Seville had been arrived at with the Special Water Commission appointed for the purpose. The additional water would be taken from the River Guadalquivir, filtered, and distributed in the city in separate mains. It would be utilized for all purposes other than domestic—the latter service being still carried out by the spring water supply. The agreement had been ratified by the Municipality, though with some modifications, which had still to be adjusted. It was believed, however, that the points in question would be settled shortly. Referring to this matter in his address, the Chairman stated that, when the Municipality had gone through the various forms of considering and approving the scheme, it would then have to go to the Central Government in Madrid for final approval, and, with a matter of such magnitude and importance as this, a little time must elapse before this was announced. He heartily congratulated the Engineer and Manager (Mr. J. J. Bethell) upon the work he had succeeded, under much difficulty, in accomplishing in connection with the scheme. The report and accounts were adopted.

BRENTFORD GAS COMPANY.

Half-Yearly Report and Accounts.

The Directors of the Brentford Gas Company, in their report for the six months ended the 30th of June, which will be presented at the half-yearly meeting to-morrow, state that the continued expansion of business in every department gives them great satisfaction. They regard it as very encouraging, and feel that it justifies a further reduction of 2d. per 1000 cubic feet in the price of gas, which they propose shall take place as from Michaelmas. They express their pleasure in reporting that the portion of the projected Greater London Railway which affected the Southall works of the Company was struck out by the Parliamentary Committee appointed to consider the Bill.

The accounts accompanying the report show that the revenue from the sale of gas amounted to £190,244; from meter and stove rents, to £23,689; and from the sale of residual products, to £47,114—the total receipts being £261,047, as compared with £255,295 in the first half of 1910. The expenditure on the manufacture of gas was £131,254; on distribution, £35,891; and on management, £8,412—the total expenses being £175,557, compared with £201,073 in the six months ended June 30, 1910. The balance carried to the profit and loss account is £65,906, compared with £54,222 this time last year; and the amount available for distribution is £124,081, against £98,750. The Directors recommend dividends at the rates of 5, 13, and 10 per cent. per annum, subject to income-tax, on the preference, consolidated, and new stocks respectively.

The working statements show that, under the supervision of Mr. Alexander A. Johnston, the Engineer and Manager, 94,177 tons of coal and 1,304,880 gallons of oil were used in the past half year in the production of 1,576,127,000 cubic feet of gas (including 482,395,000 cubic feet of carburetted water gas), of which 1,469,815,000 cubic feet were sold and 1,491,198,000 cubic feet were accounted for. The estimated production of residuals was: Coke, 58,900 tons; breeze, 8321 tons; tar, 1,243,090 gallons; and ammoniacal liquor, 26,415 butts.

SOUTH SUBURBAN GAS COMPANY.

Half-Yearly Report and Accounts.

The following is the report of the Directors of this Company for the half year ended the 30th of June, which will be presented at the ordinary general meeting on Friday.

The accounts show that after providing for the debenture interest, and including the amount brought forward from last half year, the balance available for distribution is £32,695 10s. 8d.; and the Directors recommend payment of dividends at the rate of 5 per cent. per annum on the 5 per cent. preference stock, and at the rate of £5 13s. 4d. per cent. per annum on the ordinary stock, carrying forward to next half year £14,053 17s. 4d.

The sales of gas have improved by 5.01 per cent. as compared with the corresponding period of last year, when, however, a slight falling-off had to be recorded. Deducting the extra consumption derived from the Festival of Empire Exhibition at the Crystal Palace, the ordinary consumption shows the substantial gain of 3.65 per cent.

An all-round improvement in the returns for residuals is again a prominent feature in the accounts; and although, except for tar, the highest prices realized during the half year have not been maintained, the outlook is not unfavourable. The demand for tar continues to be sustained by its increasing use for road-making purposes.

Gas-heating appliances for domestic use continue to be in good request; and the number of consumers who both light and cook or heat by gas is steadily increasing. Thus the proportion of cookers alone to meters in use has risen during the last two years from 68.3 to 70 per cent.

The exceptionally important installations for light and power at the Crystal Palace, which were referred to in the last half-yearly report as having been undertaken by the Company, have been successfully carried out. The three gas engines, aggregating 2750 H.P., are the largest of their type in the world, and the largest that have ever been worked from a town supply of illuminating gas. The Exhibition Committee generate with them the whole of the electricity required for working the "All Red Route" railway and for other purposes. The lighting of the grounds and north end of the Palace itself by 294 high-power gas-lamps may be described as a triumph of artificial lighting, forming a highly attractive feature of the Exhibition.

Coal supplies for the current year have been arranged for at somewhat lower prices than those of last year; and the Directors have had pleasure in announcing a reduction of 1d. in the price of gas—making this 2s. 4d. per 1000 cubic feet. This will benefit consumers to the extent of about £5800 per annum, which is much more than the saving effected in the purchase price of coal. It is hoped, however, that by the stimulus which reductions of price usually give to consumption the difference may soon be made up.

The National Insurance Bill, now under the consideration of Parliament, materially affects the interests of the Company's employees, who receive from the sick fund, which was established in 1880, greater benefits for smaller contributions than are proposed by the Bill. Endeavours are being made to secure autonomy for this and similar sick funds by excepting them from the operation of the Bill, as already conditionally provided in the case of employment under the Crown or any local or public authority.

The accounts accompanying the report show that the total expenditure on capital account at the close of the half year (including a nominal amount of £202,500 added by conversion) was £794,633, or £36,730 less than the receipts, inclusive of £49,305 premium capital—£831,363 in all. Only £582 was expended on capital account in the half year. The revenue from the sale of gas was £88,029; the rental of meters and stoves produced £7345; the sale of residuals, £36,751; and the total receipts were £132,235. The following were the principal items

of expenditure: Manufacture of gas (including £45,424 for coal and £20,397 for maintenance of works and plant), £71,670; distribution, £23,151; management, £5189; rents, rates and taxes (£5310), and miscellaneous items bringing up the total to £108,612. Among these items is a sum of £1618 charged on account of the co-partnership scheme. The balance carried to the net revenue account is £23,623; and the amount applicable for dividend is £32,695.

The statements as to working show that, under the supervision of Mr. S. Y. Shoubridge, the Engineer, 64,100 tons of coal were carbonized in the half year. The quantity of gas made was 755,534,000 cubic feet, of which 731,561,000 cubic feet were sold and 741,722,000 cubic feet accounted for. The residuals were: Coke, 769,200 cwt., of which 121,060 cwt. (estimated) were used in manufacture; breeze, 17,429 yards; tar, 607,047 gallons; ammoniacal liquor, 18,397 butts—the make of sulphate of ammonia being 782 tons.

TOTTENHAM AND EDMONTON GAS COMPANY.

Half-Yearly Report and Accounts.

In the report for the six months ended the 30th of June which the Directors of the Tottenham and Edmonton Gas Company will present at the half-yearly general meeting next Saturday, they state that there was an increase of 6.18 per cent. in the sales of gas compared with the corresponding period of 1910. The number of consumers augmented to the extent of 3071; and 3391 more cooking and heating stoves were sold and let on hire. The accounts accompanying the report show that the sale of gas produced £92,349; rental of meters, stoves, fittings, &c., and the maintenance of incandescent mantles, £18,864; residuals yielded £24,376; and the total revenue was £135,673, compared with £127,315 for the first half of last year. The manufacture of gas entailed an expenditure of £69,163 (£38,381 being for coal and £15,882 for the repair and maintenance of works and plant); distribution cost £23,484; and management expenses, public lighting, rents, rates, and taxes, &c., made up a total of £109,455, against £104,099 before. The balance carried to the profit and loss account is £26,218, compared with £23,216; and the amount available for distribution is £45,490. The Directors recommend payment of the full statutory dividends of 7½ per cent. per annum on the "A" stock, and 5½ per cent. per annum on the "B" stock. These will absorb £16,842, and leave £28,648 to be carried forward. The increased dividends are due to the reduction in price made in January last.

The working statements show that, under the supervision of Mr. A. E. Broadberry, the Engineer and Manager, 49,951 tons of coal and 552,594 gallons of enriching oils were used in the six months in the production of 846,389,000 cubic feet of gas, of which 812,224,000 cubic feet were sold and 831,191,000 cubic feet were accounted for. The estimated quantities of residuals produced were: Coke, 29,970 tons, of which 6993 tons were used in the manufacture of coal gas, and 4235 tons for the production of carburetted water gas; breeze, 5877 chaldrons, of which 4121½ chaldrons were used; tar, 598,813 gallons; ammoniacal liquor, 16,187 butts—the quantity of sulphate made being 439½ tons.

GAS PROFITS & ELECTRICITY AT NEWCASTLE (STAFFS.)

At the last meeting of the Newcastle-under-Lyme Town Council, the Gas-Works Management and Electric Supply Committee reported that it had been decided that an independent consulting electrical engineer should be engaged to advise as to the electricity plant.

Alderman MYOTT, in presenting the report of the Committee, stated that the gas-works had been thoroughly overhauled by the Manager (Mr. F. L. Wilmhurst), and were in very good condition. The works had not been able to provide so much for the rates during the past year as they had previously, because they had lost a large proportion of their area in the Wolstanton district; while the price of gas had been reduced. Then, during the past year the price of coal had advanced. The Committee had passed a resolution that in future all capital expenditure should be provided out of revenue; and he thought this a very proper resolution. They had been adding to their capital expenditure each year; and this year they had paid for it all out of revenue. In regard to the Electric Light Department, they were improving every year. Last year they made a profit of £83; whereas this year they had a profit of £441. This had been brought about by an increase in the sale of current, which during the past year had realized £1881, as against £1471 the previous year. It was the intention of the Committee to increase the plant in the department. Owing to the demands made, they were unable at the present time to put on any more consumers. Their total output was already mortgaged; and it was necessary, even to supply their present customers, to increase the plant. He thought both the Gas Manager and the Electrical Engineer were to be congratulated.

Mr. MAYER said that as they had made £400 on electric light, there might be a demand for a reduction in the price of the current; but it should be pointed out that the loss of these works in the past had been paid out of the gas-works. They had not yet made sufficient profit on the electricity works to pay their debts.

Alderman MYOTT said he could not state how much had been paid from the Gas Department to the Electricity Department; but for the last three or four years the electric undertaking had stood on its own foundation. During the past year, they had paid off a balance of £63 charged to the debit of the undertaking; and the profit over and above this had been devoted to paying off capital account. Roughly, the amount paid in the past by the Gas Department to the Electrical Department was somewhere about £600; and this was at a time when the Electrical Department was in its infancy. He might say, however, that the Electrical Department paid a good price for their gas—their motive power was gas. The Gas Department had made more money out of the electricity undertaking than they had paid for the deficiencies of it.

The report of the Committee was adopted.

NEXT YEAR'S CITY AND GUILDS EXAMINATIONS.

The Questions in "Gas Engineering" and "Gas Supply."

In another part of the "JOURNAL," reference is made to the issue of the programme of the Technological Department of the City and Guilds of London Institute for the session 1911-12. As before, separate examinations will be held in "Gas Engineering," including manufacture, and "Gas Supply," including distribution and the various applications of gas; and they will include questions founded upon the following subjects.

GAS ENGINEERING.

GRADE I.

1. The construction and setting of retorts for the destructive distillation of coal, and the furnaces or producers for heating them.
2. The methods of charging and discharging retorts, and the machine and other tools employed. The fittings of the retort-bench, including the hydraulic (or dry) main.
3. The effects of modifications of carbonizing temperature upon the quantity and quality of gas yielded by the coal.
4. The description of apparatus for the manufacture of water gas (uncarburetted or carburetted), and the practical working of the plant.
5. The principles and methods of gas condensation, with descriptions of apparatus employed.
6. The exhaustor, its construction, its use or object, and the means by which it is actuated and controlled.
7. The methods of removing the gaseous impurities present in the gas after condensation, together with the apparatus and materials employed. The chemical reactions involved.
8. The various instruments used in gas-works for ascertaining and recording pressure and exhaust, and their practical employment and significance.
9. The usual methods and apparatus employed for testing coal gas, water gas, producer gas, waste gas, &c., including the usual tests for illuminating power, calorific value, specific gravity, and purity of the gas supplied to the public, and those for ascertaining the value of the bye-products.
10. The simpler physical and chemical principles involved in the ordinary processes of gas manufacture and the formation of the bye-products.
11. The general principles involved in the construction of the gas-holder and its tank. The advantages of the holder in gas distribution. The laying of mains and services. The necessary methods for securing an adequate supply of gas throughout the area of a district. The methods and instruments employed at the works for due control of the pressure in the street-mains.
12. The fitting-up of premises for the supply of gas for light, heat, and power. The construction, testing, and fixing of gas-meters. The influence of temperature and pressure on the volume of gas.
13. The construction of various types of gas-burners. The simpler physical and chemical principles involved in the combustion of gas. The economy and efficiency of incandescent lighting as contrasted with luminous flames. High-pressure lighting.

FINAL EXAMINATION.

In this examination, more difficult questions will be set in the subjects named in the syllabus of Grade I., and, in addition, a knowledge will be required of the following.

1. The characteristic properties of the various kinds of coal, and their value for gas-making purposes.
2. The effects of temperature upon the production of residuals.
3. Chemical composition and physical properties of coal gas, and the influence of each component upon the illuminating power and calorific value of the gas.
4. The principles of combustion, and their application to the working of retort-furnaces.
5. The more advanced physical and chemical principles involved in the processes of destructive distillation of coal, and in the condensation and purification of the resulting gas.
6. The methods of complete gas analysis, including those for ascertaining the amount of impurities in the crude gas. The method of testing oil to be used in the manufacture of carburetted water gas.
7. Theory and practice of photometry, calorimetry, and pyrometry. Full details of apparatus employed.
8. Gas lighting. High and low grade gases. Illuminating power. Flame temperature. Specific heats. Air supply. Incandescent lighting, theory and practice. Intensified lighting. Burners and apparatus.
9. Application of power and labour-saving appliances in gas-works.
10. The construction of gas-works plant generally.
11. The management of the various portions of the plant in order to obtain the best efficiency of the apparatus, with due regard to economy in working.
12. The method of dealing with such emergencies as are of more common occurrence in gas-works through the breakdown of machinery or other failure of plant.
13. Working-up of ammoniacal liquor and treatment of waste products.
14. Gas in competition for light, heat, and power.
15. The construction, working, and efficiency of the gas-engine.
16. Flow of gas in mains, theory and practice. High-pressure distribution.
17. Structural capacity. Working costs.
18. Such important recent developments of the gas industry as have been fully described in the Technical Press.

GAS SUPPLY.

GRADE I.

1. *Mains and Services.*—Station and district governors. General principles of distribution. The various kinds of pipes and fittings

used, and testing of same. Comparative advantages of wrought iron, cast iron, and steel. Methods of laying. Various forms of joints and methods of jointing. Maintaining supply during alterations to existing mains and services. Causes, preventives, and methods of dealing with corrosion and deposits. Unaccounted-for gas. Causes of, and testing for, leakage. Syphons. Valves. Pressure-gauges. Maintenance.

2. *Gas-Meters.*—Principles and construction of gas-meters, including slot and stop mechanism. Repairing and fixing of meters. Appliances required for, and regulations governing, official tests of meters.

3. *Plumbing.*—Properties and composition of various alloys, such as brass, gun-metal, &c., used for valves, cocks, gas-fittings, &c. Solders, their composition, preparation, and uses. Methods of soldering.

4. *Interior Fittings.*—Description and size of pipes in relation to requirements. Distribution of light. Testing of installations. Anti-vibrators. Movable pendants. Other fittings and accessories. Simple principles of ventilation. Method of governing pressure beyond the meter.

5. *Luminous and Bunsen Flames.*—Theory and application of.

6. *General Lighting.*—Construction of flat-flame, argand, regenerative, and incandescent burners. Regulation of gas and air supply to burners. Causes and prevention of mantle breakages. Influence of shades, globes, wall-papers, &c., on light efficiency.

7. *Outside Shop and Street Lighting.*—Types and construction of lanterns, including burners and other fittings. Principles of windproof lanterns. Suspension brackets and lamp-pillars.

8. *Use of Gas for Heating Purposes.*—Construction, types, and fixing of cookers, boilers, fires, irons, &c. Hot water circulating appliances. Geysers. Flues for waste products.

9. *Gas Power.*—Construction and practice of the gas-engine.

10. *Tools and Appliances.*—A full knowledge must be obtained of all the tools and appliances necessary for repair and extensions, from the works governors to the point of combustion.

FINAL EXAMINATION.

1. *Mains and Services.*—Flow of gas in mains, theory and practice. Electrolysis and electric fusion. Pressures and pressure recording instruments. Main-laying costs in relation to prospective income. First aid in cases of "gassing." High-pressure distribution. Fans, blowers, and compressors. Subways, advantages and disadvantages of. The carrying of mains over bridges and under rivers and canals. Explosive mixtures.

2. *Interior Fittings.*—Specifications. Principles and construction of various types of burners and plant for intensified lighting. Lighting of churches, factories, and other large buildings. Theory and practice of ventilation by gas. Lighting for special purposes, such as billiard-tables, &c. Switch lighting.

3. *General Lighting.*—Efficiency of flat-flame, incandescent, and other burners. Low and high pressure lighting. Theory, manufacture, composition, and testing of the incandescent mantle. Illuminating effect of different methods of lighting. Flame temperature. Air supply. Hygiene of gas.

4. *Outside Shop and Street Lighting.*—Public lighting. Testing for illuminating power and illuminating effect. Advertising and illuminating devices. Automatic lamplighting appliances.

5. *Influence of Reflection on Indoor and Outdoor Lighting.*—Reflecting powers of various surfaces and the means of ascertaining same.

6. *Gas used for Heating Purposes.*—Industrial and domestic uses of gas. Testing of heating appliances. The application of refractory materials to the construction of heating (and lighting) appliances. Influence of air supply and flame temperature.

7. *Gas Power.*—Calorific power. Comparative costs and thermal and mechanical efficiencies of the gas-engine and competing power agents. Gas-driven electricity plants.

8. *Physics and Chemistry as applied to Lighting and Heating.*—The physical laws of temperature, radiation, conduction, convection, reflection, and refraction. The physical and chemical laws concerning diffusion and humidity. Instruments used for investigation, including spectrometers, hygrometers, and thermoscopic appliances.

9. *Competition.*—Gas in competition for light, heat, and power.

10. *Statutory Enactments, &c.*—The general legal obligations affecting gas supply. The Factory and Workshop Acts, so far as they relate to the use of gas lighting and heating appliances and the purity of the atmosphere in rooms. The relative fire risks of various illuminants, and the effect on insurance rates.

11. *Developments.*—Such important recent developments in any of the foregoing subjects as have been fully described in the Technical Press.

Gas-Meter Testing in Bristol.—During the past quarter, 434 gas-meters were examined and tested in Bristol, and of them 335 were incorrect within the provisions of the Sale of Gas Act, 1859. Of the incorrect meters, 21 registered in favour of the seller; and the average percentage of error was 3.45, with a maximum of 7.41. In the case of those registering in favour of the consumer, the average percentage was 10.13, with a maximum of 49.11.

Tyldesley-with-Shakerley Gas and Water Supply.—According to the annual report of the Gas and Water Engineer of the Tyldesley-with-Shakerley Urban District Council (Mr. H. R. S. Williams), the gross profit of the Gas Department for the year ended the 31st of March last was £2953; the net profit being £735, which has been added to the reserve fund, bringing it up to £2648. The gross profit is at the rate of 14.56 per cent. on the capital employed. There was a loss of £322 on the water undertaking; and this was increased to £622 by a contribution of £300 in aid of the rates. Mr. Williams explains that the loss is caused by the large amount of excess water taken during the year at the higher price. The total quantity purchased from Manchester was 208,342,000 gallons—an increase of 12,564,000 gallons; the cost being £3682, or £625 more than before. Taking the population at 15,582, the consumption per head per day for domestic purposes was 15.4 gallons, and for other purposes 7.2 gallons—a total of 22.6 gallons per head per day.

HIGH-PRESSURE LIGHTING AT MANCHESTER.

A Further Installation Inaugurated.

A second installation of high-pressure gas lighting for street illumination has just been completed by the Gas Department of the Manchester Corporation; the system having been extended to Mosley Street and St. Peter's Square, at an estimated cost of about £700. Those present at the inauguration of the additional lamps the other evening included Councillor W. Kay (Deputy-Chairman of the Gas Committee), Alderman Hassall (Chairman of the Street Mains and Lighting Committee), Councillor Meadowcroft (Deputy-Chairman), and a number of members of the Gas Committee, together with Mr. J. R. Brocklebank (Superintendent of Street Mains and Lighting), and Mr. T. Vosper (Chief Clerk in the Gas Department). There was no ceremony at the inauguration of the extension of the system from Piccadilly to Mosley Street and St. Peter's Square; but the small gathering of the public—attracted probably by curiosity—were evidently impressed by the steady white light of the lamps and the great diffusive power of each when got to work.

There are now in operation in the thoroughfares named 60 high-pressure lamps of 1500-candle power; and it is claimed that they give seven-and-a-half times as much light as those they superseded, for a trifle more than twice the expenditure of gas. Of the 22 lamps in Piccadilly, one is of 3000-candle power; and the light given by it is remarkably bright, pure, and soft, as with the others of lesser power. These installations have been made by way of experiment, and such has been the success of them that further extensions will no doubt be made in the near future. The department are prepared for this by the existing plant to the extent of 400 lamps; there being two compressors. That the new system is attracting attention, is evidenced by the orders already placed with the Corporation, and the inquiries made by large firms in the centre of the city.

GAS CHARGES AT SALFORD.

Proposed Reduction.

The Gas Committee of the Salford Corporation have resolved to recommend the Council to reduce the price of gas to ordinary consumers by 2d. per 1000 cubic feet, as from the reading of the meters for the quarter ending Sept. 30, and to increase the quantity of gas supplied through prepayment meters for 1d. from 27 to 30 cubic feet, as soon as possible after confirmation by the Council.

One of the reasons for the proposed reduction is that the Gas Committee have been able to effect a considerable saving this year in the coal contracts, amounting to several thousand pounds; this having been made possible by the rescinding at the last Council meeting of the resolution adopted in July, 1909, by which the prices paid for coal and cannel were published in the Council *agenda*. With one firm alone this year, there was a difference of over £200, on condition that the estimate did not become public property. A member of the Gas Committee, who was formerly opposed to this system of "bargaining" with the colliery proprietors, says he is convinced, as the result of recent experiences, that the Corporation had adopted the right course in rescinding the resolution of July, 1909. There could be no two opinions, he added, as to the colliery proprietors having formed a "ring;" and now they knew that the prices tendered would not be made public, they were prepared to give various concessions, and had done so in contracts for the ensuing year.

The price of gas to ordinary consumers in Salford at present is 2s. 9d. per 1000 cubic feet, with a discount of 4d. if paid within a month. Consumers of large quantities have special concessions as to price, and discount as well. It is understood that efforts will be made by certain Labour members to have the quantity of gas supplied for 1d. by slot-meters raised to 33 cubic feet—thus placing Salford consumers on the same level as those in Manchester.

ACCRINGTON GAS AND WATER SUPPLY.

General Manager's Annual Report.

The General Manager of the Accrington District Gas and Water Board (Mr. Charles Harrison) has presented his report for the year ended the 31st of March. It furnishes the following particulars.

The quantity of coal carbonized in the twelve months was 38,906 tons, or 571 tons more than in the year ended March 31, 1910; and the gas sold was 9,490,000 cubic feet more than before. The cost of manufacture was again slightly lower; and there was a reduction of 1,865,000 cubic feet in the gas unaccounted for, with an increased make of 7,700,000 cubic feet. The profit on the gas undertaking was £21,306, or £2649 more than in 1909-10. A sum of £12,001 has been applied to the payment of annuities and interest on mortgage and debenture stock; and £5015 has been added to the sinking funds. The surplus revenue amounts to £3588; and out of it £1120 has been set aside to cover the discount on the March quarter's rental, as suggested by the Auditors, leaving a balance of £2468. The surplus revenue now stands at £8997. Mr. Harrison says he should be glad if the Board would, at their early convenience, take into consideration the question of a thorough system of haulage in connection with the coal supply to their Great Harwood works, as an improvement on the present method is urgently needed. He trusts the Board will in the near future see their way to consider the larger question of installing stoking machinery, for which the works are in every way suitable.

The revenue from the supply of water amounted in the past year to £26,098; being an increase of £2663. The gross profit was £18,051, or £2509 more than before. The deficiency in 1909-10 was £5280; whereas last year it was £2711, which was transferred to the Gas Department, in accordance with the Board's Act of 1905. The number

of consumers added during the twelve months was 244; making a total of 20,369. The quantity of water supplied from all sources to the districts of the Board was 777,199,000 gallons, which is equal to 25 gallons per head per day for 83,000 people.

Mr. Harrison states that on the two departments combined there is now a slight margin of surplus profit.

The report is followed by one by the Auditors (Messrs. Ashworth, Mosley, and Co., of Manchester), and by the accounts of the Board, prepared by the Accountant (Mr. William B. Rhodes). The latter contain a working statement giving particulars for the past and the preceding year. It shows that the gross profit on the gas undertaking last year was equal to £5 4s. 5½d. per cent. on the capital employed, compared with £4 11s. 10¾d. in 1909-10.

COCKERMOUTH GAS UNDERTAKING.

Effect of the Transfer to the District Council.

In the "JOURNAL" a few weeks ago, we gave some figures from the last annual report of the Manager and Secretary of the gas undertaking of the Cockermouth Urban District Council (Mr. Ernest D. Wootten), and a condensed report of the speech of the Chairman of the Gas Committee (Mr. J. Fleming) in moving the adoption of the report, in both of which evidence was afforded of the successful working of the undertaking since it has been in the hands of the Council. The transfer was effected on the advice of Mr. Arthur Silverthorne, who has sent to a local paper some observations on the matter, in the course of which he contrasts the management of the Council with that of their predecessors. He says: "We are constantly being reminded how superior gas companies' management is to that of municipal bodies. A close examination of relative working rarely supports the assertion; and it is interesting to trace, if possible, where the difference arises. A ton of coal yields the same profit to the Cockermouth Gas Department in 1911 (9s. 4½d.) that it did to the Gas Company in 1886 (9s. 3¼d.); but the difference consists in this—that to earn that same profit on a ton of coal carbonized, the Company charged the consumers 4s. 2d. per 1000 cubic feet and meter-rents. The Council's working is so much more economical that they only charge 2s. 9d. and no meter-rents. They have developed the undertaking to 25,464,100 cubic feet. To produce for sale nearly 9 millions, the Company required to carbonize 1239 tons of coal; but the Council, to sell nearly three times the amount, require only 2714 tons. The cost of coal merely varies as 13s. 9d. (1886) to 13s. (1911) per ton. Improved working is without doubt chiefly answerable for the striking difference." Mr. Silverthorne proceeds to show in detail how the 4s. 2d. was allocated; and then presents Mr. Wootten's latest results in the same comparative terms, as evidence of how good municipal working tends to yield improved results and cheaper gas. He adds: "There has been a disposition at times to criticize the sum paid for these works, and to suggest that the amount paid was in excess of their value; but the undertaking would never have yielded the results it has done had this been really the case."

NEW YORK GAS-SUPPLY STATISTICS.

The Public Service Commission of New York has prepared its annual report as to the assets and liabilities of light, heat, and power companies in Manhattan and the Bronx, including the Consolidated Gas Company and associated gas companies. According to some particulars given in "Progressive Age," the operating revenues of the Consolidated Gas Company for 1910 amounted to \$13,398,597—an increase of \$717,795 over the figures for 1909; the surplus at the close of last year being \$10,658,166, or \$4,724,849 more than at the close of 1909. For the New Amsterdam Gas Company, the revenue rose to \$2,703,446—an increase of \$152,457; while the deficit was \$2,594,048, or a reduction of \$362,653. For the New York Mutual Gaslight Company, the revenue rose from \$48,581 to \$1,567,782; the surplus being \$1,192,324—an increase of \$199,949. For the Astoria Light, Heat, and Power Company, the revenue increased to \$3,324,227, or \$53,957 above the figures the previous year; while the surplus was reported to be \$905,174, or \$263,876 more than before. For the Standard Gaslight Company of New York City, there was an increase of \$52,335, bringing the revenue up to \$1,718,950; the surplus being \$890,702, or an increase of \$289,423 over 1909. For the Central Union Gas Company, the revenue is put at \$1,837,790—an increase of \$211,119; and the surplus at \$2,136,707, or a rise of \$450,282. For the Northern Union Gas Company, the revenue is given as \$754,973—an increase of \$121,044; and the surplus as \$363,381, or \$176,325 more.

Municipal Undertakings at Mansfield.—The report on the past year's working of the Mansfield gas undertaking stated that the gross profit was £6792; and after allowing for interest on loans and contributions to the sinking fund, there remained a net profit of £989. It has been decided, however, to pay over the same amount to the rates as last year—namely, £1500. On water, there is a net profit of £2864; and of this £2000 is to go to the general district rate, and the balance to the reserve fund. The Electricity Committee, too, have decided to hand £200 over to the rates, and to place £266 to the reserve.

New Joint-Stock Companies Registered.—Under the title of R. Laidlaw and Son, Limited, a Company has been formed with a capital of £5000, in £1 shares, to acquire the goodwill of the merchant business in Glasgow of R. Laidlaw and Son, and to carry on the business of ironfounders and founders in other metals, merchants, and mechanical engineers. The Mitchelite Petrol Air Gas System Company, Limited, was registered on the 19th ult., with a capital of £4000 in £1 shares. Messrs. Stewarts and Lloyds (Australia) was registered in Edinburgh last week. The Company are to take over the business in Australia of Stewarts and Lloyds, Limited, and manufacture and act as merchants in connection with steel and iron, &c. The capital is £30,000 in £1 shares, for which the public are not invited to subscribe,

METROPOLITAN WATER BOARD.

Proposed Water Tunnel at Twickenham—Water Authorities and the National Insurance Bill.

At the Meeting of the Metropolitan Water Board on Friday (the last before the summer recess), the Works and Stores Committee submitted a report proposing the construction of a tunnel under the Thames at Twickenham at a cost of £35,400, including the purchase of the land. The Committee stated that at present there were two 36-inch trunk mains conveying unfiltered water from the West Middlesex intake at Hampton to the reservoirs at Barnes. They crossed beneath the Thames just below Richmond Bridge; and three trunk mains of the Southwark and Vauxhall district crossed under the river at the same point. The pipes were laid by means of coffer-dams a short distance below the bed of the river. Should one of the pipes, which were of cast iron, burst or become injured, the situation might be serious. The report was adopted.

The Law and Parliamentary Committee presented a report on the National Insurance Bill. They stated that, in the Board's view, it was important to consider carefully the provisions of clause 46, under which authorities might be rendered liable in respect of excessive sickness among insured persons caused by defective or contaminated water supplies. It would seem that the clause disregarded any inquiry as to whether or not the water authorities had been negligent; and there did not appear to be any obligation on Health Committees to prove that the excessive sickness arose from a contaminated water supply. The clause should be amended so as to provide for the right of appeal, and a proviso should be added to the effect that no liability should be incurred by a local water authority under the section except on proof that insufficiency or contamination of the supply arose from default on the part of the authorities or companies to comply with the Acts regulating their undertakings. The Board approved the action of the Committee in requesting the Clerk to communicate with the Local Government Board with a view to securing amendment in Part I. of the Bill; and they also agreed to endeavour to procure the assistance of local authorities supplying water in the country in order to obtain the suggested amendment.

Voelker Lighting Corporation, Limited.—The report and balance-sheet of this Company have been issued in view of the meeting of shareholders to be held on Friday. They show that the period covered (the year ended the 30th of June) was an exceptionally good one for the Company; considerable profit being realized, which enables the Directors to recommend another dividend, and carry forward a substantial amount. In view of the severe competition in the mantle industry, it is satisfactory to find that the Company's mantles, which are made entirely in London by British labour, have retained an extensive hold upon British trade.

NOTES FROM SCOTLAND.

From Our Own Correspondent.

Saturday.

The Edinburgh and Leith Gas Commissioners, at their monthly meeting on Monday, had before them a report by a Sub-Committee upon a proposal to hold an exhibition of gas appliances. The Sub-Committee recommended that the Commissioners should hold an exhibition in the spring or autumn of next year, and that the full organization, control, and management of it should be entrusted to Mr. J. M. Freer, who had the management of the exhibition held in Glasgow last autumn. The Sub-Committee also recommended that the Commissioners might, in the meantime, consider whether they could not, with the view of increasing the consumption of gas, offer more favourable terms than the present on which gas cookers and fires might be hired out or sold to consumers and the traders; also that they might authorize preliminary lectures to be given in the spring of next year, throughout Edinburgh and Leith, as to the advantages to be derived from the use of gas cookers and fires. The Commissioners sent the report back to the Sub-Committee for further consideration.

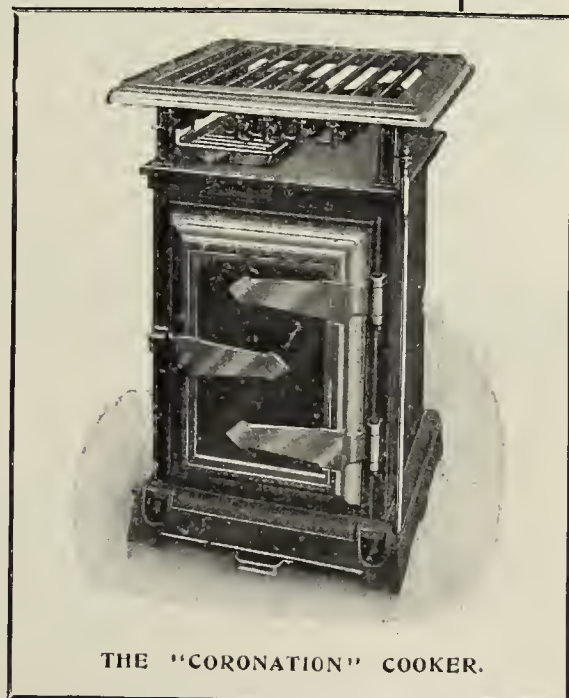
A communication by the Treasurer and Collector—Mr. A. Canning Williams—which had been before the Finance and Law Committee was submitted. Mr. Williams reported that a firm in Edinburgh who had received discount for some years had failed to get any in 1910-11, not having used £50 worth of gas during the year. The rates of discount allowed were: £50 and under £100, 2½ per cent.; £100 and under £400, 5 per cent.; £400 and under £800, 7½ per cent.; and £800 and upwards, 10 per cent. The firm wrote complaining of the loss of the discount, and asking to be dealt with leniently. The Treasurer went on to report that the firm used gas of the value of £46 2s. 6d. If the price had remained at 2s. 10d. per 1000 cubic feet, and the firm had used the same quantity, the value would have been £54 7s. 5d., and the discount would have been £1 7s. 2d.; so it might be said that they had not had the full benefit of the reductions. It was usual for discounts to be based on the quantity of gas consumed rather than upon the value; and he suggested that some such scale as the following might be adopted as from Whitsunday last: 350,000 cubic feet annual consumption and under 700,000, 2½ per cent.; 700,000 and under 3 millions, 5 per cent.; 3 millions and under 6 millions, 7½ per cent.; and 6 millions and upwards, 10 per cent. This scale, at the present rate of 2s. 8d. per 1000 cubic feet, if shown on the value basis, would be as follows: £46 13s. 4d. and under £93 6s. 8d., 2½ per cent.; £93 6s. 8d. and under £400, 5 per cent.; £400 and under £800, 7½ per cent.; and £800 and upwards, 10 per cent. It would be seen that the proposed scale was practically the same as the old one, but, if adopted, it would prevent a consumer losing his discount owing to a reduction in the price of gas. The Finance and Law Committee, apparently giving no heed to the plaint of the firm for the past year, recommended adoption of the Treasurer's suggestion. When the matter was brought before the Commissioners, Bailie Cullen asked if it would not be better to begin at 1 per cent. and

RECORD BREAKING.

The demand for "**MAIN**" Cookers increases year by year.

Each season they make many new friends and retain their old friends.

This season they are breaking all records. These facts are the best proof of their quality, design, and efficiency.



THE "CORONATION" COOKER.

R. & A. MAIN, LIMITED,

WORKS: Gothic Works, EDMONTON, N.; and Gothic Ironworks, FALKIRK.

SHOW-ROOMS: 25, Princes St., Oxford Circus, W.; 136, Renfield St., GLASGOW; 56, Broad St., BIRMINGHAM; 83, Old Market St., BRISTOL; 13, Whitworth St. West, MANCHESTER; 333, Queen St., MELBOURNE; and 12, Cunningham Lane, Pitt Street, SYDNEY.

go up. If a consumer used 690,000 cubic feet, he got less than 5 per cent. discount, whereas if he consumed 701,000 cubic feet, he got 5 per cent., but he did not get any more till he reached 3 millions. Mr. Williams explained that he had sought not to alter the scale which had been in use by the Commissioners. They agreed to a suggestion by Judge Bryson that the Clerk and the Treasurer should report on the matter in September.

The Clerk read the docquet of the Auditor—Mr. K. Kenward-Shiells—to the effect that he had found the annual accounts of the Commissioners to be correctly stated and sufficiently vouched. The Commissioners approved the accounts; and in accordance with a recommendation by the Finance and Law Committee, they agreed to carry forward to the credit of the current year the balance of £5748. It may be of interest to state that in June last the sinking fund investments of the Commissioners amounted to £197,410—repayments out of the funds having been made during the year to the amount of £14,600; and that at Whitsunday last the mortgage debt amounted to £1,099,195, having been reduced during the year by £77,182, in sums either repaid or not replaced.

On Thursday last, the Corporation of Paisley gave their annual consideration to the financial position of the burgh. Treasurer Robertson, in his introductory statement, referring to the gas account, said it had always been able to show a respectable profit. He was sure it was as gratifying to members as it was to him that they had the handsome profit of £5120, and this, too, notwithstanding the fact that last year they reduced the price of gas 1d. per 1000 cubic feet. The price was 2s. 2d. per 1000 cubic feet, which was the lowest they had ever charged. So recently as 1903 it was 2s. 9d. He would have much liked to propose another reduction, to 2s. 1d.; but he was prevented from doing this, as the department was bound to make good any deficiency in the electricity account. In this connection, he might mention that since the commencement of the electricity works gas had had to find no less a sum than £18,758 for its support. Although the Gas Department had earned such a good balance, they had been able to put £2400 to the depreciation fund, which was £1157 more than the previous year; and they were obliged, by their agreement with the Scotch Office, to put a like sum to depreciation every year. The fund now stood at £6642. On the electricity accounts, he said, he had had so often to make comments that he now preferred to say as little as possible. The actual deficit for the past year was £3541. To square this, £2127 had been taken from the reserve fund, which exhausted it, and the balance would have to be made up by the Gas Department.

There has been proceeding in Edinburgh this week an inquiry, under the Private Bill Legislation (Scotland) Act, into an application by the Corporation of Falkirk for an extension of the burgh boundaries. The chief opponents of the measure are the Stirling County Council, who have retained Lord Robert Cecil, K.C., as their leading Counsel. Mr. J. H. Balfour Browne, K.C., is leading Counsel for the promoters. In his opening address on Wednesday, Mr. Balfour Browne said that the Polmont District Gas Company supplied the village of Laurieston with gas at 4s. 2d. per 1000 cubic feet, com-

pared with 2s. 9d. charged in the burgh. The Company had done good work in supplying Laurieston with gas; and he would not suggest that Falkirk should go in and compete with them. He was quite willing to meet the Company, and to buy their undertaking. On Thursday morning, it was intimated that the promoters had purchased the interest of the Polmont Company in Laurieston for £6000. The Company thereupon withdrew their opposition. In the course of his evidence in support of the measure, Dean of Guild Neilson said that the fact that they supplied Larbert with gas was one of the reasons why the promoters wished the extension. In point of fact, the Town Council had, on their own responsibility, erected gas-works at Falkirk. These were opened in 1906. At that time they had a large income for gas supplied to the Larbert district. Within the past year or two, the Carron Company had introduced electric light, and the large annual gas account which the Council had with the Company fell to £400. Other concerns had followed the example of the Carron Company. The fact that the Town Council had been led to build such large gas-works partly for the purpose of supplying the district proposed to be annexed and that large consumers were now leaving them, was one of the reasons why the Bill was being promoted. The price of gas was the same to consumers outside the burgh as to those inside. The inquiry is still proceeding.

The West Kilbride Gas Company, Limited, have reduced the price of gas to all consumers by 2½d. per 1000 cubic feet.

The report of the Directors, submitted to the annual meeting of the Saltcoats Gas Company, Limited, stated that the balance at credit of the profit and loss account, after providing for depreciation on works, was £1877. A dividend at the rate of 8 per cent., free of income-tax, was paid, absorbing £1280, and the balance of £597 was carried forward. The revenue from the sale of gas, to ordinary consumers at 3s. 4d. per 1000 cubic feet, was £4308; to prepayment meter consumers at 4s. 2d., £179; and for street-lamps, at 2s. 11d., £343. Tar and liquor realized £410, and coke (1084 tons) £559—an average of 10s. 4d. per ton. The total revenue was £5353. Coal, with cartage, cost £1746. The quantity of coal used was 2743 tons—an increase of 154 tons. The yield of gas per ton of coal was 10,454 cubic feet—an increase of 104 cubic feet. The gas made amounted to 28,687,000 cubic feet—an increase of 1,887,000 cubic feet. There are 2447 consumers—an increase of 19; and 141 consumers, an increase of eight, are supplied through prepayment meters. Unaccounted-for gas amounted to 7 per cent.—being an increase of 2 per cent. The price of gas was reduced by 5d. per 1000 cubic feet.

The annual meeting of the Bo'ness Gas Company, Limited, was held last Monday—Ex-Provost Ballantine presiding. In moving the adoption of the report and accounts, he said the Company was never in a better position than it was now. The gross profit was £1568; and after allowing £560 for depreciation, there remained a balance of £1008. From this sum a dividend of 5 per cent. was declared, absorbing £706, and leaving, with the balance brought forward, £934 to be carried forward. The Chairman intimated a reduction in the price of gas from 3s. 4d. to 2s. 11d. per 1000 cubic feet, and stated that arrange-

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ments had been made for opening a show-room in the town. The report of the Manager (Mr. James Campbell) showed that there had been an increase in the sales of gas amounting to 986,400 cubic feet, with an augmented make of 888,000 cubic feet. The total quantity of gas made was 28,836,000 cubic feet, from 2827 tons of coal; being at the rate of 10,198 cubic feet per ton. The coke sold amounted to 1271 tons, equal to 8'99 cwt. per ton; and the tar and liquor sold equalled 39'32 gallons per ton. Of the cost of coals, 67'6 per cent. was recovered from residuals; leaving the net price of coals 3s. 8d. per ton.

CURRENT SALES OF GAS PRODUCTS.

[For Table of "Tar Products Prices," see p. 318.]

Sulphate of Ammonia.

LIVERPOOL, July 29.

During the past week the position of this article has continued to gather fresh strength, and the improvement in values has been more rapid than that which has been experienced since the commencement of this month. At the close the tone is very firm at £13 17s. 6d. per ton f.o.b. Hull, £13 18s. 9d. per ton f.o.b. Liverpool, and £14 per ton f.o.b. Leith. The purchasing has largely been on account of dealers, but direct buyers have also shown appreciable interest. There has again been good inquiry for future delivery, and £14 per ton f.o.b. at some of the principal ports has been realized, for both October-December this year and January-June, 1912. Makers have now raised their limits for the early months of next year; but no business has been reported at a higher figure.

Nitrate of Soda.

The market for this article is slightly easier on spot, in consequence of some fresh arrivals, and the quotations have been put back to 9s. 10½d. per cwt. for 95 per cent. quality and 10s. 1½d. for 96 per cent.

LONDON, July 31.

Tar Products.

Markets for tar products still remain very firm. There has been a slight improvement in pitch, and better prices have been secured from all quarters. Benzols are quiet; but the price remains steady. In solvent naphtha, there is not very much doing; but heavy naphtha remains steady. Creosote is in fair demand, and prices have improved in some quarters. Crude carbolic is exceedingly firm at the present moment, and good prices are reported to have been paid both for this and next year's delivery.

The average values during the week were: Tar, 20s. to 23s., ex works. Pitch, London, 39s. to 40s.; east coast, 39s. to 40s.; west coast, Manchester, 38s. to 38s. 6d., Liverpool, 39s. to 40s., Clyde, 39s. to 40s. Benzol, 90 per cent., casks included, London, 9½d. to 10d.; North, 9d. to 9½d.; 50-90 per cent., casks included, London, 8½d. to 9½d.; North, 8½d. to 9d. Toluol, casks included, London, 9½d. to 10d.; North,

9½d. to 9½d. Crude naphtha, in bulk, London, 4d. to 4½d.; North, 3½d. to 3½d.; solvent naphtha, casks included, London, 11d. to 11½d.; North, 10d. to 10½d.; heavy naphtha, casks included, London, 11½d. to 1s. 0½d.; North, 10d. to 10½d. Creosote, in bulk, London, 2½d. to 2½d.; North, 2d. to 2½d. Heavy oils, in bulk, 2½d. Carbolic acid, 60 per cent., casks included, east coast, 2s. to 2s. 1d.; west coast, 1s. 11d. to 2s. Naphthalene, £4 10s. to £8 10s.; salts, 40s. to 42s. 6d., bags included. Anthracene, "A" quality, 1½d. per unit, packages included and delivered.

Sulphate of Ammonia.

There is still considerable inquiry in the market, and a large amount of business has been done for delivery now to the end of June next, and in some cases large contracts have been made for delivery all over next year. Actual Beckton make is nominally quoted at £13 8s. 9d. to £13 10s. Outside London makes are quoted £13 10s. to £13 12s. 6d., Hull £13 17s. 6d., Liverpool £13 17s. 6d. to £13 18s. 9d., Leith £14; while for forward 2s. 6d. to 3s. 6d. premium is asked at nearly all ports.

COAL TRADE REPORTS.

Northern Coal Trade.

There is now a steady demand in the northern coal trade, and prices show firmness; but the change in South Wales has altered the pressure here. The steam coal trade is generally steady. Best Northumbrian steams are about 11s. 6d. per ton f.o.b., second-class steams 9s. 3d. to 9s. 6d., and steam smalls from 5s. to 6s. There is also a good forward demand for steam coals, but at rather lower prices than those just given for prompt delivery. In the gas coal trade, the demand is good and prices are strongly held. Second-class Durhams are 9s. 6d. per ton f.o.b., and best Durhams are firm at from 10s. 4½d.; while "Wear Specials" are now about 10s. 9d. to 10s. 10½d. Some sales for the Magona Gas Company are reported—about 11,000 tons in all. The price reported is near 17s. 6d. per ton, delivered at Porto Vecchio. Some other contracts are in treaty, but not for very large amounts. Where long forward delivery is stipulated for, the tendency is to ask higher prices, as it is believed that there will be a greater cost of production through legislation. Coke is firmer. Good gas coke is quoted from 14s. to 14s. 3d. per ton f.o.b. in the Tyne.

Scotch Coal Trade.

There is more activity in the market than there was a fortnight ago. The foreign demand has improved considerably, leading to a firming of prices. Small sorts are still plentiful. The prices quoted are: Ell 9s. 3d. to 10s. per ton f.o.b. Glasgow, splint 9s. 6d. to 9s. 9d., and steam 9s. to 9s. 3d. The shipments for the week amounted to 181,892 tons—a decrease upon the preceding week of 157,781 tons, and upon the corresponding week of 830 tons. For the year to date, the total shipments have been 8,816,077 tons—an increase upon the corresponding period of 41,888 tons.

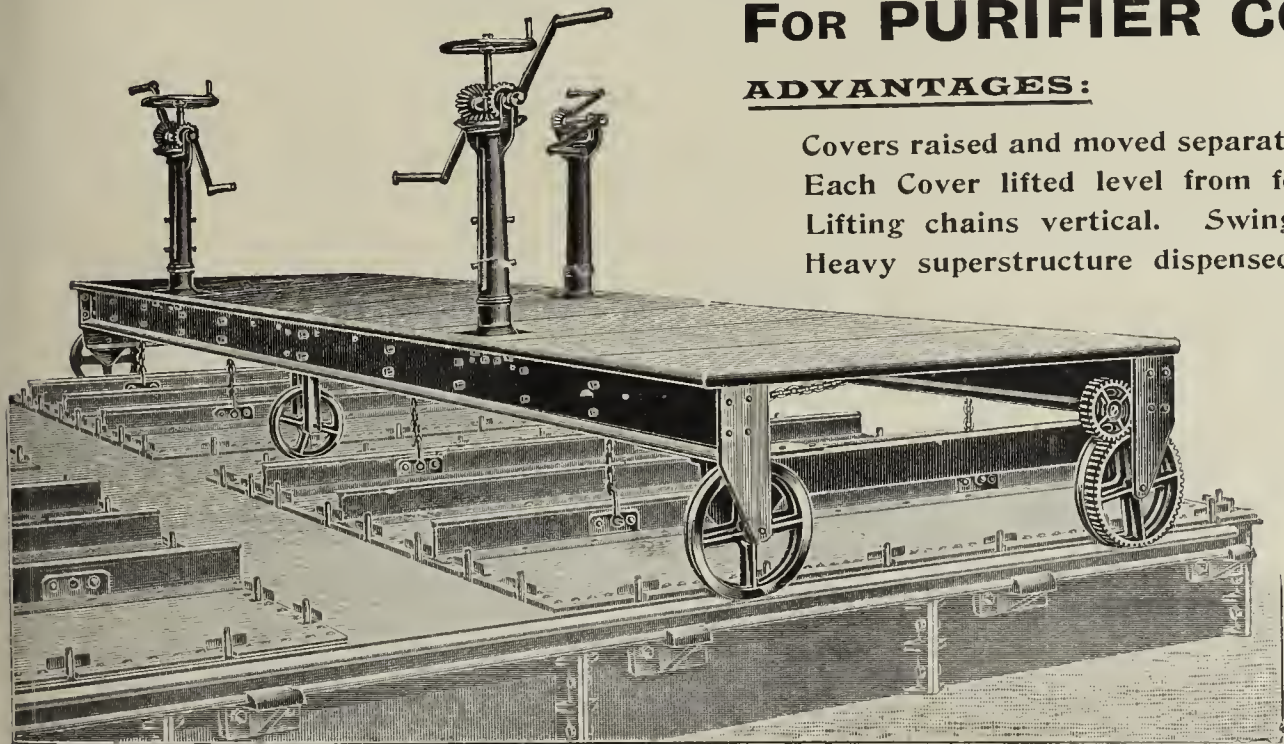
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Scottish Tube Trade Amalgamation.

"The Times" last Wednesday contained the following statement by an Edinburgh correspondent: "After protracted negotiations, the Scottish producers of wrought-iron and steel tubes have agreed upon combination, and the businesses of the following firms will be taken over by the Company, to be styled the Scottish Tube Company, Limited, with a capital of £600,000: Wilson's and Union Tube Company, Limited, David Richmond and Co., Limited, Hendry Brothers, Limited, David Marshall and Sons, James Edie and Sons, Caledonian Company, Coats Tube Company, and the Tradeston Tube Company. Stewarts and Lloyds, Limited, the biggest producers of all, hold aloof so far as amalgamation is concerned; but they will work in harmony with the new Company, holding a considerable number of ordinary shares, and nominating a Director. The combination is the outcome of ruinous price-cutting which has prevailed since the collapse of the International Tube Association three years ago. It is expected that the next step will be the formation of an Anglo-Scottish combine, to be followed by the resuscitation of the International Agreement. The British production of tubes is 300,000 tons valued at £6,000,000."

The Humorous Side.

At the recent Manchester Assizes, the Corporation were defendants in an action to recover damages for injuries said to have been caused by their negligence. There was a motor-car accident; and one of the points was as to the proper lighting (or otherwise) of the street in which it occurred. The efficiency of the illumination was testified to by Mr. J. G. Newbigging, the Chief Engineer to the Manchester Corporation Gas Department; and his evidence gave rise to the following amusing paragraph in the "Manchester Courier": "One lives and learns. How many people, I wonder," writes a correspondent, "know what is meant by the 'hit-and-miss' principle in street lighting? It was novel to me certainly when the expression was used the other day by an expert witness in an Assize Court case. The phrase, it appeared, was used to designate a system by which a street was lighted alternately by pillar-lamps and by lamps bracketed on the walls. The origin of the phrase was sufficiently comprehensible; but its exact and full significance set me speculating. Why 'hit-and-miss'? Why not 'here-and-there' or 'dot-and-carry-one'? After profound pondering over the problem, I have arrived at a solution. The phrase—in conjunction with lamp-posts—can refer only to the time-honoured custom of gentlemen returning home in the wee sma' hours, excessively hilarious under the influence of what is euphemistically known among the initiated as 'a drop too much.' Hit-and-miss! Do you see? The happy but helpless reveller 'hits' the first lamp-post, embraces it in a loving hug, regains his breath, and struggles on in touching confidence to where past experience has taught him to expect another refuge. He struggles on. But he is doomed to disappointment. Blindly he gropes for the post; but in vain. There is no post. The next lamp is in the wall. That is the 'miss'!"

Winding-Up of the Whaley Bridge Gas Company, Limited.—At a meeting of the shareholders of the above-named Company held early last month, it was resolved that the Company should be wound up, and a liquidator or liquidators appointed for the purpose, and to carry into effect an agreement made between the Company and the Chapel-en-le-Frith, Chinley, and District Gas Company, Limited, for the purchase by the latter Company of the works and undertaking of the former. The resolution was confirmed at a subsequent meeting.

Coal Gas for Train Lighting.—As mentioned in the "JOURNAL" last week (p. 238), an article on this subject, by a "Railway Officer," recently appeared in the Engineering Supplement to "The Times." Referring to the article, another officer has written to our contemporary to inquire whether, in each case, the cost of compression had been included by the author, as, he says, "this is undoubtedly a very important item; and it is hardly fair to compare the non-compressed gas in one case, and in the other to make allowance, not only for compression, but also for interest and depreciation of plant." He adds that "coal gas with the incandescent mantle undoubtedly offers advantages in some cases, and would prevent the provision of special gas-works."

Withdrawal of Opposition to the Swansea Gas Bill.—As already recorded in our "Parliamentary Intelligence," the Bill of the Swansea Gas Company has been referred to a Select Committee of the House of Commons, by whom it was to be considered next Thursday. Several meetings have, however, been held of the Parliamentary Committee of the Swansea Corporation and Directors of the Company, with the view of adjusting the differences between the two bodies. As a result, a settlement has been effected, which provides for the transfer of the Vetch Field to the Corporation at a rental to be fixed by an arbitrator, who is not to take into account any special value which may be attached to the land for the purposes of the Company. The opposition of the Corporation will, therefore, be withdrawn, and the Bill will proceed as an unopposed measure.

Gas-Meter Testing Station at Edmonton.—The annual report of the General Purposes Committee of the Middlesex County Council, just issued, states that the Council's gas-meter testing station at Edmonton was opened in July, 1900, as the result of an agreement entered into between them and Messrs. Thomas Glover and Co., Limited, who were desirous of having their gas-meters tested and stamped in close proximity to their factory at Edmonton. On the firm undertaking to make good any loss which might fall upon the Council, the station was opened. Owing to the increase in the number of meters submitted for testing, negotiations with Messrs. Glover are now in progress with a view to the station being enlarged. The receipts in excess of payments in respect of the station during the year ended March 31 last amounted to £1050 8s. 7d.; and the total amount which has gone in aid of the county rate since the station was opened is £10,442 9s. 1d. During last year, 5936 meters were received from gas companies and consumers; and of these 1939 were stamped, and 3927 rejected. From makers 82,385 meters were received, and 2299 rejected.

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Inspection of the Manchester Corporation Reservoirs.

At the invitation of the Water Committee of the Manchester Corporation, members of the City Council and a number of invited guests made an inspection last Thursday of the water-works in the Longden-dale Valley, as well as the reservoirs at Godley, Audenshaw, and Gorton on the return home. The party numbered upwards of a hundred, and included the Lord Mayor (Mr. Charles Behrens); Sir Bosdin T. Leech, the Chairman of the Water Committee; Alderman Phillips, the Mayor of Salford; Alderman Snape, the Chairman of the Water Committee of the Salford Corporation; and Mr. Lewis Galloway, the Chairman of the North Cheshire Water Company. In the course of the inspection, it was explained that between Woodhead and Manchester there are fourteen reservoirs belonging to the Corporation; the holding capacity of the whole being 5965 million gallons, and the drainage area about 19,300 acres. In addition, there is the supply from Thirlmere, where there is at present a drainage area of 7400 acres. When the lake at Thirlmere is fully utilized, the area will be not less than 11,000 acres. From Thirlmere, two conduits are in use; and the third is expected to be available in the spring of 1913. The party were entertained at lunch at Annfield by the Water-Works Committee. Sir Bosdin T. Leech, in proposing "Success to the Manchester Water-Works Undertaking," gave the company some interesting information as to its development. He mentioned that the embankment of their first reservoir was considered so frail that horse-men were kept in readiness to gallop down the valley to give warning to the residents in case of a burst. This, however, was a danger that did not last long, for the engineers carried out excavations to the depth of 160 feet, to the solid rock, and so secured a safe impounding of the water. As evidence of the development of the undertaking since those days, Sir Bosdin stated that the capital outlay amounted to £8,000,000; and as they had a sinking fund of £1,900,000, he considered they were paying their way very fairly. To-day Manchester was supplying itself and its neighbours with 44 million gallons of water daily, and the consumption on a certain date recently reached 52 millions. He claimed that, for cheapness, purity, and softness, Manchester's water was not excelled by that of any other town in all Great Britain.

Melbourne Metropolitan Gas Company.—Messrs. John Terry and Co., the London agents for this Company, have received a cable advice to the effect that the profits for the half year ended the 30th of June were £95,250. A dividend of 5s. per share has been declared for this period, a sum of £52,000 added to the reserve fund, and a balance of £5000 carried forward.

Farnham Gas Company and the Supply of Electricity.—The Farnham Gas Company have now completed their arrangements, and are proceeding with the erection of an electricity supply station to the plans of Messrs. Handcock and Dykes, Consulting Engineers, of Westminster, who were responsible for the station of the Ascot Gas and Electricity Company. It is proposed to instal two 95-kilowatt 2000-volt alternators, driven by Diesel engines.

Water-Main Burst at Manchester.—The bursting of a 12-inch water-main in Cross Street, Manchester, last Tuesday morning, resulted in the loss of a great volume of water and considerable damage to the roadway. It was opposite the Royal Exchange that the accident occurred; and very soon a cavity several yards across, and about 5 feet deep, was formed. Before the water could be turned off, 80 yards of the roadway had been damaged, and property in the neighbourhood flooded.

Wolverhampton Water-Works Extensions.—The auxiliary water-works at Tettenhall which have just been completed by the Wolverhampton Corporation were formally opened last Thursday week; and the Chairman of the Water Committee (Alderman John Marston, J.P.) and the Engineer (Mr. E. A. B. Woodward) were the recipients of many congratulations on the successful completion of the scheme, which, it is acknowledged, is one of the most important yet undertaken in the history of the borough. The new engine-house was first opened by Alderman Marston, who was presented by the Mayor (Mr. C. T. Richards) with a suitably inscribed gold key. The party then proceeded to the new reservoir, the valve of which was opened by Alderman Marston. Luncheon on the ground concluded the proceedings.

Selby's Successful Gas Undertaking.—At the last meeting of the Selby Urban District Council, it was resolved to increase by another 2d. per 1000 cubic feet the discount allowed to ordinary consumers, making the price range from 2s. 2d. to 2s. 6d. per 1000 cubic feet, according to the quantity consumed; while for power gas the price ranges from 1s. 4d. to 2s. 6d. The reduction takes effect as from the 1st ult. When the present Gas Manager (Mr. T. H. Alderson) first went to Selby, rather more than twelve years ago, the price of gas to ordinary consumers was 3s. per 1000 cubic feet. It is interesting to note that the last payment of the original loan of £20,000 for the purchase of the gas-works will be made next March, and the town will thus be possessed of a valuable property which has paid for itself.

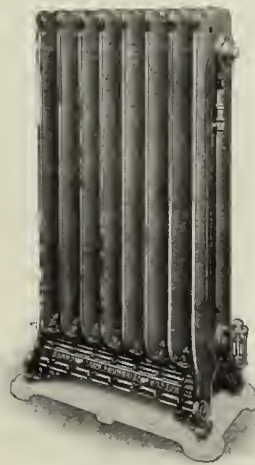
Cheaper Gas-Mantles.—Under the heading "Told after Shop Hours" in the current number of the "Ironmonger," is the following statement by "Bypasser," writer of the notes: "There seems some prospect of a slight further cheapening in the price of gas-mantles, owing to the expiration of the contract between the Brazilian Government and the Thorium Syndicate, and the consequent break-up of the quasi-monopoly enjoyed by the latter body. The yearly consumption of monazite sand (from which the thorium used in the impregnation of the fibre of gas-mantles is extracted) is placed at between 2000 and 2500 tons; but as the supplies of the sand have for some years past been equal to double the consumption, and with the expiration of the Thorium Syndicate's contract are likely to be still greater in future, a reduction in the price of thorium should occur, and with it, of course, a drop in the cost of mantles made from cotton or ramie fibre. Mantles of silk are, however, likely to retain their price; and from what I hear, are well worth the extra money asked for them."

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Littleborough Gas Company's Record Year.—Presiding at the ordinary half-yearly meeting of the shareholders in the Littleborough Gas Company, held last Thursday, Mr. John C. Hudson had a very satisfactory report to present; and a dividend at the rate of 10 per cent. per annum (less income-tax) was declared on the six months' working. For the half year ending June, the gas sales realized £4489, compared with £4419 in the corresponding period of last year; the quantity being 33,556,400 cubic feet, as against 31,283,400 cubic feet in 1910. From residual products, £1546 was realized, compared with £1349. On revenue account, the profit was £1466, and the disposable balance £3246. The gas sales for the twelve months ending June 30 constituted a record—not only as to output, but as to increase. The total sales were 67 million cubic feet—an increase of $4\frac{1}{2}$ millions, or 7 per cent., as compared with the previous year.

Waste of Water in New York.—According to "Engineering Record," water-waste inspection in New York City is being carried on vigorously, owing to the low stage of the water in the reservoirs of the Croton Valley. It is asserted, though not officially confirmed, that more than half of the houses that have been visited contain leaky fittings, and it really would not be surprising to find that this condition exists throughout the city. The inertia of large bodies is proverbial; and New York is about the biggest thing in the United States. It does not mean to waste water, because a large proportion of the people know that the expense of furnishing the supply is heavy, and that even if they do not pay the water bills themselves directly to the city they pay them indirectly, since their landlords collect the money in the form of increased rents. But there is, nevertheless, a very deep prejudice against meters.

Tarring Roads in Sussex.—An important discussion on the subject of road tarring in relation to the dust nuisance took place at a meeting of the East Sussex County Council last week. Alderman Mannington, in moving a resolution urging that the tarring of main roads in the county should be expedited, said since motors became fashionable the dust nuisance had become intolerable in those places where no tarring was done. He urged that the prime object of road tarring was to lay the dust; whereas the principle they had acted upon in East Sussex was to do it under conditions which were favourable for strengthening the roads. They had had a dry summer, and the greatest nuisance from dust ever experienced. It was very desirable that tarring should be commenced earlier, and applied over a greater length of road. Mr. Bridgman mentioned a portion of the London and Brighton road which was absolutely eaten up, whereas other parts which had been tarred were wearing well. Mr. Goodwin King, the Chairman of the Roads and Bridges Committee, contended that the Council had no legal right to tar simply and solely for the sake of minimizing the dust. They must show that it contributed to the life of the road; and to do this, they must tar when conditions were favourable. The Council resolved to have a further report on the matter.

At last Wednesday's meeting of the General Purposes Committee of the Rochdale Town Council, it was stated that the National Insurance Bill would entail an expenditure of about £1000 on the whole of the Corporation departments. On the gas-works, the amount is £150; and for the water-works, £50.

TAR PRODUCTS PRICES.

Representative manufacturers give the following as fair current values for the week ending July 29. Prices are net, and they include the usual packages and delivery f.o.b., f.a.s., or f.o.r., as customary.

Article.	Basis.	London.	North-East Coast.	East Coast, Yorks.	West Coast,		Glasgow.
					Liverpool.	Manchester.	
Tar, crude	per ton	28/- 30/-	20/- 25/-	20/3 24/3	19/- 22/-	19/- 22/-	—
Pitch	"	40/-	38/-	40/-	40/-	38/6 39/-	39/-
Benzol, 90%	per gallon	-/11	-/9 $\frac{1}{2}$	-/9	-/9 $\frac{1}{2}$	-/9 $\frac{1}{2}$	-/10
Benzol, 50-90%	"	—	-/10	-/9 $\frac{1}{2}$	-/8 $\frac{1}{2}$	-/8 $\frac{1}{2}$	—
Toluol, 90%	"	—	-/10	-/10	-/10	-/10	-/10
Crude naphtha, 30%	"	—	-/4	-/4	-/3 $\frac{1}{2}$	-/3 $\frac{1}{2}$	—
Light oil, 50%	"	—	-/3 $\frac{1}{2}$	-/3 $\frac{1}{2}$	-/3 $\frac{1}{2}$	-/3 $\frac{1}{2}$	—
Solvent naphtha, 90-160	"	—	-/10	-/10	-/10	-/10	-/11
Heavy naphtha, 90-190	"	—	-/11	-/11 $\frac{1}{2}$	-/11 $\frac{1}{2}$	-/11 $\frac{1}{2}$	-/11
Creosote in bulk	"	-/2 $\frac{3}{4}$	-/2	-/2	-/2 $\frac{1}{2}$	-/2 $\frac{1}{2}$	-/1 $\frac{1}{2}$
Heavy oils.	"	—	-/2 $\frac{1}{2}$ -/2 $\frac{5}{8}$	-/2 $\frac{1}{2}$	-/2 $\frac{1}{2}$	-/2 $\frac{1}{2}$	-/2 $\frac{1}{2}$
Carbolic acid, 60's.	"	—	1/11	1/11	1/11	1/10 $\frac{1}{2}$	1/11 $\frac{1}{2}$
Naphthalene, crude drained salts	per ton	—	43/9	41/3	47/6	47/6 50/-	—
" pressed.	"	—	60/-	63/-	60/-	60/- 72/6	—
" whizzed.	"	—	—	—	70/- 72/6	60/- 75/-	60/-
Anthracene	per unit	-/2	-/1 $\frac{1}{2}$	-/1 $\frac{1}{2}$	-/1 $\frac{1}{2}$	-/1 $\frac{1}{2}$	—

GAS COMPANIES' STOCK AND SHARE LIST.

Referred to on p. 382.

Issue.	Share.	When ex Dividend.	Dividend or Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Invest-ment.	Issue.	Share.	When ex Dividend.	Dividend or Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Invest-ment.
£			p.c.				£ s. d.	£			p.c.				£ s. d.
1,551,868	Stk.	Apl. 12	5	Alliance & Dublin Ord.	82-85	..	5 17 8	4,940,000	Stk.	May 12	9	Imperial Continental	180-183	-2 $\frac{1}{2}$	4 18 4
374,000	Stk.	July 14	4	Do. 4 p.c. Deb.	93-95	..	4 4 8	1,235,000	Stk.	Feb. 10	3 $\frac{1}{2}$	Do. 3 $\frac{1}{2}$ p.c. Deb. Red.	92-94	..	3 14 6
250,000	5	May 12	7	Bombay, Ltd.	64-64 $\frac{1}{2}$	..	5 3 8	561,000	Stk.	Feb. 24	10	Liverpool United A.	215-217	..	4 12 2
50,000	10	Feb. 24	15	Bourne-) 10 p.c. . .	28 $\frac{1}{2}$ -29 $\frac{1}{2}$	..	5 1 8	718,100	"	"	7	Do. B.	163-165	..	4 4 10
311,810	10	"	7	mouth Gas } B 7 p.c. .	16 $\frac{1}{2}$ -16 $\frac{1}{2}$	..	4 3 0	306,083	"	June 30	4	Do. Deb. Stk.	102-104	..	3 16 11
75,000	10	"	6	and Water } Pref. 6 p.c.	14 $\frac{1}{2}$ -15	..	4 0 0	75,000	5	June 15	6	Malta & Mediterranean	4 $\frac{1}{2}$ -4 $\frac{1}{2}$	..	6 3 1
380,000	Stk.	"	13 $\frac{1}{2}$	Brentford Consolidated	257-262	..	4 10 3	560,000	100	Apl. 1	5	Met. of 15 p.c. Deb.	100-102	..	4 18 0
330,000	"	"	10 $\frac{1}{2}$	Do. New . . .	200-210	..	4 15 3	250,000	100	"	4 $\frac{1}{2}$	Melbourne 4 $\frac{1}{2}$ p.c. Deb.	100-102	..	4 8 3
50,000	"	"	5	Do. 5 p.c. Pref.	122-124	..	4 0 8	541,920	20	May 31	3 $\frac{1}{2}$	Monte Video, Ltd.	123-131	..	5 5 8
206,250	"	June 15	4	Do. 4 p.c. Deb.	97-99	..	4 0 10	1,775,892	Stk.	Feb. 24	4 $\frac{1}{2}$	Newcastle & Gt. Tesh'd Con.	103-104 $\frac{1}{2}$	..	4 3 9
220,000	Stk.	Mar. 10	11	Brighton & Hove Orig.	217-220	..	5 0 0	529,705	Stk.	June 30	3 $\frac{1}{2}$	Do. 3 $\frac{1}{2}$ p.c. Deb.	87-89	..	3 18 8
246,320	"	"	8	Do. A Ord. Stk.	157-160	..	5 0 0	55,940	10	Mar. 10	7	North Middlesex 7 p.c.	15-16	..	4 7 6
490,000	20	Apl. 12	11 $\frac{1}{2}$	British . . .	44 $\frac{1}{2}$ -45 $\frac{1}{2}$	..	5 3 5	300,000	Stk.	Apl. 27	8	Oriental, Ltd.	137-139	..	5 15 1
120,000	Stk.	June 30	4	Do. 4 p.c. Deb. Stk.	94-96	..	4 3 4	60,000	5	Apl. 12	8	Ottoman, Ltd.	63-74	..	5 10 4
109,000	"	Feb. 10	6	Bromley, A 5 p.c. .	116-118	..	5 1 8	31,800	53	Feb. 24	13	Portsea Island A	135-140	..	4 18 4
165,700	"	"	4 $\frac{1}{2}$	Do. B 3 $\frac{1}{2}$ p.c. . .	87-89	..	5 1 2	100,000	50	"	12	Do. C	120-125	..	4 16 0
82,278	"	"	5 $\frac{1}{2}$	Do. C 5 p.c. . .	106-108	..	5 1 10	398,490	5	May 31	8	Primitiva Ord.	71-72 $\frac{1}{2}$	-1 $\frac{1}{2}$	5 6 8
55,000	"	June 30	3 $\frac{1}{2}$	Do. 3 $\frac{1}{2}$ p.c. Deb.	82-84	..	4 3 4	796,980	5	June 30	5	Do. 5 p.c. Pref.	54-55 $\frac{1}{2}$	..	4 10 11
250,000	Stk.	"	4	Buenos Ayres 4 p.c. Deb.	95-97	..	4 2 6	488,900	100	June 1	4	Do. 4 p.c. Deb.	97-99	..	4 0 10
100,000	10	"	—	Cape Town & Dis., Ltd.	2-3	..	—	312,650	Stk.	June 30	4	River Plate 4 p.c. Deb.	95-97	..	4 2 6
100,000	10	"	—	Do. 4 $\frac{1}{2}$ p.c. Pref.	4-5	..	—	250,000	10	Mar. 24	9	San Paulo, Ltd.	213-223	..	4 0 0
100,000	Stk.	June 30	4 $\frac{1}{2}$	Do. 4 $\frac{1}{2}$ p.c. Deb. Stk.	80-83	..	5 8 5	115,000	10	"	6	Do. 6 p.c. Pref.	12-12 $\frac{1}{2}$	..	4 16 0
157,150	Stk.	Feb. 24	5	Chester 5 p.c. Ord.	109-111	..	4 10 1	125,000	50	July 1	5	Do. 5 p.c. Deb.	49 $\frac{1}{2}$ -50 $\frac{1}{2}$	..	4 19 0
1,513,280	Stk.	"	5/9/4	Commercial 4 p.c. Stk.	114-116	..	4 14 3	135,000	Stk.	Mar. 24	10	Sheffield A	236-238	..	4 4 0
560,000	"	"	5 $\frac{1}{2}$	Do. 3 $\frac{1}{2}$ p.c. do.	108-110	..	4 16 11	209,984	"	"	10	Do. B	236-238	..	4 4 0
475,000	"	June 15	3	Do. 3 p.c. Deb. Stk.	75 $\frac{1}{2}$ -77 $\frac{1}{2}$	..	3 17 5	523,500	"	"	10	Do. C	236-238	..	4 4 0
800,000	Stk.	May 31	4	Continental Union, Ltd.	90-93	-1	4 6 0	70,000	10	June 15	7	South African	81-91	..	7 7 4
200,000	"	"	7	Do. 7 p.c. Pref.	135-137	..	5 2 2	6,429,895	Stk.	Feb. 10	5/9/4	South Met., 4 p.c. Ord.	119-121	..	4 10 3
492,270	Stk.	"	5 $\frac{1}{2}$	Derby Con. Stk.	122-124	..	4 8 9	1,895,445	"	July 14	3	Do. 3 p.c. Deb.	78 $\frac{1}{2}$ -80 $\frac{1}{2}$	..	3 14 6
55,000	"	July 28	10	Do. Dch. Stk.	104-105	..	3 16 2	209,820	Stk.	Mar. 10	8	South Shields Con. Stk.	154-156	+1	4 12 9
840,150	10	Feb. 24	1/11/8	European, Ltd.	183-193 $\frac{1}{2}$	..	5 2 7	605,000	Stk.	Feb. 24	5 $\frac{1}{2}$	S'th Suhurh'n Ord. 5 p.c.	120-122	..	4 12 9
16,160,600	Stk.	"	3 $\frac{1}{2}$	Gas-) 4 p.c. Ord.	107-108	..	4 7 8	60,000	"	"	5	Do. 5 p.c. Pref.	118-120	..	4 3 4
2,600,000	"	"	3 $\frac{1}{2}$	light) 3 $\frac{1}{2}$ p.c. max.	85-87	..	4 0 6	117,058	"	July 14	5	Do. 5 p.c. Deb. Stk.	121-123	..	4 1 4
4,062,235	"	"	4	and) 4 p.c. Con. Pref.	103-105	..	3 16 2	502,310	Stk.	May 12	5	Southampton Ord.	108-110	+1	4 10 11
4,531,705	"	June 15	3	Coke) 3 p.c. Con. Deb.	78 $\frac{1}{2}$ -80 $\frac{1}{2}$	..	3 14 6	120,000	Stk.	Feb. 10	7 $\frac{1}{2}$	Tottenham A 5 p.c. .	147-150	..	4 15 0
258,740	Stk.	Mar. 10	5	Hastings & St. L. 3 $\frac{1}{2}$ p.c.	95-97	..	5 3 1	483,940	"	"	5 $\frac{1}{2}$	and) B 3 $\frac{1}{2}$ p.c. .	116 $\frac{1}{2}$ -118 $\frac{1}{2}$	..	4 15 0
82,500	"	"	6 $\frac{1}{2}$	Do. do. 5 p.c.	—	..	—	149,470	"	June 15	4	Edmonton) 4 p.c. Deb.	96-98	..	4 1 8
70,000	10	Apl. 27	11	Hongkong & China, Ltd.	17 $\frac{1}{2}$ -18	..	6 2 2	182,380	10	June 15	8	Tuscan, Ltd.	84-94	..	8 13 0
131,000	Stk.	Mar. 10	7 $\frac{1}{2}$	Ilford A and C	147-150	..	4 18 4	149,900	10	July 1	5	Do. 5 p.c. Deb. Red.	96-98	..	5 2 0
65,780	"	"	5 $\frac{1}{2}$	Do. B	119-122	..	4 16 3	236,476	Stk.	Feb. 24	5	Tynemouth, 5 p.c. max.	115-117	..	4 5 6
65,500	"	June 30	4	Do. 4 p.c. Deb.	94-96	..	4 3 4	255,636	Stk.	Feb. 24	6 $\frac{1}{2}$	Wands-) B 3 $\frac{1}{2}$ p.c. .	141-143	..	4 14 5
200,242	Stk.	Mar. 10	6	Lea Bridge Ord. 5 p.c.	120-122	..	4 18 4	85,766	"	June 30	3	worth) 3 p.c. Deb. Stk.	71-73	..	4 2 2

Prices marked * are "Ex. div."

† Next dividend will be at this rate.

WANTED, FOR SALE, CONTRACTS, &c., ADVERTISEMENTS IN THIS WEEK'S "JOURNAL."

Appointments Vacant.

CHEMIST. Oriental Gas Company. Applications by Aug. 15.
TRAVELLER (TOOLS, &c.). Taylor and Bryden, Billiter Street, E.C.
GAS FITTER. Oriental Gas Company. Applications by Aug. 15.
STOKER. No. 5426.

Appointments Wanted.

REPRESENTATIVE. E. Stockdale, Putney.
ASSISTANT TO MANAGER (for Holiday). No. 5434.

Plant, &c. (Second-Hand), for Sale.

CONDENSER. Sutton Gas Company.
METERS. No. 5421.
PURIFIERS, COLUMNS, &c. Oxford Gas Company.

Plant, &c. (Second-Hand), Wanted.

GASHOLDER. No. 5433.

Patents, Licences, &c.

ACETYLENE LAMPS AND GENERATORS, &c. Haseltine, Lake, and Co., Southampton Buildings, W.C.
TREATING COAL FOR COKING PURPOSES. Haseltine, Lake, and Co., Southampton Buildings, W.C.

Meetings.

BROMLEY AND CRAYS GAS COMPANY. Bell Hotel, Bromley. Aug. 3. Six o'clock.
IRISH ASSOCIATION OF GAS MANAGERS. Queen's Hotel, Queenstown, Aug. 8.
SOUTH SUBURBAN GAS COMPANY. Works. Aug. 4. 2.30 o'clock.

Stocks and Shares.

HARPENDEN DISTRICT GAS COMPANY. Applications by Aug. 5.
SIMPLEX SCOOP SYNDICATE. No. 5435.

TENDERS FOR

Coal and Cannel.

BARRY URBAN DISTRICT GAS DEPARTMENT. Tenders by Aug. 7.
BRADFORD GAS DEPARTMENT. Tenders by Aug. 24.
HAVERFORDWEST CORPORATION. Tenders by Aug. 14.

Coal and Cannel (continued).

STRATFORD-ON-AVON GAS COMMITTEE. Tenders by Aug. 12.
WINSFORD URBAN DISTRICT COUNCIL. Tenders by Aug. 12.

Condensers.

SMETHWICK GAS DEPARTMENT. Tenders by Aug. 11.

Meters.

DEWSBURY GAS DEPARTMENT. Tenders by Aug. 12.

Pipes, &c.

DEWSBURY GAS DEPARTMENT. Tenders by Aug. 12.
HEYWOOD GAS DEPARTMENT. Tenders by Aug. 12.

Sulphuric Acid.

DEWSBURY GAS DEPARTMENT. Tenders by Aug. 12.
HEYWOOD GAS DEPARTMENT. Tenders by Aug. 12.
SEAFORD GAS COMPANY.

Tinnerd Ware.

HEYWOOD GAS DEPARTMENT. Tenders by Aug. 12.

NOTICES TO CORRESPONDENTS, ADVERTISERS, AND SUBSCRIBERS.

No notice can be taken of anonymous communications. Whatever is intended for insertion in the "JOURNAL" must be authenticated by the name and address of the writer; not necessarily for publication, but as a proof of good faith.

BANK HOLIDAY.

In consequence of the BANK HOLIDAY, Communications for the next issue of the "JOURNAL" and Orders respecting ADVERTISEMENTS should be received at the Office

NOT LATER than the FIRST POST ON SATURDAY.

Wanted, For Sale, and Tender Advertisements, Six Lines and under, 3s.; each additional Line, 6d.

TERMS OF SUBSCRIPTION to the "JOURNAL."

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All Communications, Remittances, &c., to be addressed to
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O'NEILL'S OXIDE

For GAS PURIFICATION.

LARGEST SALE OF ANY OXIDE.

SPENT OXIDE PURCHASED IN ANY DISTRICT.

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"VOLCANIC" FIRE CEMENT.

Resists 4500° Fahr. Best for GAS-WORKS.

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Pitch, Creosote, Brick and Fuel Oils, Benzol, Solvent Naphtha, Carholie, Sulphate of Ammonia.

SULPHURIC ACID.

SPECIALLY prepared for Sulphate of AMMONIA Makers by

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REPAIRS RECEIVE PROMPT ATTENTION.

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GAS-WORKS requiring Extensions should Communicate with FIRTH BLAKELEY, SONS, AND CO., LIMITED, Dewsbury, who make a Speciality of Catering for the Smaller Gas Concerns. Prices Reasonable; quality and results, the best. Satisfaction Guaranteed.

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Gives no back Pressure.

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We guarantee promptness with efficiency for Repairs.

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Telegrams: "CHEMICALS."

PATENTS AND TRADE MARKS
PUBLICATIONS, "MERCHANDISE MARKS ACT, and Decisions thereunder," Is.; "TRADE SECRETS v. PATENTS," 6d.; "DOCTRINE of EQUIVALENTS, Mechanical and Chemical," 6d. "SUBJECT-MATTER of PATENTS," 6d.
MEWBURN, ELLIS, & PRYOR, Chartered Patent Agents, 70 & 72, Chancery Lane, London, W.C. Telegrams: "Patent London." Telephone: No. 243 Holborn.

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"GUIDE to Patents, Trade Marks and DESIGNS," 1910. 4th Edition. Contains concise information on British, Colonial, and Foreign Patents, &c. All Inventors and those interested should send for free copy to J. S. WITHERS & SPOONER, Chartered Patent Agents, 323, High Holborn, LONDON. 'Phone. 480 HOLBORN. Telegrams: "Improvably, London."

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Works: BIRMINGHAM, GLASGOW, LEEDS, LIVERPOOL, SUNDERLAND, and WAKEFIELD.

FOR Instructions on Polishing and Cleaning Gas-Cookers and Gas-Fittings, read Canning Handbook on Polishing, Electro-Plating, and Lacquering. Fully illustrated. Price 2s. 3d., post free; abroad, 2s. 6d.
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ASSISTANT No. 5410.

APPLICANTS for the Position advertised under the above Number are THANKED, and informed that an APPOINTMENT HAS BEEN MADE.

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FOR SALE—A One Million Cubic Feet per diem WATER COOLED CONDENSER, Marshall's Patent, by Kirkham, Hulett, and Chandler, 18-inch Inlet, Outlet, and Bye-Pass Valves and Connections Complete.
Offers to the SECRETARY, Sutton Gas Company, Sutton, SURREY.

IRISH ASSOCIATION of GAS MANAGERS.

PRESIDENT:
J. PATERSON, Esq., Queenstown.

THE ANNUAL MEETING

Of the Association

WILL BE HELD IN THE
QUEEN'S HOTEL,
QUEENSTOWN.

ON TUESDAY, AUG. 8, 1911.

The Chair will be taken at 11 a.m. by the PRESIDENT.

Business: Report of Committee, with Abstract of Accounts and Auditor's Report; Election of Scrutineers; Election of District Representative on Council of Institution of Gas Engineers; Election of New Honorary Member; Mr. J. E. Enright's motion to change the date of Meeting; President's Address; Presentation of Illuminated Address to James Whimster, Esq., J.P., Armagh; Reading of Papers, and Discussion.

PAPERS TO BE READ.

"Notes on Purification," by Mr. A. PERCY HOSKINS, of Belfast.

"The Construction and Working of a Small Sulphate of Ammonia Plant," by Mr. HORNBY, of Longford.

"Gas Apparatus for Workshops and Laboratory Purposes," by Mr. G. F. HUNST, of Birmingham.
If time permits, there will be a discussion; the subjects suggested being: "Is the Improved Upright Incandescent Burner better than the Inverted for Ordinary Gas Pressures?" and "The best means of Disposing of Tar in View of the Deterioration in Prices, lately."

By kind permission of the management, members may visit the Cork Gas-Works.

By Invitation of the President, Light Refreshments will be partaken of at 1.30 p.m.

The members and their friends will, on the kind invitation of the Chairman and Directors of the Queenstown Gas Company, dine in the Queen's Hotel, at 5.30 p.m.

Applications for Dinner Tickets must be made to the Hon. Secretary not later than the 1st of August, after which no ticket will be issued.

On Wednesday, Aug. 9, an Excursion has been arranged for Members and Lady Friends to Youghal, with a Steamboat trip on the Blackwater and a Drive from Cappoquin to Mount Melleray Abbey. Tickets (inclusive) 8s. each, applications for which should be received by Aug. 1.

G. AIRTH,
Hon. Secretary and Treasurer.
Dundalk, July 21, 1911.

ORIENTAL GAS COMPANY, LIMITED.

WANTED, for Calcutta, a thoroughly qualified Gentleman (unmarried) as CHEMIST and PHOTOMETRIST to the Company.

Applicants must have thorough knowledge of Photometry and Gas Testing in all branches, of Analytical Work, and of the Manufacture of Sulphate of Ammonia and Sulphuric Acid, and must be capable of Superintending their Manufacture.

To embark early in October.

Commencing Salary, £30 per month, with First-Class Passage.

Engagement, Five Years.
Applications to the SECRETARY of the Company, Finsbury House, Blomfield Street, LONDON, E.C., not later than Aug. 15.

ORIENTAL GAS COMPANY, LIMITED.

WANTED, for Calcutta, a thoroughly qualified GAS FITTER (unmarried) competent to carry out Internal Fittings, Fix Meters, Gas-Stoves, Geysers, &c. Must have good Practical knowledge of Shop Lamps, Indoor and Outdoor, and all kinds of Incandescent Burners, Fittings, &c.

To embark early in October. Wages, £20 per Month, with Second-Class Passage.

Engagement, Five Years.
Applications to the SECRETARY of the Company, Finsbury House, Blomfield Street, LONDON, E.C., not later than Aug. 15.

WANTED, a small Second-Hand Gas- HOLDER. Not more than 1000 cubic feet capacity.
Send Price, &c., to No. 5433, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

WHAT offers for One 50-Light and Three 100-Light Dry Tin-Cased GAS-METERS? Thoroughly overhauled, and equal to new.
Address No. 5424, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

THE Oxford Gas Company have for sale TWO PURIFIERS, 25 feet square, 4 ft. 6 in. deep, with 18-inch Bye-Pass Valves and Connections complete. Also CAST-IRON COLUMNS with Wrought Iron staging for carrying same.
Apply the Engineer and Manager.

THE Seaford Gas Company, Limited, invite TENDERS for the Supply of 20 Tons, more or less, of SULPHURIC ACID, to be Delivered during the Twelve Months ending Sept. 1, 1912.
Further Particulars, &c., may be obtained from the undersigned.

L. D. MOSLEY,
Engineer and Manager.

BOROUGH OF HEYWOOD.

THE Gas Committee invite Tenders for the Supply of TUBES and FITTINGS, SULPHURIC ACID, and TINNED WARE.
Specification and Form of Tender may be obtained upon Application to Mr. W. Whatnough, Gas Manager. Sealed and endorsed Tenders to be sent to me not later than Saturday, Aug. 12, 1911.
By order,
GEO. G. BOUCHIER,
Town Clerk.

Municipal Buildings, Heywood,
July 20, 1911.

CITY OF BRADFORD.

TO COLLIERY PROPRIETORS AND OTHERS.

THE Gas Committee of the Bradford Corporation are prepared to receive TENDERS for the Supply of Best GAS COAL, COBBLES, NUTS, and CANNEL, all to be Well Screened, Dressed, and free from Shale and Pyrites, to be Delivered at the several works of the Corporation during the period of One Year, commencing on the first day of October next.

Form of Tender, with any further Information required, may be had on Application to Mr. Chas. Wood, Gas Engineer, Town Hall.

Sealed Tenders, endorsed "Tender for Coal," to be sent to me on or before Thursday, the 24th of August next.

The Contracts will be let subject to the Fair-Contracts Clauses of the Corporation, which may be seen at the Town Clerk's Office, and which the accepted Contractors will be required to sign.

The lowest or any Tender will not necessarily be accepted.

FREDERICK STEVENS,
Town Clerk.

Town Hall, Bradford,
July 24, 1911.

BARRY URBAN DISTRICT COUNCIL.

TENDERS FOR GAS COAL.

TENDERS are invited for the Supply of GAS COAL (up to 17,000 Tons), to be Delivered in such quantities and at such times as the Engineer and Manager may require, during One Year from August, 1911.

The Tenders must state the names of the Pits from which the Coal will be raised, the names of the Gas-Works at which it is used, and the price per Ton Delivered into the Council's Siding at the Gas-Works, Barry, and must be accompanied by a copy of the Analysis of the Coal.

Any person whose Tender is accepted must enter into a Contract in the Form required, also a Bond with approved Sureties, for its due performance.

Further Particulars may be obtained from Mr. T. E. Franken, Engineer and Manager, Gas-Works, Barry.

Sealed Tenders, endorsed "Tender for Gas Coal," must be sent to the undersigned on or before the 7th of August, 1911.

The lowest or any Tender not necessarily accepted.
T. B. TORDOFF,
Clerk.

Public Offices, Barry,
July 26, 1911.

COUNTY BOROUGH OF SMETHWICK.

(GAS DEPARTMENT.)

CONDENSERS.

THE Gas Committee are prepared to receive TENDERS for the Supply and Erection of a Battery of WATER-COOLED CONDENSERS equal to a capacity of four Million Cubic Feet per Twenty-Four hours.

Plans and Specifications may be obtained (on payment of a sum of £2 2s., which will be refunded on receipt of *bona-fide* Tender) upon Application to Mr. Vincent Hughes, Engineer, Gas-Works, Rabone Lane.

The Contractor will be required to pay the Standard Rate of Wages in accordance with the Council's Fair-Wages Clause, which will be embodied in the Contract.

Sealed Tenders, endorsed "Tender for Condensers," addressed to the Chairman of the Gas Committee, to be Delivered to the undersigned not later than Ten a.m. on Friday, the 11th of August next.

The Committee do not bind themselves to accept the lowest or any Tender.

By order
W. J. STURGES,
Secretary.

Gas Department, Council House,
Smethwick, July 26, 1911.

WINSFORD URBAN DISTRICT COUNCIL.

THE above Council are prepared to receive TENDERS for the Supply of CANNEL and Best Screened GAS COAL and GAS NUTS to be Delivered at the Cheshire Lines Station, Winsford, or the Over and Wharton Station of the London & North Western Railway, or at the Council's Wharf on the River Weaver at Winsford.

The Material is required for a term of Twelve Months ending the 31st of August, 1912.

The probable Quantities required will be about 300 Tons of Cannel, and about 2800 Tons of Gas Coal, which must be Freshly-Wrought, Well-Screened and free from Sulphurous Pyrites and other objectionable matter; but the Council reserve the right of reasonably increasing or decreasing the quantities named.

The person whose Tender is accepted will be required to enter into an Agreement with the Council for the due performance of the Contract.

Sealed Tenders, stating Price per Ton delivered as above, are to be received by the undersigned on or before the 12th day of August, 1911, and endorsed "Gas Coal Tender."

The Council do not bind themselves to accept the lowest or any Tender and reserve to themselves the right to divide the Contract as they think fit.

Forms of Tender and further Particulars may be had on Application to the Gas Manager, Mr. F. Sidwell, Winsford, or from

JNO. H. COOKE,
Clerk to the Council.

Council Offices, Russell Street,
Winsford, Cheshire, July 24, 1911.

CORPORATION OF HAVERFORDWEST.
COAL.

TENDERS are invited for the Supply of about 1800 Tons of Double Screened GAS COAL of the very best quality, to be Delivered at the Haverfordwest Railway Station, or at the Gas-Works Quay, Haverfordwest, by water communication, in quantities as required by the Gas Manager during the Year commencing on the 1st of September next. Tenders by Aug. 14, 1911. Forms of Tender and further Particulars of R. T. P. WILLIAMS, Town Clerk. Haverfordwest, July 26, 1911.

STRATFORD-ON-AVON CORPORATION.
(GAS DEPARTMENT.)

THE Gas Committee invite Tenders for the Supply of 6000 Tons of Good Screened GAS COALS or NUTS for Delivery during Twelve Months ending Sept. 30, 1912. Forms of Tender and other Particulars can be obtained upon Application to the Engineer and Manager. Tenders to be sent in (and will be accepted only on the Form supplied) not later than Aug. 12, 1911. The lowest or any Tender not necessarily accepted. J. S. CRANMER, Engineer and Manager. July 21, 1911.

BOROUGH OF DEWSBURY.

THE Gas Committee of the above Corporation invite TENDERS for the Supply and Delivery, during the period ending the 31st day of August, 1912, of:
SULPHURIC ACID.
WET and DRY METERS.
CAST-IRON GAS and WATER PIPES.
Specifications and Forms of Tender may be obtained on Application to the Gas Manager, Mr. Geo. Wm. Fligg, Gas-Works, Saviletown, Dewsbury. Tenders, under sealed cover, endorsed "Sulphuric Acid," "Meters," or "Cast-Iron Pipes," as the case may be, to be sent to me not later than the 12th day of August, 1911. The Corporation do not bind themselves to accept the lowest or any Tender.

H. ELLIS,
Town Clerk.

Town Hall, Dewsbury.

SOUTH SUBURBAN GAS COMPANY.

NOTICE is Hereby Given, that the ORDINARY HALF-YEARLY GENERAL MEETING of the Proprietors of this Company will be held in the "Livesey Memorial Hall," at the Works of the Company, Lower Sydenham, S.E., on Friday, the 4th day of August, 1911, at 2.30 o'clock in the afternoon precisely, to receive the Report of the Directors and Statement of Accounts for the Half Year ended June 30 last; to declare a Dividend for the same period; and for General Purposes. The TRANSFER BOOKS WILL BE CLOSED from the 21st day of July to the 4th of August, both days inclusive.

By order of the Board,
CHARLES M. OHREN,
Secretary.

Offices and Works,
Lower Sydenham, S.E.,
July 17, 1911.

BROMLEY AND CRAYS GAS COMPANY.

NOTICE is Hereby Given, that the ORDINARY HALF-YEARLY GENERAL MEETING of this Company will be held on Thursday, the 3rd day of August, 1911, at Six o'clock p.m. precisely, at the "Bell" Hotel, Bromley, Kent, to receive the Report of the Directors; the Balance-Sheet certified by the Auditors; to declare a Dividend; and to Transact generally the Business of a General Meeting. The TRANSFER BOOKS WILL BE CLOSED from the 19th of July to the 3rd of August, 1911, both days inclusive.

By order of the Board,
HENRY W. AMOS,
Secretary.

Offices: 156, High Street,
Bromley, Kent, July 19, 1911.

FOR SALE—450 Fully-Paid £1 Shares in the Simplex Scoop Syndicate, Limited. Apply, to No. 5435, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

HARPENDEN DISTRICT GAS COMPANY.

ISSUE OF £2000 FOUR PER CENT. MORTGAGE DEBENTURES AT PAR.
THE Directors of the Harpenden District Gas Company are prepared to receive APPLICATIONS for £2000 Four Per Cent. MORTGAGE DEBENTURES forming part of £8000 authorized to be borrowed under the powers of the Harpenden District Gas Act, 1901.

The amount now borrowed under the powers of the said Act is £4300; and the present issue of £2000 will make a total of £6300 secured by Mortgage on the undertaking of the Company. The total issued Share Capital of the Company now amounts to £23,000, divided into two classes of Shares; and recent dividends have been paid at the rates 10½ per Cent. and £7 11s. 6d. per Cent. per Annum respectively on the two classes of Shares. The present issue of Debentures is therefore amply secured. Applications should be made by letter, addressed to the Secretary, before Aug. 5, 1911, and need not be accompanied by a remittance. The Debentures will bear interest from date of payment.

By order,
FRED. W. TAYLOR,
Secretary.

Offices: Wheathampstead Road,
Harpenden, July 18, 1911.

SALES BY AUCTION OF GAS AND WATER STOCKS AND SHARES.

MESSRS. A. & W. RICHARDS beg to notify that their SALES BY AUCTION of NEW CAPITAL ISSUED UNDER PARLIAMENTARY POWERS, and of STOCKS and SHARES belonging to EXECUTORS and other PRIVATE OWNERS in LONDON, SUBURBAN, and PROVINCIAL GAS and WATER COMPANIES, take place PERIODICALLY at the Mart, TOKENHOUSE YARD, E.C. Terms for Issuing New Capital, and also for including other Gas and Water Stocks and Shares in these Periodical Sales, will be forwarded on Application to MESSRS. A. & W. RICHARDS, at 18, FINSBURY CIRCUS, E.C.

THE Proprietors of the Patents No. 7188 of 1901, for "IMPROVEMENTS IN OR RELATING TO ACETYLENE GAS LAMPS OR GENERATORS;" No. 11,612 of 1902, for "ACETYLENE GAS-LAMP FOR TABLE USE;" No. 23,629 of 1903, for "IMPROVEMENTS IN ACETYLENE GAS GENERATORS;" and No. 10,185 of 1905, for "IMPROVEMENTS IN ACETYLENE GAS GENERATORS," are desirous of entering into Arrangements, by way of LICENCE and otherwise, on reasonable Terms, for the purpose of EXPLOITING the same and ensuring their full Development and Practical Working in this Country. All Communications should be addressed in the first instance to HASELTINE, LAKE, & Co., Chartered Patent Agents and Consulting Engineers, 7 and 8, Southampton Buildings, Chancery Lane, London, W.C.

THE Proprietor of the Patent No. 19,799 of 1907, for "IMPROVEMENTS RELATING TO GENERATORS FOR ACETYLENE GAS OR THE LIKE," is desirous of entering into arrangements, by way of LICENCE and otherwise, on Reasonable Terms, for the purpose of EXPLOITING the same and ensuring its Full Development and Practical Working in this Country. All Communications should be addressed in the first instance to HASELTINE, LAKE, & Co., Chartered Patent Agents and Consulting Engineers, 7 & 8, Southampton Buildings, Chancery Lane, London, W.C.

THE Proprietor of the Patent No. 17,580 of 1904, for "Improved Method of Treating Coal for Coking Purposes," is desirous of entering into arrangements, by way of LICENCE and otherwise, on Reasonable Terms, for the purpose of EXPLOITING the same and ensuring its Full Development and Practical Working in this Country. All Communications should be addressed in the first instance to HASELTINE, LAKE, & Co., Chartered Patent Agents and Consulting Engineers, 7 & 8, Southampton Buildings, Chancery Lane, London, W.C.

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Highest Results in Gas, & Excellent Coke.

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in diameter, and make and erect to order
RETORTS, PURIFIERS and TANKS, with
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These are cast in one piece, without Chap-
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[See Illustrated Advertisement, June 13, p. 712.]

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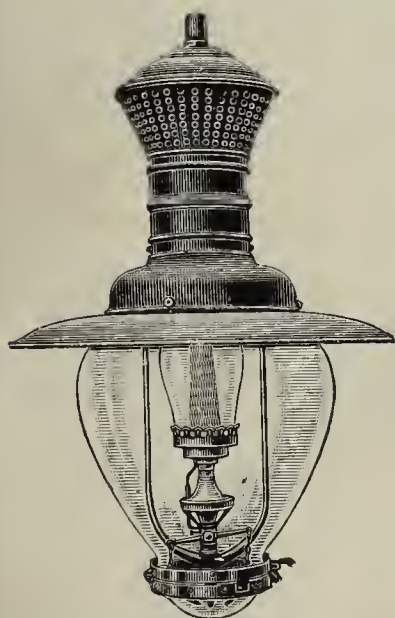
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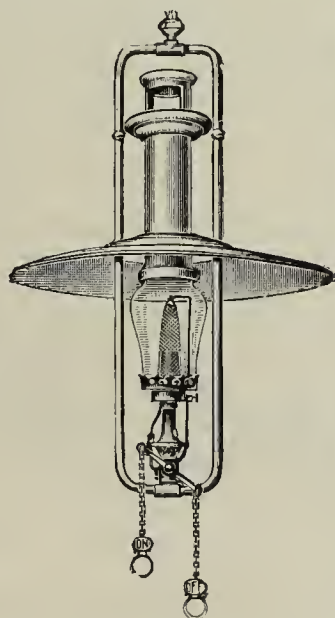
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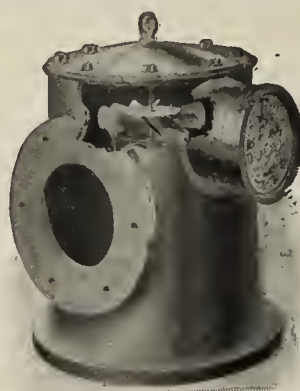
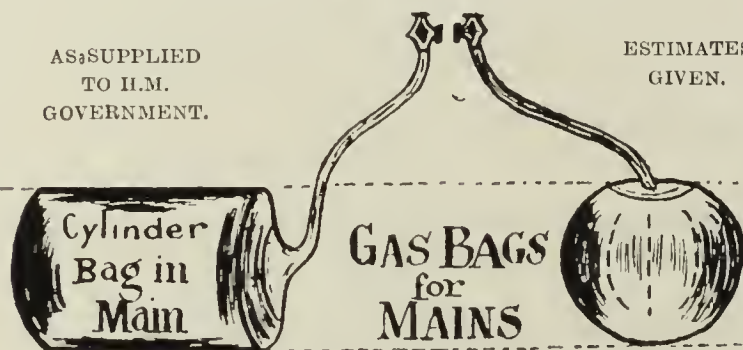
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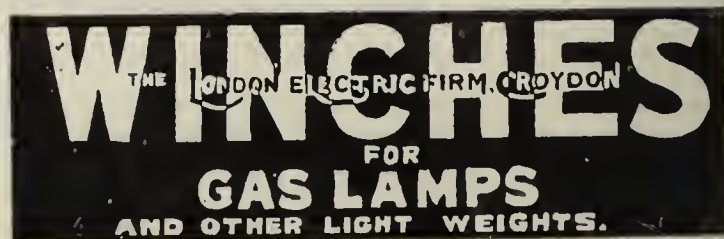


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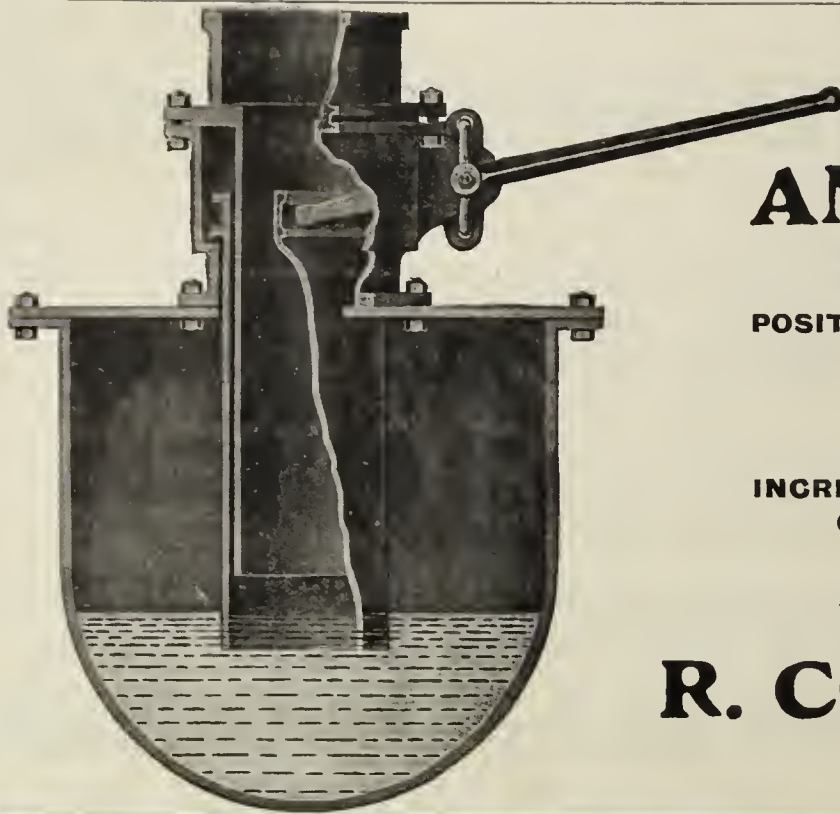
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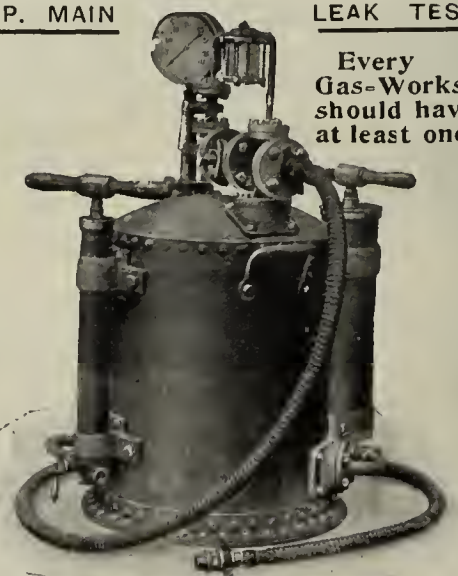
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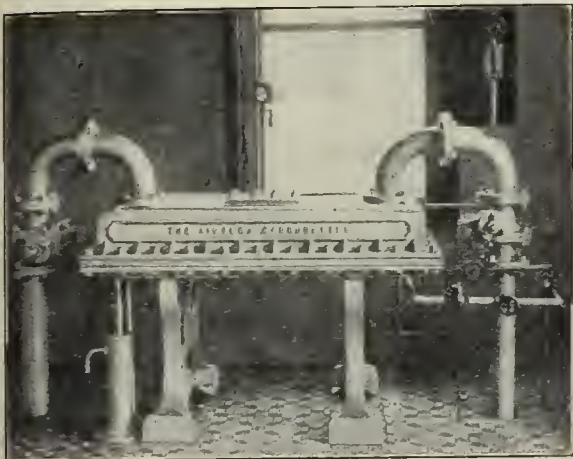
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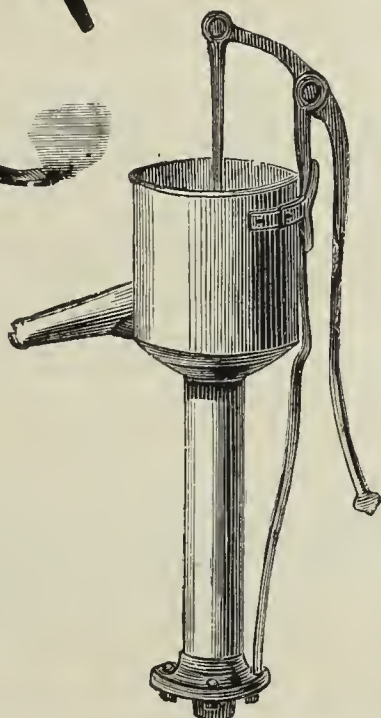
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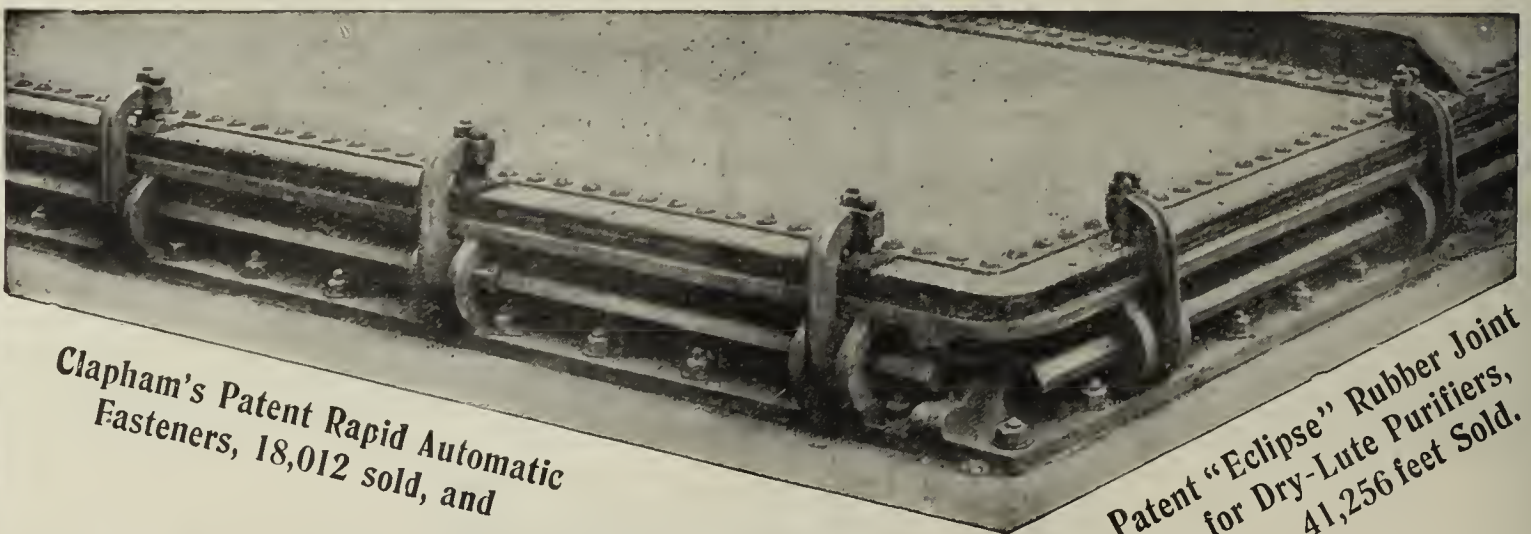
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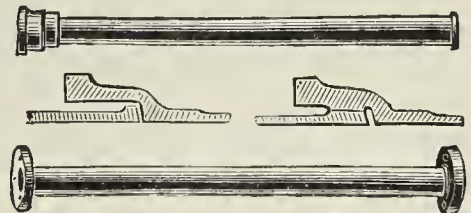
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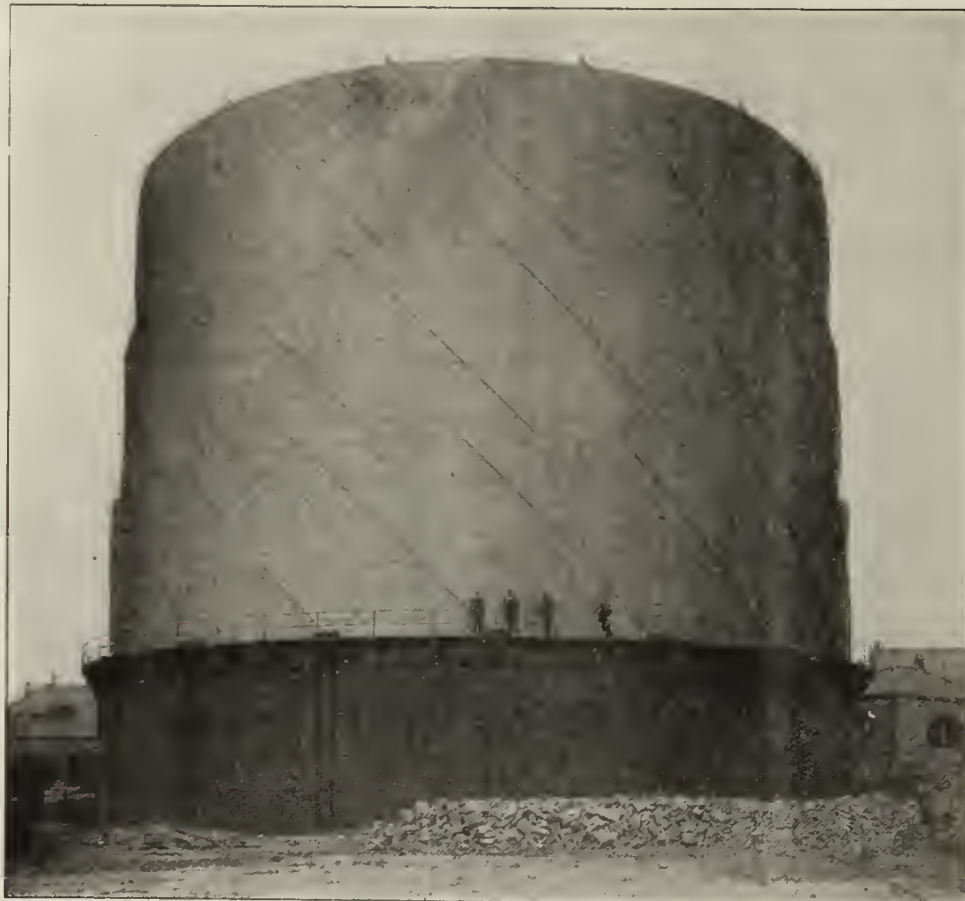
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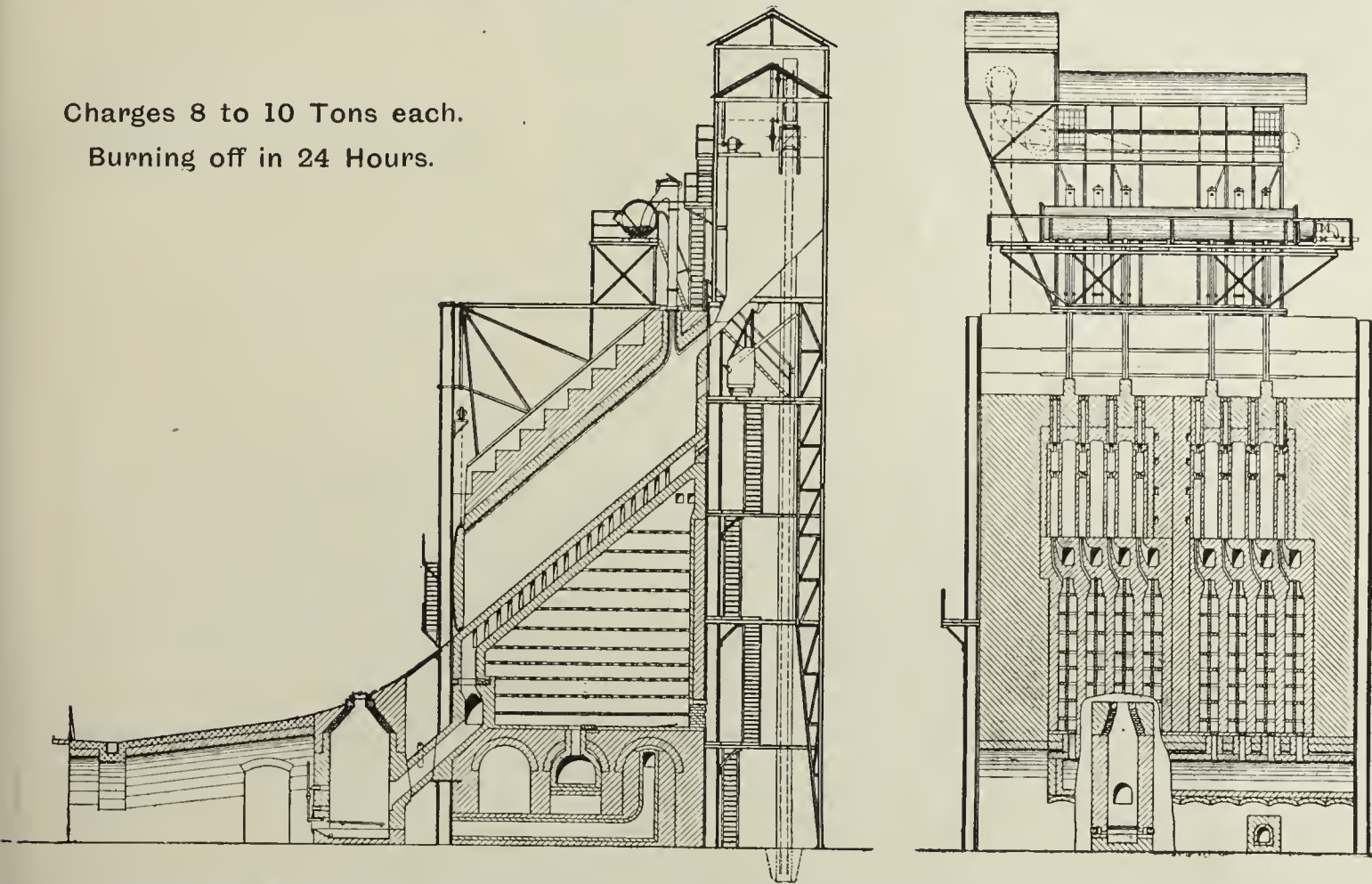
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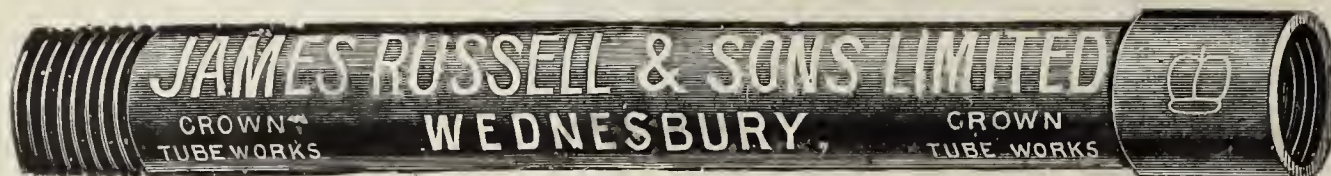
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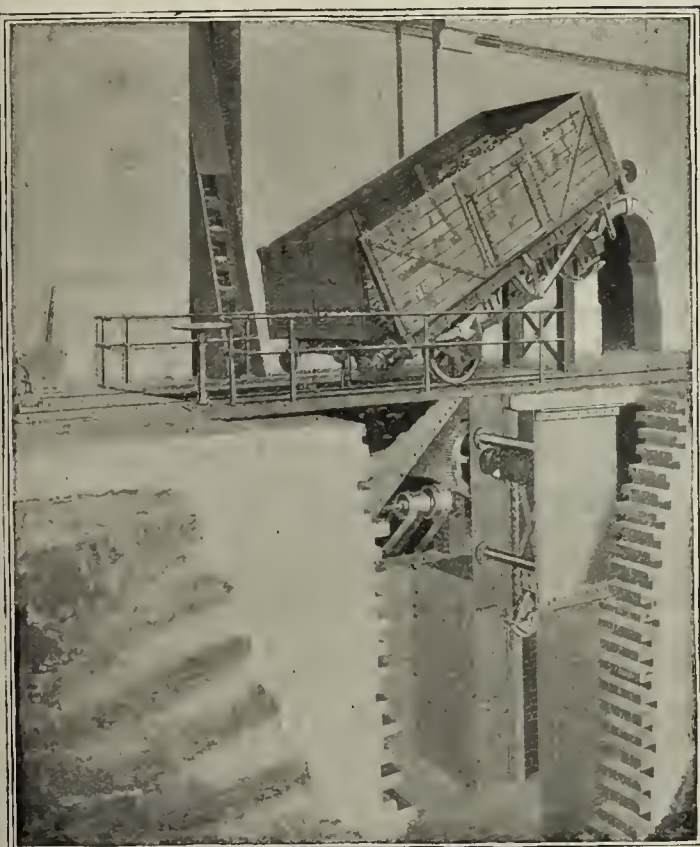
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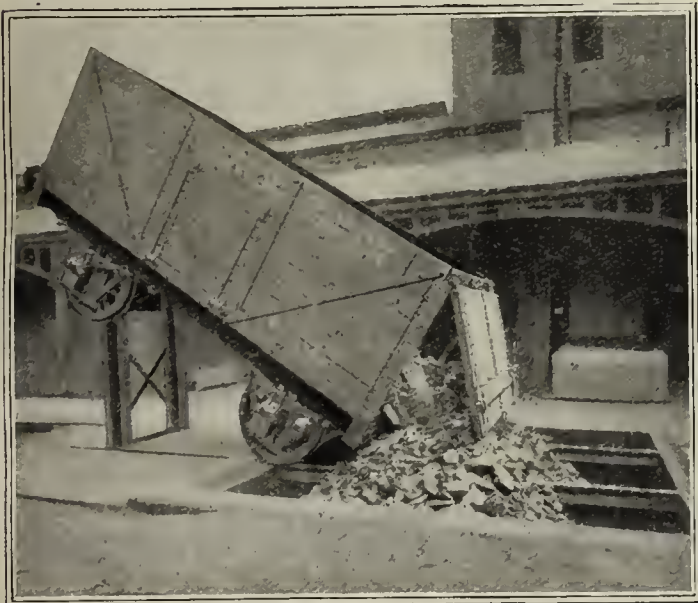
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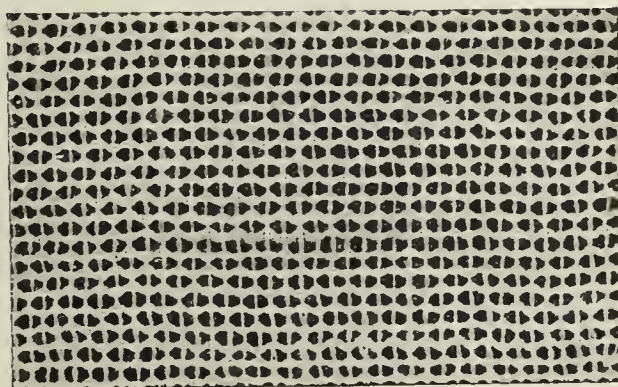
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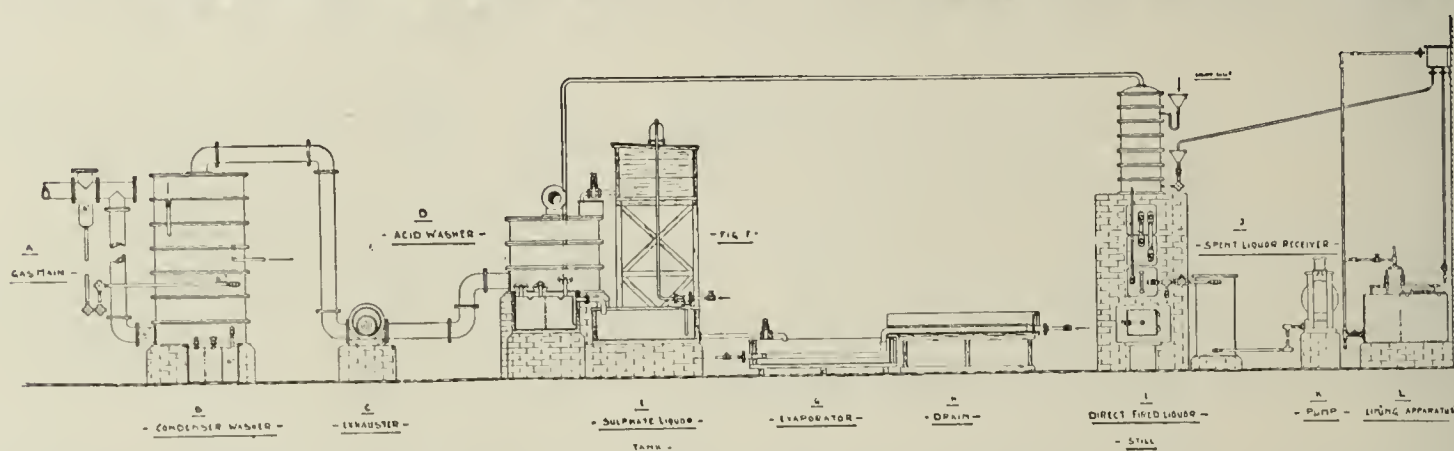
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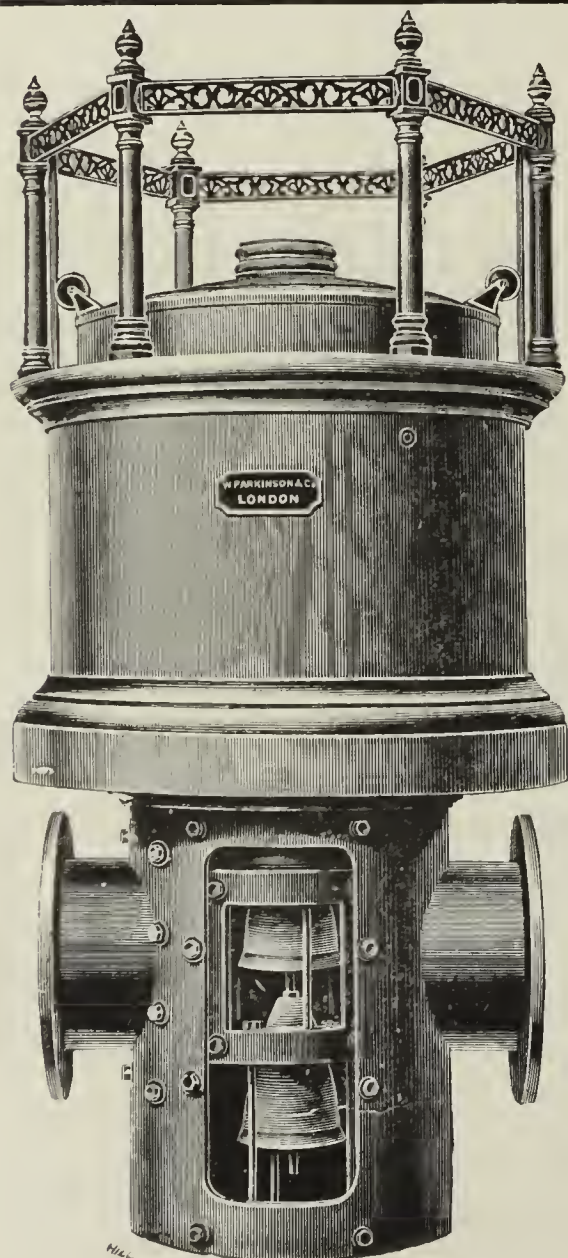
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EDITORIAL NOTES—GAS, &c.

Policy and Changing Circumstance.

ANNIVERSARIES have a way of stirring up more or less pleasant recollections. A fact of historical interest with which the Governor of the Gaslight and Coke Company (Mr. Corbet Woodall) commenced his address at the meeting last Friday may have caused some of the older proprietors to cast their minds back, and to pass through, in lightning review, periods when prosperity was not for the Company at high-water mark as reckoned in the industry. But the thoughts of any who made such retrospect were again hurried back to the present by the Governor's voice relating the causes that have contributed to the production in these days of a condition of prosperity never before attained by the Company. The historical fact with which he opened his address is that the Company are within a few months now of completing a century as a statutory concern. The application for an Act of Incorporation that was successfully made by the pioneers of distributed gas supply was lodged in the year 1810; and the Company were at work under the Act before the Royal Charter of Incorporation was granted in April, 1812. The Company have had a great and prominent part in the history of the gas industry generally; but if we take only into account the record of the undertaking in its commercial relations with London, then it can be said that the closing years of its century of statutory life have seen an unprecedented development of its affairs and of its services to the consumers. It is a case in which age has, by the application of administrative acuity, revealed an enormous amount of latent vitality, and the vitality has been energetically put to use to the advantage of a considerable section of the people of London, of the proprietors and workers of the Company, and of the undertaking itself. As a matter of fact, there has, in the last few years of the century's work, been created practically, or at all events largely, a new business for the Company, and a business of such a varied order that the long years which preceded, and which form the foundation of the present, seem years that are best forgotten for their inefficiency and crudity. Yet in the part of those years within our own compass we used to talk, from the then point of view, of the stability and prosperity of the gas industry; but the causes that then justified the statement appear in paltry light compared with the causes that justify to day the similar expressions. The point of view has changed, and (what is more) is still changing, and opening up fresh prospects to the eye.

The beneficial changes, however, that have occurred, and are still occurring, cannot be expected to have in all directions a perpetual full flow; and proprietors must anticipate this. The same changes, too, carry new responsibilities and new obligations; and these, too, proprietors must realize. Let us instance just one or two, as found in the Governor's address on this occasion. He called attention to the fact that the cost of meter and stove repairs continues to grow with the number of the consumers. But it is, he added, a matter for regret that there is, in relation to the past half year, a reduction of £10,000 in the cost of fittings, as it indicates a falling off in the rate of increase in the number of prepayment consumers connected. In the half year to June, 1910, the number was greater by 6000. "While it" would be foolish to generalize from the experience of "one half year, yet this fall does remind us that there is" a limit to the number of possible prepayment consumers "in our district, immense though it be. It also justifies the" policy adopted by the Directors, of acquiring the undertakings of neighbouring small companies, and so obtaining "fresh fields for the enterprise of the Company." This emphasizes the fact that the change introduced by the prepayment meter into the business and circumstances of the gas industry cannot always be expected to be maintained at the higher recorded points in producing new business; but the diversity of the gas business, and the new openings that

ever and again disclose themselves, to a very large extent neutralize any decline in the rate of expansion in any one direction. This, however, is a matter for the proprietors to realize—that productive change cannot always be expected to be sustained at the recorded maximum yield, and that with changes policy must comply.

A point may be instanced where change necessitates the application of a policy different from that which formerly obtained. With all the prosperity of the gas industry, there is greater need to-day for a good accumulation of funds in hand. There are changes that have come over the scene which make certain conditions that play an important part in the prosperity of the gas industry more sensitive than formerly; and if the conditions are adversely influenced, the position of a concern might be seriously affected if it—more particularly such a huge concern as the Gaslight and Coke Company—had not a good financial backbone. Some of the proprietors of the Company have thought that to carry forward a sum of £699,350, with prosperity at full tide, is unnecessary, and that a portion of it might be distributed as dividend. The Directors could not so dispose of it if they would, without exercising the condition precedent of making a reduction in the price of gas. It was only a few weeks since that the Governor and others satisfied a Committee of Parliament that, in view of the extensive operations of the Company, it would be most unfair to limit the carry-forward, as is now becoming the practice, to a sum equal to a year's dividends. A very substantial sum in hand (in one place or another) is more necessary than ever, owing to the ramifications and character of the business, as well as to certain readily fluctuating conditions that have their bearing upon the degree of success. Without such reserves, there is the ever-present risk of having to alter the relations of the Company and the consumers, and of putting a spoke in the wheel of progress, by raising the price of gas. The conditions of labour in the coal market are now such that never for any long period can the gas industry rely on constancy in the price of coal. It so happens that, in respect of the net cost of coal, gas undertakings—the Gaslight Company among them—have recently been in an abnormal position. Contracts for coal have been entered into by the Company at somewhat lower prices than ruled last year; and at the same time the markets for the secondary products are maintaining an unusually good tone, especially having regard to the fact that this applies more or less to all residual products. What reliance, however, is there that these conditions will be maintained? Coal contracts are now running at the lower price; and everything looks favourable in regard to residuals. Nevertheless, coal may rise in price; residuals may descend. Who can tell? Therefore the need for giving a good breadth to a gas undertaking's financial policy in these days. At the same time, the Governor expressed the confidence of the Board that further reductions in the price of gas will be taking place in due course; and then the proprietors will further benefit through their dividends, with an appreciation of the market values of their stock.

All this, however, goes to show how, according to the circumstances of a concern, administrative policy must undergo revision, in order to meet changes in business and condition. Old-fashioned habiliments will not always serve adequately; and had the Board of the Gaslight Company, under their new leader, not realized this a few years ago, the concern would probably have been still lumbering along with a smaller business, a heavier price to the consumers, a lower dividend, and a market price for the ordinary stock at below par. Those proprietors who, having already tasted improved dividends, are asking for more, should recognize that the existing Board require no urging to do the right thing; and the past few years claim for them the knowledge as to what is the correct course to take. The speech of the Governor shows how prosperity has been accruing under the new policy. Less capital is employed per ton of coal carbonized, less money is required per ton for interest and dividend, yet a higher dividend is paid, the consumers have had within easy recollection four penny reductions; the 4d.

representing £400,000 a year on present consumption. Further, more gas is made per ton of coal carbonized; the works have been very largely modernized; and economies in working have been achieved that have made an extraordinary impression on results. The consumers are responding to the benefits they have received by an increased use of the cheaper gas. But the outstanding illustrative feature of the Governor's address is that policy, like most other things, must be modernized as occasion demands, in order that it and changed technical and commercial conditions may not be antagonistic.

Gas Workers and National Insurance.

DURING the past week or so, the agitation among London gas workers for obtaining exemption from the National Insurance Bill in respect of sickness, where it can be shown that "the terms of the employment are such as to secure" provision in respect of sickness and disablement on the "whole not less favourable than the corresponding benefits conferred by the Act," has been prosecuted with vigour. What offends is, as we have before pointed out, that under the present sick funds and methods of administration, in connection with their employment, the monetary benefits are greater and the expenses are less than they would be under the terms of the proposed Act. This was recently illustrated by Mr. Charles Carpenter (*ante*, pp. 91, 120), as well as by Mr. Charles Hunt in a tabulated statement circulated at Friday's meeting of the South Suburban Gas Company. The matter, however, is essentially one for the workers; but the information to hand shows that the Boards of the Gaslight and Coke Company, the South Metropolitan Gas Company, and the South Suburban Gas Company are backing up (as may be the boards of other companies) the views of their men in this regard. And it is right they should do so; for in times when the tenets of Socialism are spreading with such rapidity among some sections of the country's workers, it is refreshing to see several thousands of gas workers moving for the defence of their existing conditions as against new State-designed conditions. As Mr. Corbet Woodall said in his speech to the proprietors of the Gaslight and Coke Company last Friday, this shows the employees' "appreciation of the fact that their interests, both in regard to provident funds and in other directions, are carefully safeguarded by the Board." The London gas workers have a long experience of the safeguarding of their interests in this particular—in the case of the South Suburban Company, Mr. Hunt was saying on Friday, extending to 31 years, and the period may be longer in respect of the larger companies.

This is a very flattering sign. But what is being actively done? The employees of many concerns may be at work, trying to obtain "exception" under the condition laid down for local or other public authorities, as quoted at the commencement of this article; but special measures are being taken in certain cases. The Governor of the Gaslight and Coke Company, on behalf of their men, has addressed a letter to the Chancellor of the Exchequer, asking whether it is possible that they may be left outside the purview of the Act—the Company guaranteeing the solvency of the funds. The South Metropolitan Company's men have been taking very active steps. Members of a Committee of the employees have sought, in the lobbies of St. Stephen's and elsewhere, interviews with Ministers and Members of Parliament so as to enlist their sympathy. In all cases they have been given a hearing, and, in the main, the members interviewed have agreed that such cases as theirs deserve exceptional treatment. The South Suburban Company's men have been doing the same thing. As a result of the representations of the workers of the various Companies, Sir Henry Kimber, Sir Fortescue Flannery (who is a Director of the South Suburban Gas Company), and Mr. R. J. N. Neville (who is a Director of the Brentford Gas Company) are giving notice of amendments, with the view of endeavouring to realize the desire of the men, who naturally prefer their present conditions to the State proposals. But the South Metropolitan men have gone farther than this. They have sought and obtained an interview with one of the officials at the Treasury, acting as the representative of the Chancellor; and the men, headed by the Chairman of the Company (Mr. Carpenter), had this interview last Wednesday. It is hoped Mr. Lloyd George will, as a result, see the reasonableness of the case that his representative had put before him, and act accordingly.

Instead of continuing to operate independently in this matter, why should not the workers of the various Gas

Companies unite in some way? They could make an impressive showing standing alone as the workers of a single industry, although there are other big interests in precisely the same boat. We see, for example, that at the meeting of shareholders of the London, Brighton, and South Coast Railway the other day, the Chairman said he feared that the insurance scheme, if it passes in its present form, would add a heavy burden to the expenses of the Company; while to the staff, or a large proportion of the staff, it was doubtful whether the benefits would prove as advantageous as those they now enjoy. This helps to show how widespread is the existence of funds that are superior in their effects to the Chancellor's scheme. There is no objection whatever to making provision against sickness compulsory; but there is an objection to worsening the position of a whole army of employees in order to place in a better position those workers who are not in the enjoyment of the same privileges. Surely the latter can be legislated for in some way without reducing the former to an inferior position. This is not by any means a party matter; it is a question of justice. Therefore we echo the words to which Mr. Hunt gave utterance on Friday, to the effect that, if any gas proprietors can assist the employees in this matter, by bringing pressure to bear in any quarter in which they may have an interest, they will be doing a service to them.

Calorific Power, Unit of Light, and Other Matters.

THE sketch of the proceedings at the Conference of the International Photometrical Commission at Zurich that appeared in our columns last week, indicates that there were certain matters of current practical importance under the consideration of the delegates, and one of them especially so at the present time to this country. This had reference to the looming question of the suppression of the illuminating power standard and the substitution of a calorific power one. Any expression of opinion that is unanimously concurred in by the delegates forming a Commission international in character, as is this one, must carry an influential amount of weight. This being so, it must have given pleasure to the two representatives of British gas interests who are accredited by the Institution of Gas Engineers—Dr. H. G. Colman and Mr. W. J. A. Butterfield—to have heard the deliberate and unanimous opinion of the Commission that the test of the illuminating power of luminous flames has lost all importance under modern conditions, and that for the evaluation of gas to-day a test for calorific power should be substituted for that of illuminating power. This distinctly shows that the International Commission disapproves *in toto* of any dual test for gas. Everyone who has made a study of latter-day developments of the gas business must now be convinced of the absurdity of the retention of a test representing a standard of quality valueless in relation to the uses of gas. The Commission did not go the length of suggesting what, quantitatively, the calorific standard should be. It is a matter beyond their province, and an impossible thing for them to essay. Local conditions, methods of carbonization, the characteristics of the coal used, and other matters must all be factors for consideration in the determination of a standard; and therefore it must be left to decision in each country, and in every individual case in each country—the same as the illuminating power standard has hitherto been determined. However, the resolution that was passed was the matter of importance; and the expression of opinion will be welcomed as highly satisfactory and useful.

Touching this question, Dr. Colman invited some further expression of opinion from the Commission as to whether calorific standards should be "gross" or "net." In this country, though the only example of a statutory calorific power standard is represented by the "net" value—that is, the Gaslight and Coke Company's standard—expert opinion, we think it may be confidently said, inclines to the "gross" value. The time will soon be expiring when the Gaslight Company will have the right to claim the consideration of the revision of the terms under which their gas is at present tested; and it is to be hoped that attention will be given to this particular point among others. Bearing upon this, there is a significant statement in the Notification of the Metropolitan Gas Referees, which indicates that, in that influential quarter, the "net" value is not regarded as of importance. The passages to which we refer are these:

The maximum calorific power which gas can thus exert is determined directly by the calorimeter. This is a true measure of the total heating power, and is termed the gross calorific power of the gas.

But in many cases in which gas is used as a heating agent, the steam which is formed escapes into the air uncondensed; and thus the heat due to the condensation of the steam and the cooling of the water so formed is not utilized. The amount of heat thus lost can be estimated; and if it is subtracted from the total heat yielded by the combustion of gas in the calorimeter, another value is obtained which is termed the net calorific power of the gas. Since, however, when steam escapes uncondensed, the uncondensable products of combustion also pass away at a high temperature, and since the loss of heat thus arising is commonly the greater of the two, *the customary partial correction from gross to net has not much significance.* [The italics are ours.]

From which it is plain the "net" value does not find sympathizers in the Metropolitan Gas Referees.

However, to return to the proceedings on this point at the sitting of the Photometric Commission. It may be said that all countries, excepting France, are favourable to the "gross" value being taken as the standard. But, as the representatives of France at the conference were of the contrary view, Dr. Colman (seeing that on this occasion a unanimous vote was not possible) withdrew his suggestion. It is only a question of detail. On the fundamental point as to calorific value being the rational standard and not illuminating power, it is something gained to have the unanimous judgment of the Commission. But this particular "detail" will most probably be brought up again. It is a legitimate matter for the Commission to deal with; and our friends in France may in the meantime be asked to give it further consideration, and to take a very broad survey. If they do so, they will find, as we have said, much expert opinion in this country in favour of the "gross" value being taken. Mr. Butterfield—one of the British delegates—we remember long since, spoke in its favour. Germany has oftentimes given evidence of the preference that exists there for the gross value. America, in its calorific standards, has adopted the "gross;" and so we go on. France at the moment appears to occupy in this respect a solitary position. We hope this state will be changed, on reconsideration, by a transference of opinion from the "net" to the "gross," so as to offer a solid international agreement on the point.

The subject of an international unit of light was also discussed; but we are not yet to be allowed to give the candle the nominal distinction of being "international." On behalf of the British gas industry, Dr. Colman and Mr. Butterfield pressed for the adoption of the candle as the international unit. But Germany and Austria decline to adopt it; and so the term "international" has to fall. England, France, and America are favourable to the candle as the standard unit; and therefore the Commission have made a real advance in assisting in bringing three nations which formerly had different units to adopt a common one. This, in effect, means that four pre-existing units have been reduced to two—the candle and the Hefner unit, between which there is the simple relation of 0.9 candle being equivalent to 1 Hefner unit. It would, of course, have been a distinct advantage to have obtained an international unit of light; but the impossibility at the moment cannot be helped. The reduction achieved in the number of units, however, brings us nearer than before to a united front in this matter. As to the prospects, we are not sure that the German electric lamp makers would not prefer to have the candle as the unit, inasmuch as, the ratings on their lamps being at present in Hefner units, a lamp marked (say) 16 Hefner units bears a poor contrast in illuminating power to one rated and marked 16 standard candles. Similarity of rating, with a difference in illuminating result, has the tendency to bring their productions into disrepute. Connected with this subject, the inapplicability, under the circumstances, of the term "international" candle, led to discussion as to the application of the descriptive terms "normal," "standard," or "*décimale*." But no agreement was arrived at; and in this country we shall be quite content to continue using the term "standard candle."

A general point to which consideration was also given at the Conference had reference to the raising of the number of accredited representatives from each country, in order to give greater assurance of the attendance of delegates from time to time who are cognizant of the work of the Commission. It was considered desirable; but the voting power of each country is to be represented by one. Another interesting point was the application on behalf of German electrical institutions for admission to the Commission; and on this point it was resolved to welcome them when matters of mutual interest are under consideration.

In another part of the "JOURNAL" to-day, extended notice is made of other portions of the proceedings not dealt with in the general reference of last week. From the account

presented, from the foregoing comments and those made last week, together with the important paper by Messrs. Butterfield, Haldane, and Trotter, it may be said that the proceedings at the Conference must be voted as being of considerable technical value.

Competition of the Diesel Oil-Engine.

THERE are some people who think the large amount of attention that is being devoted to the Diesel oil-engine in technical circles is a tribute as much to brilliant commercial energy as to any distinctive merits that this type of oil-engine possesses. Whether this be so or not, the fact remains that the engine has obtained considerable investigation at the hands of men of good technical position; and it has already received a very fair amount of adoption. Moreover, it has induced research into the question of its fuel supply on the part of our friends at the Karlsruhe experimental works of the German Gas Association, as mentioned a fortnight since. It is in the direction of this fuel supply that the gas industry has a limited interest in the development of the engine. The industry would prefer to be left without further competition with town gas for power purposes. But such preference will not stay developments of the kind; and therefore the situation must be accepted, and the best use possible be made of the fact that gas oil tars and the tars from vertical retort working that contain little naphthalene and free carbon form one of the sources of fuel for these engines, if the price permits of their use in comparison with the several other available fuels.

But we do not entertain any opinion that the Diesel engine will form a serious competitor with town gas, where this is cheap, for power purposes. It must always suffer the disadvantage in the eyes of the manufacturer, in comparison with town gas, that the fuel has to be purchased, then conveyed to his works or factory, and there stored, besides which there is the attendant labour involved in feeding and so forth. In this respect, it is very much like suction or pressure gas plant; and it is with such plant that it will be the strongest competitor. But if business for suitable tar can be developed with the users of such engines, as business is being developed in coke supply for suction-gas plants, as between these two methods of power production the gas industry must stand upon neutral ground—regarding at the same time both as competitors with town gas. There is another respect in which the Diesel engine bears a strong resemblance to the suction or pressure gas plants, and to its disadvantage in comparison with town gas, and that is it appears to require a fair amount of attention in order to keep its working parts clean. The very nature of the fuel used suggests that this must be so; and there is confirmation in a paper which Mr. F. Schubeler read before the Institution of Mechanical Engineers, at their recent meeting in Zurich, although he stated, on information received, that engines had worked for six or eight weeks without interruption, even in cement factories, and in mills. We have nothing at hand authorizing any contradiction of this. But just as one swallow does not make a summer, so isolated examples may not represent the rule. But given the ordinary rough working conditions under which all engines are operated in many places, we can quite conceive that the Diesel engine, having regard to the characteristics of the fuel used, may exact more cleaning than town-gas driven engines through carboning up, trouble with dirty valves, and so forth. The paper of Mr. Schubeler (which we print in this issue) is of interest in the information it contains as to the disadvantages and advantages of the engine as the author sees them; and it also points to the lines of future development. It is of importance that gas engineers should be kept advised as to developments which produce new competition, or which offer a new line for business.

However, there is something more than mere fuel economy for the manufacturer to consider in making choice of the means of power that he requires. But there must be protest against any unfair comparisons for his guidance. In the paper before us appears this statement: "It has also been ascertained that two-cycle gas-engines show an increased fuel consumption at partial loads; whereas the two-stroke cycle Diesel engine has, with smaller load, consumptions which only differ slightly from those obtained by normal load." The layman on reading this sentence might possibly imagine that the difference was considerable; whereas (whatever the consumption difference may be with the Diesel engine as between normal and partial load) the fact is that the difference proportionately between

normal and partial load is only small in the case of the modern gas-engine. However, the efficiency stated for the Diesel engine is good; and there is still room for development in this regard. The fuel costs per kilowatt hour as quoted by the author towards the end of the paper are also low. But as we have submitted, fuel costs do not comprehend the whole of the expenses in running this type of engine. On the other hand, the latitude given to users of the engine by the variety of the sources of fuel supply is an undoubted advantage.

From all considerations, it seems clear that the competition of the Diesel engine will be chiefly with power competitors employing solid fuel. Shipping is a large user of solid fuel for propulsion purposes; and interest is awakened in the engine under notice becoming the possible channel of one of the big ship-engineering developments of our times. Lord Furness called attention to the matter a few days since at a meeting of Furness, Withy, and Co., Limited, who have given the first order for a cargo vessel to be fitted with the new type of engines. Lord Furness is known as one of the business captains of the North; and bringing his keen and trained penetrative powers to bear upon the capabilities of the engine, he is sufficiently persuaded as to the genuineness of the foundation for the claims (though he will not certify the accuracy of the latter until he has put them to thorough test) to entertain a strong belief that there lies in this invention the prospective means of revolutionizing the methods of propulsion in shipping. Here are the reasons for his belief in the economic applicability of the system for the propulsion of ships. The distribution of oil is at least as wide as that of coal. Its manipulation is easier; and the dangers are not in any degree greater. The weight of fuel is but a fifth part of that required for a first-class steam plant of equal horse power; and ton for ton less stowage space is required. Oil, too, can be handled through pipes with a minimum of labour. There will also be a saving in space of boilers and condensers. These are obvious advantages; the mechanical ones are to be yet tried for this particular work. It is befitting the position of a firm of the standing of the one presided over by Lord Furness that such experiments should be made by them, in the cause of the world's progress.

A High Sulphate Make at Lower Sydenham.

The South Suburban Gas Company have had an excellent half year; and the Chairman (Mr. Charles Hunt) had therefore a good tale to tell the proprietors at their meeting in the new Livesey Memorial Hall [described elsewhere] at Lower Sydenham last Friday. It must be the Company's best year in financial result on record. The consumption of gas, compared with the first half of 1910, increased by 5.01 per cent., and 3.65 per cent. of this was increase outside the Festival of Empire Exhibition at the Crystal Palace. The work that the Company have done at the Palace has, by the way, created a great amount of interest in technical circles, and among public lighting authorities. For what has been done there, and in connection with the Company's business generally, the Chairman awarded praise, without stint, to Mr. S. Y. Shoubridge, the Engineer and Manager, and his staff. The co-partners of all kinds are to share in the fruits of prosperity. The price of gas goes down to 2s. 4d., the proprietors will soon be entitled to a dividend at the rate of £5 16s. 8d., per cent., and the employee co-partners will receive another $\frac{1}{2}$ per cent. bonus (making 7 per cent.) upon their wages. All residuals stood well by the Company during the half year; and commendation was paid to the Sulphate of Ammonia Committee for the work they are doing in connection with this secondary product. In dealing with the matter, a very striking sentence fell from Mr. Hunt. It was this: "I am sure you will agree that Mr. Shoubridge and his assistants deserve well of this Company when I tell you that the increase during the last two years in the quantity of ammonia recovered per ton of coal carbonized, represents an annual value to the Company, at present prices, of about £2000." Perhaps, if he had not been modest, the Chairman might have gone a little farther than this; but the statement is sufficiently remarkable. If we look into the working results, it is seen that in the past half year 782 tons of sulphate were made; and we calculate that this averages 27.3 lbs. per ton of coal carbonized—a high average indeed. Why is it that the make at Lower Sydenham is from 5 to 8 lbs. per ton of coal in excess of certain other concerns whose accounts have been examined as the result of Mr. Hunt's remark?

Good and Bad Experiences at Brentford.

The Brentford Gas Company have been proving that expenditure on reconstruction is an excellent investment, when parts of the works have run down to a point that does not conform with present-day efficiency. The work that Mr. Alex. A. Johnston, the Engineer and General Manager, took in hand for the Company a few years since is paying for itself and to spare. While the changes were proceeding, the Company were not in a position to do much for the consumers; but energy outside the works as well as inside meanwhile so developed business that twelve months ago the price was reduced 2d., and there is another 2d. coming off at Michaelmas, when the consumers will be receiving gas at 2s. 5d. They are now benefiting considerably from the work that was taken in hand. There was another matter to which the Chairman (Mr. Ulick J. Burke) called attention at the proprietors' meeting on Wednesday last; and it is one upon which the Directors and the proprietors feel very sore. It is really a monstrous thing that a statutory company such as this should be put to a double, and each time heavy, expense in defending the same statutory rights in Parliament. In a recent session, the Greater London Railway scheme was promoted; and the authors of the project, apparently indifferent to any interests but their own, proposed to cut right through the Southall works of the Company, which have been developed on lines to serve the present and future requirements of the supply area. They were at the time defeated, but at considerable expense to the Company. Again they came in the present session, seeking similar power; and again the Company defeated them, but once more at considerable expense. It is a strange condition of affairs that enables this sort of thing to proceed, and repeatedly involve a statutory company of this kind in expense of such a character in defending the powers that the Legislature has granted them, and which expense is really so much loss to the consumers. If there is any consolation to be derived from the fact, the proprietors of the Brentford Gas Company will have learned with satisfaction of the complete rejection of the scheme last Thursday by the House of Lords Committee who had been considering it.

An International Miners' Congress.

A large number of resolutions were passed by the International Coal Miners' Congress during their sittings in London recently; and presumably the different delegates will have returned home satisfied with what has been accomplished in this way. The establishment of a minimum wage was favoured; and it was agreed that the mineral wealth of the land belongs to the nation, and should therefore be worked in the interests of the community. Another motion passed, which was submitted by Great Britain, called for legislation to increase the safety of mines; it being pointed out that, in spite of the advancement of science, the number of fatal accidents in coal mines was on the increase. Mr. A. Stanley, M.P., remarked that a very important measure dealing with this question had been introduced by the Home Secretary; and before this became law the miners' representatives would insist on the supreme necessity of certain safeguards. Among these was an adequate inspection of mines, an improvement upon the means of ingress and egress at present in force, and a better system of mine ventilation. Another danger had resulted from the introduction of electricity into the mines. In his assertion that at least one of the most appalling of recent coal-mine accidents was due to electricity, he was supported by the best opinion of the country. On the suggestion of the German delegates, it was agreed that "the length of the shift of all the workmen employed in the mining industry on the surface or underground should be reduced by law to eight hours from bank to bank. In very hot and wet places, the length of the shift should be six hours at the most." Several resolutions affirming the principle of miners' pensions for old age and invalidity were passed, as was one demanding improved housing accommodation and the passing of legislation to prevent the eviction of "workers" from their houses during an industrial dispute. More serious matters than some of those already mentioned were considered towards the close of the congress. One resolution which was referred to the International Committee expressed the opinion "that the regulation of production is desirable, and that, in order to achieve it, it is expedient to employ every means at the command of the Miners' Unions, and especially the national strike in case of necessity. The arguments advanced in favour of this proposition were (1) that there has in recent years been an

enormous increase in production of coal, and when the output is greater than the consumption, and stocks accumulate, wages are reduced and strikes encouraged, because they tend to reduce output; and (2) that when a strike occurs in one country, the owners in the other countries increase their output in order to send coal to the strike area. In the course of the discussion, one of the South Wales delegates remarked that Welsh coal used to find a good market in the North of France; but it had been driven out of that country by the Westphalian Syndicate, at a price at which they could not get the coal to the pit's mouth in South Wales.

Some Mining Statistics.

In connection with some of the business transacted by the congress, notice may be taken of the subsequent issue of Part I. of the Annual General Report on Mines and Quarries for the year ending Dec. 31, 1910 (which is signed by Mr. R. A. S. Redmayne, the Chief Inspector of Mines). During the period referred to, the total number of persons employed in and about all the mines of the United Kingdom was 1,078,083, of whom 1,049,407 worked at the 3253 mines under the Coal Mines Act. This, compared with 1909, is an increase of 35,409 persons. Just over 80 per cent. of the total number were employed below ground. The total output of minerals at the mines under the Coal Mines Act was 278,609,949 tons, of which 264,417,588 tons were coal, 2,484,069 tons fire-clay, 7,979,750 tons ironstone, 3,130,280 tons oil-shale, and 598,262 tons sundry minerals. Adding 15,440 tons from open quarries, the total output of coal was 264,433,028 tons, which is an increase of 658,716 tons over the previous year. Scotland shows a marked increase of output (1,566,767 tons); it being pointed out in the report that the introduction of the statutory eight-hours working day would have little adverse effect on the producing power of Scotch collieries, as what was practically an eight-hour day had been universal in the East of Scotland for some years prior to the passing of the Act. A large increase in the output of the York and North Midland district (2,896,148 tons) is accounted for by the extension of the industry eastwards in Yorkshire, where new coal areas are being opened out. In South Wales, a substantial decrease (1,663,955 tons) is chiefly accounted for by the stoppages of work which took place at several large collieries owing to disagreements relating to wages questions. Then a large reduction of output in the Northern coalfield (amounting to 2,836,016 tons) is largely due to the stoppage of work at a number of collieries during the early months of the year, consequent on difficulties arising from the re-adjustment of shifts under the Eight Hours Act. The average output of minerals at mines under the Coal Mines Act was 328 tons per person employed underground, or a decrease of 12 tons on the previous year. At these mines there were during 1910 1242 separate fatal accidents, causing 1775 deaths, or 322 more deaths than in the preceding year. Compared with 1909, there was also an increase of 5736 in the number of persons injured in the mines. The death rate in 1910 of the underground and surface workers as a whole was 1.69 per 1000 persons employed, as against 1.43 in the preceding year. The total number of deaths from accidents at mines under the Coal Mines Regulation Acts, adds the report, is the highest yet recorded in any one year. The ratio of deaths per 1000 persons employed is, however, the proper criterion of comparison to adopt; and we have to go back to the year 1890 to find a higher death rate from all causes underground, when the figure was 2.09 per 1000, as against 1.91 last year.

Personal.

At the last meeting of the Southampton Town Council, the names of the three candidates selected by the Water Committee out of 77 applicants for the position of Water Engineer were submitted; and, in the result, Mr. E. C. RODDA, B.Sc., of the City Engineer's Office, Sheffield, obtained the appointment.

A pleasing incident followed the business proceedings at the half-yearly meeting of the Runcorn Gas Company last week, when the Chairman (Mr. Frederick Rigby) presented to Mr. J. R. FRITH, the Engineer and Secretary, three beautiful fruit-dishes of silver gilt, bearing the following inscription: "Golden wedding, June 20, 1911. Presented to Mr. and Mrs. J. R. Frith, as a mark of esteem, by the Runcorn Gas Company."

The death occurred on Monday last week, at his residence in Lisburn, of Mr. JOHN STEVENSON, who was Chairman of the Lisburn Gas Company before the transfer of their undertaking to the Urban District Council. Deceased was upwards of eighty years of age.

ELECTRICITY SUPPLY MEMORANDA.

Business Getting—Sankey on Canvassing for Small Concerns—Future of Electricity Meters—Wonderful Heating Novelties—Bearing Electric Burdens at Newcastle-under-Lyme—Provisional Orders.

APART from the work of the Electricity Publicity Committee, electricity undertakings throughout the country are, generally speaking, individually doing more in connection with canvassing and publicity, or at all events are considering the question of greater activity. But some of the administrators of these undertakings are said to have little ideas in the matter, which make it all the better for the gas undertakings. Of this, however, they may be sure, that whatever they do in this direction the managements of gas undertakings will keep their eyes upon them, and will not be very long in at any time going one better. The little notions as to what is desirable of some managements of electrical undertakings—not by any means of all—is considered by certain contemporaries to be a fit subject for badinage instead of mercurial sympathy. The Hammersmith Borough Council last year were frightfully prodigal. They spent as much as £50 on publicity literature! But their ideas are expanding this year; and they have just voted £300 for business development, which is to include the annual salary of the canvasser. Their "reckless" enterprise has brought down upon their highly developed commercial intelligences an amount of ridicule from certain folk who think that they occupy a place at the very base of the fount of wisdom. Surely the Hammersmith Borough Council know their own needs best; and they are of opinion that the sum in question will be sufficient this year in counteracting the "active methods pursued by the gas companies." The electricity undertakings are finding difficulties crowding in upon them. The popularity of high-pressure gas lighting, the growing popularity of the gas-fire and of water heating by gas—the recognition of the labour-saving ability of gas throughout the house on economical terms, from installation and maintenance to running expenses—are all obstacles to business-getting by the electricity supplier. It is to propagate knowledge of these things that the general publicity work and the private canvassing methods of gas undertakings are being pursued with vigour. Knowledge and experience of the utilities of gas, and advances in methods among householders and others, are the best barriers to effective results from the efforts of our electrical competitors, who are as much at liberty as gas undertakings to prosecute systems of business development, providing they refrain from the use of malicious slander with the view of damaging legal rights.

The smallest of gas and electricity undertakings can do something in the way of canvassing, and increase the load on the concern. Mr. W. Sankey, the Borough Electrical Engineer of Whitehaven, has in "Electrical Industries" been singing the praises of canvassing work for modest sized concerns. The £ s. d. side of the question is an important one; and small concerns cannot afford to keep a canvasser solely for the work covered by the title. What does Mr. Sankey do? He obtains the services of an intelligent man, who can canvass, fix and read meters, and (this is important) change the meters, and, in fact, do any work on the consumers' premises other than the laying of the service. That canvasser of multi-qualification creates his own work. Mr. Sankey has been going in for main extensions; and he employed a temporary canvasser, at 30s. a week, for nine-and-a-half weeks. His wages, and the requisite outlay for printing and stationery, came to £19 11s. 7d. Direct results do not appear to have been great as the result of this expenditure; but it was looked upon as the necessary cost of tilling the ground. Then the canvasser-craftsman was engaged; and from then to March 31 last the amount fairly chargeable as the cost of obtaining new consumers—30 on the new network, or 33 on the whole system—beyond the average of former connections on the old system for the same period, is £33 16s. 9d. This includes all the canvasser's time charged to consumers' premises account £22 9s. 2d., and printing, stationery, bill-posting, &c., £11 7s. 7d.—together £33 16s. 9d. Adding this sum to the £19 11s. 7d. previously spent on the work of the temporary canvasser, it will be seen that it makes a total of £53 8s. 4d. During the period covered, the revenue from the 33 consumers amounted to £54 17s. 3d.; so that there was only a balance of £1 8s. 11d. to pay for electricity and all the other expenses incurred in the supply. If the matter is looked at this way, and future business with the 33 consumers is of normal character (it is expected to get an average revenue of between £3 and £4 a year from them), and if the canvasser-craftsman goes on bringing in new business at the same rate (which we doubt now that the cream has been obtained)—well, Mr. Sankey proves the value of this sort of man to the small undertaking.

Electricity meters—to be, or not to be, is the oft-debated question. Managers of electric undertakings are often frothily talking of doing without them in the ease of small supplies. But as experience generally expands, it all ends in falling back into the old rut; and it is a case of "with all your faults, I [perforce] love you still." Mr. A. T. Bullen has been writing in one of our contemporaries as to the future of the electric meter. This is a big subject; and to deal with it properly, it is necessary to be prophetic. He neatly sketches the character of the meter in his opening lines; and it is virtuous. "To an electrical supply company," he says, "the capital expenditure on meters, the relatively high allowance necessary for depreciation on them, the losses incurred by their use, and the cost of maintenance, are very serious

items from a financial point of view." He forgot to mention their want of reliability, which sometimes means a serious piece of business from either the electricity supplier's or the consumer's point of view. Treating of the proposals to do without the services of meters by charging so much per light or per week, Mr. Bullen refers to restraint in the use of electricity where there is no check as being a lessening quality as time courses; and, like ourselves, he, we gather, harbours the belief that landlords are not going to be such fools as to take upon themselves the burden of being collectors for any electricity undertaking, and of being responsible for the money due by their tenants. Among the difficulties of charging without a meter, he points to the one that all classes in London (he might have added, and in large provincial cities and towns) keep much later hours than the people in some of the smaller provincial towns; and where a fixed sum might result in profit in a relatively small town, it is probable that considerable loss would be incurred at the same price in London. Again the cost of generating electricity would not in all places permit of a meterless supply to any dwelling at 6d. a week. For instance, it could not be done at Bournemouth. However, competition is bringing down the price of meters; and, after weighing all considerations, Mr. Bullen comes to the conclusion that "manufacturing firms and those workmen employed in the meter industry, need have no fear for the future, for the electric meter, like its gas colleague, is here to stay." Electric meter makers will bless Mr. Bullen for his encouraging words. The gas industry is pleased to place Mr. Bullen in an altogether different category from those electricals who display their imbecility by stating their belief that the electricity industry is going to crush the gas industry out of existence. It would be no use the gas-meter staying (as Mr. Bullen says it will stay) if there were no gas-supply undertakings in the land.

We come across some queer devices at times in our walks along electrical paths. A new system of electric heating is introduced to us. It is called the "Tubead"—an awful looking title compounded of "tube" and "bead"—and the thing itself is simply a combination of a length of seamless steel tube (say 7 ft. 6 in.), through which is run a high-resistance wire element on which glass beads are threaded. The tube is closed at one end, and at the other is provided with a connecting-box—the arrangement being carried by supports, arranged for attaching to the floor or wall. The standard consumption of electricity is a unit per hour. The elements are run at red heat, and the tube quickly warms up, heating the room by convection. People do not like convected heat so much as radiant heat for general room warming. It is also stated that precautions must be observed in fixing the tubes on account of the high working temperature; and a good place is said to be near the skirting or on the wall. For our own part, we should prefer not to run tubes at high temperatures too near the skirting boards. For cooking utensils, the wire element with its bead insulating supports is wound spirally between expanded metal discs; the base of the whole being of stoneware. These elements are usually made for a consumption of 700 to 1000 watts, and ordinary kettles or saucepans can be employed with them. It is a wonderful system. Working at such high temperatures, it is stated that the beads do not crack though water or other liquid be spilt upon them. The efficiency is stated to be high—as high as 68 per cent. for a hot-plate system employing ordinary utensils. Well, well!

The scriptural advice that we should benevolently bear one another's burdens is good up to a point; but it ought to be cut short at the entrance to the business world. In last week's issue, we had a little account of some proceedings in the Newcastle-under-Lyme Council, in which certain very kind things were said of the Engineer and General Manager of the Gas Department (Mr. Frank L. Winhurst) and of the Engineer of the Electricity Department. What, however, interests us most at the moment are the remarks that were made at the meeting by two worthy members, which amounted to an acknowledgment that the Corporation have been coolly robbing the gas consumers to pay for the deficiencies in revenue drawn from the electricity consumers. We have heard of this sort of thing being done elsewhere; but the fact that a few others besides the Newcastle (Staffs.) Corporation have been guilty of this barefaced plundering of supporters of one undertaking to make up the deficits of another undertaking does not in any way justify the proceeding. We agree with Mr. Mayer that the electricity undertaking ought to be compelled—honesty demands it—to repay its debt to the gas undertaking. But it is seen from the local paper and the electricity journals that it is considered by the electrical partisans that the gas-works have had a *quid pro quo* through having the electricity undertaking as a power customer. It is rather an expensive proceeding to have to pay £700 odd for the custom of an electricity concern for gas at a favoured price for power. It takes all the gilt off the transaction. We happen to know something of Newcastle-under-Lyme, and the association of the Gas and Electricity Departments; and so there is knowledge that the former has been very generous to the latter. Gas is supplied to the electricity station for generating purposes at 1s. 9d. per 1000 cubic feet; whereas the ordinary price of gas for general purposes is 2s. 8d., and for power 2s. 4d. We remember, too, that the electricity plant has found habitation on the gas-works lands, and we have never heard that the Electricity Department pays rent for the accommodation. The accountancy work of the Electricity Department used to be done by the clerks of the Gas Department. We suppose this holds good now. The chief officer of the Electricity

Department at one time found a room and a seat in the Gas Department's building. It is all very well to follow the scriptural injunction in private life. But the Gas Department at Newcastle-under-Lyme does more than its share in this sort of thing. It has acted the part, in its relationship with electricity, of an indulgent parent to the prodigal younger son. The dignity of the Electricity Department, if it possesses any, surely suggests that complete restitution be made. The electricity concern is now, under the benevolent treatment received in the matter of lightening its expenses, making a little bit of profit—it having attained its full load. But there is a desire to spend £6000 on extensions; and if this is done, we suppose the undertaking will again become profitless until the extensions secure full custom. Do not the Corporation think it would be a good thing to go on making a bit of profit for a time with which to pay back the gas undertaking the financial assistance rendered, and then look into the question of extensions to see what can be done, without further committing the concern to the *infra dig.* position of having to rely upon the gas undertaking?

The report of the Board of Trade on their proceedings for the past year under the Electric Lighting Acts is anything but thrilling. The schemes dealt with in the Orders are for the most part merely extensions of existing concerns. Altogether there were 28 applications for Orders, of which eleven were by local authorities and seventeen by companies or persons. In the case of five of the Orders, the districts defined in the applications were more or less curtailed by the Board. Two of the applicants—the Bognor District Council and the Uxbridge and District Electric Supply Company—determined not to proceed with their applications. The Board would not, after considering all the circumstances of the case, grant a proposed extension by the Bermondsey Borough Council. It would have been vastly better for Bermondsey if some power had originally prevented them entering upon this electric supply speculation, and if, assuming the people of Bermondsey desired electricity, a private company had taken the supply in hand. There was an application from the New Electricity Company of Macclesfield. The Corporation refused their consent to the application; and the Board dispensed with the consent, so that the Order proceeds. From a table published with the report, it is seen that between 1883 and 1910, 1386 Orders were applied for, and 1088 were confirmed by Parliament. But 334 have been revoked, repealed, or have expired.

NOTES FROM WESTMINSTER.

PARLIAMENT is going to adjourn on the 18th inst.; but there is to be an autumn sitting. We are, however, at the tail-end of the work in Committee-rooms; and it may be taken that all Private Bill business will have been completed before the adjournment, and that the autumn sitting will be devoted completely to the large contentious political business that is now agitating not only Parliament, but the country at large.

Stand-by Clause. A Committee of the Commons, presided over by Sir Edwin Cornwall, were very busy with Bills last week. One of them was that of the Swansea Gas Company; and its appearance before the Committee was almost purely formal. Since the Bill was in the Lords, and the Company won on all essential points, they have considered whether it was possible for them to revise their works' extension plans so as to meet the Corporation in the matter of the land to the utilization of which for manufacturing purposes exception was taken. The Company desire to live in amity with the Corporation; and though they have long nursed the portion of land in dispute, with an eye to manufacturing extensions, the Engineer (Mr. G. T. Andrews) has revised his plans so that this particular piece will in future be used for storage and purposes other than gas manufacture and conversion of residual products. It is a disappointment to the Company; but they (and it was diplomatic) did not desire to set themselves in the matter in direct opposition to the Corporation. This practically cleared the path of all hostility to the Bill. But there was the Local Government Board. The Board, flying in the teeth of justice whenever the stand-by clause comes up in a Gas Bill, called attention to the one framed by the Company. The Company asked power to charge up to a maximum of 25s. per quarter to those who use their meters and pipes for stand-by purposes, while employing some other means of satisfying their requirements. Sir Edwin Cornwall regarded the clause as oppressive and unreasonable. It is difficult to find the reasoning underlying the stricture. Would Sir Edwin like to spend a large amount of capital, at the instance of whoever might make the demand, for the purpose not of regular business, but merely adventitious, and thus probably have the capital lying idle for long periods without earning anything, or without compensation? We think not. Where then do oppression and unreasonableness come in? In the event, the Committee decided that the charge should not be imposed in the case of users for domestic purposes only.

Steam-Rollers. The Hertfordshire County Council have been very tenacious in trying to get a clause in the Uxbridge Gas Order that would give them protection against any liability in the case of damage to the Company's mains by the use of a roller of a weight up to 15 tons. They have

tried at every stage of the Order to obtain the provision, and have failed. They were before a House of Lords Committee in July; and the Lords would not give them exemption from liability under the terms laid down. The Council appeared again before Sir Edwin Cornwall's Committee last week. Once more they were refused special protection. The Committee saw from the evidence of Mr. H. E. Jones and Mr. Charles Carpenter the unreasonableness of the proposal. Mr. Carpenter put the matter in a nutshell when he said that the effect of the Council's clause would be to deprive the Company of their common law right by stopping the Courts from deciding what was reasonable or unreasonable. He regarded the use of a 15-ton roller as a retrograde step. The Committee gave tacit endorsement to these views by stating their opinion that the Council did not require special protection.

Margam and Aberavon. The Margam District Council have succeeded with their Bill under which they have secured the right to purchase the portion within their territory of the gas undertaking of the Aberavon Corporation. The Lords Committee, however, who had the final say in the matter, considered that, when compensation was awarded, due consideration should be given to the fact that a certain amount of the existing gas plant of Aberavon would be rendered surplus; and they further stipulated that a month's notice to terminate the supply should be given. The relations of the Aberavon Corporation with Margam were painted about as black as was possible; and in this matter generally the people of Aberavon have received scant consideration. There was a more economical way in which identity of interests in regard to the gas supply of Margam and Aberavon could have been established, without going to the extravagance of having separate works for the supply of two places that (as Mr. Corbet Woodall said) are practically one. The expert witnesses for Margam were Mr. Frank Jones and Mr. E. Herbert Stevenson. In addition to Mr. Corbet Woodall, Mr. John Mogford, of Briton Ferry, gave evidence for Aberavon.

Merthyr Tydfil Water. The protracted discussion over the Merthyr Tydfil Corporation Water Bill has come to an end; and there has been no substantial alteration in the measure. The promoters have guaranteed a supply of water to the Rhondda for fifty years; and the Pontypridd and Rhondda Board have, in association with this, secured the right over that period to construct a new reservoir.

Charco, Limited.

At an extraordinary general meeting of the shareholders of Charco, Limited, which was held last Thursday at the registered offices, Winchester House, Old Broad Street, E.C., it was decided to increase the capital from £21,000 to £35,000, by the creation of 14,000 further shares of £1 each. It is, however, not intended to make any issue of shares in connection with the matter. The Company have, we are informed, hitherto confined their attention to the completion of patents and arrangements for handling the red-hot coke as it comes from the retorts or coke-ovens, so as to produce "Charco" speedily and economically. This, it is said, has now been accomplished, and licences for manufacture may soon be completed.

"Electric Weld" Combination Boiler & Gas Water-Heater.

We understand that there is being placed upon the market a special form of combination boiler and gas water-heater of American manufacture, known as the "Electric Weld." The apparatus is self-contained. The heating chamber, being entirely surrounded by water, prevents any possible heat leak. It is made in a variety of sizes, adapted to the requirements of a small villa or flat and to the needs of large users, such as hotels, hospitals, and other places, where an unlimited supply of hot water is always in demand. The fixing of the apparatus is simplicity itself. It takes up very little space, and is entirely void of any delicate or intricate parts. The initial cost is small; and the maintenance reduced to a minimum. It has a double circulation, which is not to be found in many other makes of heaters. There is automatic or intermittent service, optional to the user without adjustment of the parts or breaking connections. The cylinder, which is of steel, and electrically welded, and is thus rendered specially strong, is guaranteed to a working pressure of 150 lbs. This pattern lends itself to direct coupling with the back boiler of an ordinary range, or it can be used independently as a gas-heater. The burner is of the bunsen type; and the heating coils are formed of brass sections—hollow six-limbed crosses of cast brass—which are arranged in such a way that the heat from the burner impinges against each separate column from top to bottom. The circulation of the "Electric Weld" boiler is claimed to be very rapid, both in the coils and within the boiler. As a result, the whole contents of the boiler are heated at practically one and the same time. An essential detail is the provision of a "thermo-valve," which is introduced into the base of the boiler in such a fashion that the incoming water impinges directly upon the thermostatic column. It follows that the latter responds immediately water at the taps is drawn; and the movement transferred from the gas-valve is exceedingly sensitive. A special feature of the "thermo-valve" is the arrangement whereby it can be brought into play at any predetermined temperature of the water desired.

CITY AND GUILDS EXAMINATIONS.

The Prize Winners.

IN the "JOURNAL" for the 27th of June (p. 1008), the list was given of the candidates who passed the last examinations in "Gas Engineering" and "Gas Supply" in the Department of Technology at the City and Guilds of London Institute. We have now received from the Superintendent of the Department (Sir Philip Magnus, M.P.) a list of the prize winners in the subjects named, as well as in those of "Coal-Tar Distillation and Products" and "Heating and Ventilation;" and the following are their names, and the centres at which they studied.

GAS ENGINEERING.

Honours Grade.—First prize (£3 and a silver medal), Frank Laurence Bassett, East Ham Technical College.

Ordinary Grade.—First prize (£2 and a bronze medal), Harold Joseph Hailstone, Birmingham Municipal Technical School; second prize (£1 10s. and a bronze medal), Allan Baker, Regent Street Polytechnic; third prize (a bronze medal), Edward William Bennett, Regent Street Polytechnic.

GAS SUPPLY.

Honours Grade.—First prize (£3 and a silver medal), Stanley Barker Johnson, Hull Municipal Training College.

Ordinary Grade.—First prize (£2 and a bronze medal), William Heathcote, Liverpool Municipal Technical School; second prize (£1 10s. and a bronze medal), Walter Edwin Oulds, York Technical School; third prize (a bronze medal), Fred Rothwell, Reading University College.

COAL-TAR COLOURING MATTERS.

Ordinary Grade.—First prize (£1 10s. and a bronze medal), Victor Hobson Goldthorpe, Huddersfield Technical College; second prize (£1 and a bronze medal), George Green Hopkinson, Bradford Technical College; third prize (a bronze medal), Louis Dennis, Halifax Municipal Technical College.

HEATING AND VENTILATION.

Honours Grade.—First prize (a silver medal), Robert Ratcliffe, Bacup Technical School, and George Twist, Doncaster Municipal Technical School (equal).

Ordinary Grade.—First prize (a bronze medal) Harold Wallace, London County Council; second prize (a bronze medal), Sydney Vernon Drew, London County Council.

The money prizes in "Gas Engineering" and "Gas Supply" are given by the Goldsmiths' Company, those in "Coal-Tar Distillation and Products" by the Salters' Company.

Presentations to Mr. and Mrs. Samuel Glover.

There was a pleasant gathering of about two hundred of the officials and workmen of the St. Helens Corporation Gas Department at the works last Friday, under the presidency of Mr. R. Sterritt, to commemorate the forty years' service of the Gas Engineer, Mr. Samuel Glover, and to testify their esteem for Mrs. Glover. The Chairman said they had every reason to be proud of Mr. Glover. He had steered the ship for a good many years in a very successful manner. They were pleased to have Mrs. Glover present, because they knew how great was the interest she took in their welfare. Mr. Glover had completed forty years' service; but his energy had not abated in the least, and his ability was greater than ever. The St. Helens Corporation not only acknowledged this, but it was acknowledged throughout the country. Mr. J. W. Allin, the Chorley Corporation Gas Engineer, and formerly Mr. Glover's Assistant at St. Helens, said the spontaneous way in which the idea of the presentation had been taken up was a striking tribute to Mr. Glover's popularity. He (Mr. Allin) attributed what success he had met with to the careful training he had received at St. Helens. Mr. E. M. Hollingsworth, the Electricity Engineer of the St. Helens Corporation, who also commenced his career under Mr. Glover, bore testimony to the great help he had been to him, and said that Mr. Glover's main characteristics were certainly kindness, energy, and ability. Mr. H. Rudge, the Gas-Works Chemist, then presented to Mr. Glover a handsome illuminated address, and to Mrs. Glover a massive salver bearing the following inscription: "Presented by the officials and workmen of the St. Helens Corporation Gas Department to Mrs. Samuel Glover, in commemoration of the association of Mr. Glover for forty years with the St. Helens Gas-Works. July, 1911." Mr. Glover, who was heartily cheered, spoke of the pleasure the gathering gave him, and thanked all those who had worked in so loyal and helpful a manner all the time they had been associated with him. He considered that the presentation was one of the greatest honours that could be conferred upon him. During the evening, the officials and workmen were entertained at tea by Mr. Glover; the gathering being in every respect most enjoyable and successful.

THE LIVESEY MEMORIAL HALL

At the Works of the South Suburban Gas Company.



Front View of the Livesey Memorial Hall, Lower Sydenham.

A WORTHY memorial to a worthy man. That is the uppermost thought as one leaves a new building (to be known as "The Livesey Memorial Hall") and recreation grounds that now grace Lower Sydenham and the works of the South Suburban Gas Company. The Chairman (Mr. Charles Hunt) and Directors of the Company, the Engineer and Manager (Mr. S. Y. Shoubridge), and the Secretary (Mr. C. M. Ohren) know, without reference to the records, what the Company owe to the administrative powers of Sir George Livesey, and the whole of the employees have a deep-seated affection for, and sense of gratitude to, the man who was instrumental in giving them new interests in life and work through co-partnership. They recognize that where duty in business was concerned, their late Chairman was a conscientious disciplinarian and strict in his dealings, with an eye ever on the trust reposed in him. But all knew him by his many overt deeds (and there was much that was done privately) to be a large-hearted humanitarian. And the greatest of his works was co-partnership. Company and workers therefore desired to have in their midst—it was a very natural desire—a fit memorial to Sir George—a memorial that in itself should represent his characteristics. He was strong; the building is likewise. He was large-hearted; the building is spacious. He was careful in matters of detail; the building for its purposes has not a single necessary item omitted. He was a great believer in healthy recreation for the hours of leisure. Here we have for entertainments a large hall of which many a town would be proud; here there is a room for billiards that would not disgrace some of our West-end clubs; here is a reading-room where the movements and affairs of the outer world can be quietly studied; here we have for the summer time a magnificent bowling-green, second to none in the South of London; and here, too, is the ground now being laid out to serve the purpose of tennis courts.

The acts of Sir George during his lifetime endorse this provision for recreation. He was always interested in the workmen's recreation clubs attached to the companies in which he was concerned. We remember the bonus days of long years ago, and how, after speech-making was over, he showed a personal interest in the games and fun of the day. The usually grave face would be radiant with laughter and merriment. We bring to mind, too, how, even in closer years, his tall figure might be seen among the employee co-partners of the two South London Companies, on co-partnership day, in the Crystal Palace grounds, and even sharing, with almost boyish delight, in the amusements there provided. He could enter, with a vast and keen enjoyment, into genuine recreation and relaxation at the proper time with the same enthusiasm and ardour that he entered into his work and interests generally. He was a leader in a great industry, and a broad-minded leader of men; and all who were directly or indirectly associated with him cannot do too much in keeping his name and example green, and in furthering the good work that he initiated. This Sydenham memorial will do its share. In the years stored deep away in Time, when those who were contemporaries and associates of Sir George have passed hence, this building will assist in reminding of the man and of much that he did. It will show how greatly he was beloved by those who moved with him. From father to son there will pass, through the memories and interests awakened by the existence of the hall, the story of a life work having for its chief ambition the benefit of the gas industry and of its workers; and the telling of the story, and the presence of the building, must—nay, will—prove an incentive to good through many generations to come.

We need not here say a word as to the amount of credit due to the Chairman and Directors for the liberal powers placed in the hands of the Engineer (Mr. Shoubridge) in connection with the memorial. They endorsed the whole of the plans with the same



A Front View of the New Buildings taken from the Reading-Room and Library End.

willingness and pleasure that they would have done those for a necessary works' extension. No member of the directorate even allowed a thought as to outlay to trespass upon this particular duty and pleasure in what they were doing. The one idea was a memorial fit, reasonable, and useful, and one of which the Company might hereafter be proud. The work is done. The Engineer and his staff have properly and fully interpreted the desire of the Directors, and the numerous workers of the Company are gratified, and not only they but the neighbourhood generally. Probably no other gas-works can claim so handsome a place of such generous capacity for purely recreation purposes. Facing Perry Rise, the building and its surroundings are an ornament to the locality. In front we have a nice boundary wall; and artistically designed double iron gates leading up to the main entrance of the building, which is set in the midst of the extensive bowling-green, the tennis courts, and other turfed ground, all of which eventually will have trees planted on their borderings for shade, and here and there, in suitable positions, there will be the relief and picturesqueness to be afforded by well-planted flower-beds. The site of the whole is taken from the part of the gas-works ground adjoining the holders, from which it is separated by a tall, lightly-paled, oak fencing, with gateways leading on to the works. While making note of these points, it may be mentioned that the bowling-green is 124 feet by 54 feet in area; and the tennis courts at the opposite end of the building occupy a ground area of 16,000 feet. It is all a little oasis in Lower Sydenham.

DESCRIPTION OF THE BUILDING.

We turn to the building itself. As to its architectural features, the lines of its design are graceful, and the whole has a very picturesque effect. The photographs will do more to show this than any number of words in description and praise. The building covers 6830 superficial feet, and its walls are composed of stock bricks made on the works by the Company's men, with terra-cotta dressings, supplied by Messrs. Burmantofts, of Leeds. The roof is covered with sand-faced red tiles with finials at ends, supplied and fixed by Mr. C. Collins, of Staines. Over the main entrance is a handsome faience panel, bearing the words "Livesey Memorial Hall," in three colours, the letters being in relief. The front boundary wall (which runs the full length of the building and grounds) is built in similar materials to match the new building—viz., best stock bricks panelled with red borders and terra-cotta caps and coping, supplied by Mr. J. C. Edwards, of Ruabon. The main entrance gates were made and supplied by Messrs. W. Macfarlane and Co., of Glasgow. The fencing forming the back boundary runs parallel with the front wall, and is (as previously said) constructed of oak with elliptical coping. Though the names of contractors for certain parts have been mentioned, the employee co-partners of the Company—beneficiaries of Sir George's work—have carried out the main parts of the construction. As already stated, the bricks and artificial stone were made on the works. To the Company's men also is due the execution of the concrete foundations and the construction of the brickwork of the building and boundary wall, the carpentering work in the making and erection of the roof, doors, windows, and the laying out of the tennis courts and bowling-green. Everything has been well and truly done; and in the high-class work and finish, there is plainly printed, as though in black and white, the feeling of every man that nothing but his best was worthy a place here.

Passing in at the main entrance portico and vestibule, the thoroughness and completeness reposing in design and work that have struck one outside are found carried throughout the building. Not an essential is omitted. The portico itself is rather more than 27 feet long by 3 ft. 6 in. wide; and the vestibule (including a hat



Interior of the Large Hall—Looking towards the Stage.

and cloak room) is 26 ft. 4 in. long by 9 ft. wide. The floors of both portico and vestibule are laid in Venetian Terrazzo marble, by Messrs. Burke and Co., of Rathbone Place, W. The main door on the right from the vestibule leads to the large concert hall and the main doorway on the left leads to the billiard and recreation room, together with the reading-room, the Committee-room, and the lavatories.

Here we are in the concert hall—a hall whose features as they are picked out by the eyes one by one in the end evoke the expression of appreciation in the single word "magnificent." The hall is 51 ft. 6 in. long by 40 ft. wide, and is designed to accommodate about 450 persons. The audience seated in this lofty and spacious hall will face a stage at one end, 44 ft. long by 17 ft. wide, fitted with a footlight screen (20 ft. long), lighted by eighteen incandescent burners. The ornamental proscenium opening is 34 ft. wide and 16 ft. 6 in. high. This capacious stage is being fitted with scenery, drop curtain, and all requisites for entertainment and effect. We can foresee many a pleasant evening provided from this stage; the Company having some good musical and dramatic talent among the employees. There is ample window area for lighting the hall in the daytime. The ventilation has likewise been abundantly considered. In the walls of the body of the hall, there are eight fresh air ventilating panels, and two are fixed in the back wall of the stage. Centrally situated in the beautiful ribbed and coved ceiling of the hall is a sunburner of Sugg's make, fitted with a cluster of 21 Graetzin inverted burners; and connected with the sunburner is a tube running up to the apex of the roof, on top of which is fixed one of Shorland's patent exhaust ventilators. This arrangement conducts away the products of combustion from the burners, and at the same time the foul air of the room. The hall is further illuminated with ten two-light wall brackets. Connected to the platform by a short passage are two dressing-rooms, each 12 ft. 7 in. by 10 ft. 1 in., both provided with lavatory accommodation. In the hall itself liberal attention, it was observed, has been paid to the exits.

Passing from the hall, we find ourselves in the billiard and recreation room, which is 39 ft. 3 in. long by 40 ft. wide. The general features harmonize with the hall just described. It was noticed that the windows are composed of tinted glass leaded in diamond shape; and while the lighting is good in the daytime, any glare there might be with ordinary windows is removed by this particular form of glazing. This room is also lighted by two Sugg sunburners fixed in a coved and ribbed ceiling; each fitting being furnished with a cluster of nine inverted burners. Again the ventilation has received very generous treatment. There are six fresh-air ventilating panels in the side walls, and the foul air is extracted in similar manner to that adopted in the concert hall. The room is of area sufficient for three full-sized billiard tables; but two full-sized ones and a small one have been provided. On two sides of the room portable platforms have been arranged, on which are leather-covered settees and tables. This room will serve as a big counter-attraction to places where billiard rooms are provided for business purposes.

From the billiard and recreation room, entrance is obtained to the reading room. This has an area of 33 ft. by 16 ft. 6 in. It contains three tables, at each of which six persons can be accommodated. The equipment also includes a set of bookcases supplied by the Globe Wernicke Company, Limited.

In the remainder of our examination, everywhere was found the attention to detail on which we have previously commented. There is a Committee room 14 ft. 9 in. by 16 ft. 1 in.; and this will be immensely useful. A refreshment room is situated on the further side of the building opposite the main entrance. It is so designed as to be common to the concert hall and recreation room; and there non-alcoholic and other refreshments of all kinds will be supplied. The room is provided with a counter, hot water urn,



A Back View of the New Buildings—Taken from the Bowling-Green End.

water supply, sink for washing-up, &c. The lavatory is 12 ft. 6 in. by 10 ft. The floor is laid with Venetian Terrazzo marble. All the fittings are by Messrs. Finch and Co., of Lambeth.

The whole building is provided with a system of low-pressure hot-water heating apparatus of ample capacity. The plant itself consists of a cast-iron Strebel sectional boiler, water-supply tank, cast-iron

flow-and-return pipes, and twelve radiators, supported on cantilevers from the wall, and distributed in the various rooms.

Well done! May the new Livesey Memorial Hall, at Lower Sydenham, have a long career of salutary usefulness. We have travelled far and wide among gas-works; but never have we seen a superior building in them devoted to recreation.

EAST GREENWICH AND ORDNANCE WHARF INSTITUTE.

WE are publishing this week an illustrated description of the Livesey Memorial Institute at Lower Sydenham, and it will be interesting to supplement this with photographs of the East Greenwich and Ordnance Wharf Institute of the South Metropolitan Gas Company, which was opened by the Chairman, Mr. Charles Carpenter, on the 12th ult., as recorded in the "JOURNAL," at the time (see p. 186). It was stated then that the main feature of the building is the hall, which will seat about 800. There is an ample stage, the opening of which is (as will be noticed) surmounted by a bust, in high relief, of the late Sir George Livesey; while at the rear are spacious rooms which may be used for purposes connected with entertainments or as committee-rooms. There is a billiard-room, a miniature rifle-range, and a recreation room in connection with the refreshment department; and the kitchen and lavatory arrangements are complete.

The accompanying photographs appear in the August number of the South Metropolitan Company's "Co-Partnership Journal," to the courtesy of



East Greenwich Institute—General View.

Braces for Retort-Settings.

A patent has lately been taken out for France by Herr Aug. Klönne for a method of bracing retorts, more especially inclined ones or chambers which are built very high, and in which the vertical bracing bars are very long in front and rear. As these bars cannot be secured otherwise than by cross-bars at the top and bottom, they must be unusually heavy. Endeavours have been made to brace them together in the centre. In this case, however, two cross-bars had to be run through the masonry; and they were soon burnt. To remedy this defect, the inventor provides around the setting circular beams which enclose the vertical bars at a suitable height. Between these bars and the beams there are springs which yield under the action of expansion and contraction of the settings. It is claimed that considerable economy in weight can be effected by means of the invention.



East Greenwich Institute—The Platform.

the Editor of which (Mr. W. T. Layton) we are indebted for the loan of the blocks and for permission to reproduce them.

William Sugg and Co., Limited.

The vacancy in the management of this Company caused by the death of the late Managing-Director, Mr. E. Sugg Wright, referred to in the "JOURNAL" a few weeks ago, has been filled by the appointment of Mr. Stanhope Evelyn Thornton, Assoc.M. Inst.C.E., as Managing-Director, and of Mr. William G. H. Mattock, as General Manager. Mr. Thornton has been a Director of the Company for several years, and has latterly filled the position of Chairman, which he now vacates in favour of Mr. R. W. Kennard, D.L., J.P., of the Falkirk Iron Company, and the Blaenavon Iron Company, who has also been a member of the Board of William Sugg and Co. for many years past. Mr. Mattock has spent the whole of his business career in the service of the Company, and received his training as an engineer under the late Mr. William Sugg. He has held several important positions—the most recent being that of Works Manager; and in his various capacities he has been brought into intimate contact with many of the leading members of the gas industry. During recent years, the Company have been progressively successful; and it is hoped that the changes now made will contribute to their continued and increased prosperity. To fill the vacancy on the Board, Mr. William Stevens Brown, the former Secretary of the Company, has been elected a Director.

Manchester Corporation and the Gas Publicity Scheme.—The Manchester City Council at last Wednesday's meeting confirmed without discussion the resolution of the Gas Committee that Manchester should subscribe to the scheme of the Publicity and Special Purposes Committee of the Institution of Gas Engineers on the basis of 2s. 6d. per million cubic feet of gas made. As stated in the "JOURNAL" last

week, this is subject to the Gas Department being "satisfactorily represented" on the Committee, and to the question of the basis of contribution being brought forward at the expiration of three years for reconsideration and for revision if necessary.

Sterilizing Water by Chloride of Lime.—The chloride of lime process for sterilizing the water from the Zwartkopjes wells of the Rand Water Board was installed in November, 1909, and discontinued in May of the following year. Last January, however, the quality of the water deteriorated slightly, and the sterilization process was resumed. After a number of tests, it was found that from 56 to 60 lbs. of lime added to the average daily supply of 4,500,000 gallons gave the most satisfactory results. The cost of sterilizing the water, as given by Mr. W. Ingham, the Chief Engineer, in his last annual report, is approximately 4s. 2d. per million gallons.

Underground Water in Central Australia.—In the August number of the "Journal of the Royal Geographical Society," Professor J. W. Gregory, F.R.S., completes a study of the flowing wells of Central Australia which he began in a previous issue. He points out that the discovery in Eastern Central Australia of deeply buried water, which is under such pressure that it flows to the surface when reached by a borehole, has effected a great economic change in the wide areas thus supplied. The water has so far proved inadequate for extensive irrigation, for which its quality is often unsuitable; but it is of incalculable service for domestic purposes, for watering stock, and for maintaining stock routes. The general distribution of the water ranges through an area of some 580,000 square miles.

INTERNATIONAL PHOTOMETRIC COMMISSION.

Third Session at Zurich.

FOLLOWING upon the report which appeared in last week's "JOURNAL," of the general proceedings of the third session of the International Photometric Commission, we publish in this issue other papers that were read, together with some of the observations that were made upon them and various matters that came up for discussion.

Wednesday, July 26.

The first paper that was taken was by Dr. Eitner. It dealt with the photometric methods used in Germany. A translation of this contribution will be found at page 357. With regard to the passage in it where it is said that Dr. Bunte proposed to invite representatives of different countries to make a report on their photometric methods, the President (M. Th. Vautier) called to mind that a very similar request had already been made in the 1903 session, as well as in 1907, but that it had not produced any result. Dr. Eitner's report again raised the question, and would serve as a basis for the new inquiry asked for by Dr. Bunte. As regards the measurement of the energy taken by the electric lamp used for comparison, it was asked why Dr. Eitner thought the measurement of tension at the terminals of the lamp was subject to great errors. The reply was: By reason of the accidental resistance which bad contacts could produce, it was safer to measure the intensity of the current. M. Laporte agreed with Dr. Eitner, but thought it was not very difficult to avoid this inconvenience. In any case it was better to measure the tension and the intensity. Two methods of measurement were indicated by Dr. Eitner; and the President asked to which he gave the preference. The reply was: To the second. The first method was preferably used when lights of great intensity had to be measured. M. Laporte said that the method which consisted in placing the secondary standard lamp at a fixed distance from the photometer of whatever kind offered the great advantage that the photometric screen received the amount of light for which the eye was most sensitive. To avoid the drawback which there was in moving a secondary flame-standard at the moment of measuring, an electric lamp could be adopted as the secondary standard. However, the second method is that most generally adopted, and is preferable. It lends itself, also, to the measurement of rather powerful lights. In such case, the amount of light thrown on the screen by the standard lamp is increased by choosing a standard lamp of suitable intensity, which enables, for example, the obtaining on the screen of a light of 20 to 50 lux. These are advantageous circumstances, seeing that above 10 lux difficulties arising from differences of colours become weaker. The conditions are unfavourable when the illumination on the screen is lower than 10 lux. Dr. Brodhun would not use an illumination greater than 30 lux. For the higher intensities there could be advantageously used a diaphragm of a diameter less than that of the pupil. As regards the methods described above, he never adopted the simultaneous movement of the secondary standard and the photometer. In Switzerland, Dr. Ott said, both methods were used according to circumstances, always with a fixed standard. Mr. Butterfield remarked that in England the method adopted was either a fixed distance between the two sources to be compared, with the photometer screen movable, or the fixed distance was maintained between the screen and the Vernon Harcourt, or the secondary standard with the method of substitution. It was therefore the lamp that was being tested which ought to be moved.

With regard to the flicker photometer, it was remarked that this kind of apparatus has met with certain criticisms. Dr. Eitner said, however, that for industrial measurements the results were accurate to within about 2 per cent. M. Laporte had used, without difficulty, the Brodhun photometer for comparing the arc light with the incandescent lamp, and recommended it for this purpose. Mr. Butterfield said that in England, when it was desired to compare lights of different shades, one used a Bunsen star-spot photometer or a flicker photometer. The old grease-spot Bunsen was preferred to the Brodhun photometer for lights of the same shade.

As to the average horizontal intensity, M. Laporte said that to measure it with electric incandescent lamps, the lamp could also be turned on its axis. Dr. Brodhun avoided this because it was necessary to turn it rather quickly, which might alter the intensity. But this method had begun to be used for metallic filament lamps, because in their case, by reason of the great number of threads, it was not necessary to turn it very quickly. M. Laporte added that for carbon filament lamps, three turns per second were quite enough, and this was not very inconvenient. Dr. Brodhun replied that in any case a certain amount of care was required with this method.

The average spherical intensity was next referred to; and Dr. Strache said that in Austria for lamps of great intensity the Brodhun photometer for street measurements was exclusively used. It was to be observed that in reflective lamps the law of distances was no longer valid. The lamp was placed so that its distance from the photometer was always 2 metres. When the lamp was large (reflector, 0.50 m.), the method based on the law of distance was no longer valid. Mirrors of 5 metres were necessary, which was not practical. Dr. Eitner said that the method of Dr. Strache was a special method, because with it apparatus

fitted with large mirrors was needful. Dr. Ott used the Martens apparatus, which was convenient for reflectors of 500 mm. diameter. M. Laporte gave the information that at the Central Laboratory of Paris, when they measured arcs provided with globes they used a mirror which was about 500 mm. one way by 800 mm. another.

For the average spherical intensity of gas-lamps, Dr. Strache said the spherical photometer could not be used because the air became vitiated. The Rousseau method was too long. They took measurements in the chosen directions (more horizontal than vertical) proportionally to the sines of the inscribed angles, and the average spherical intensity was got by dividing the addition of the measurements by ten. M. Laporte said that, theoretically, there was an apparatus, the mesometre, which gave the average spherical intensity by a single measurement. It had been described in France by Leonard, and in England by Russell. A series of mirrors fixed at an angle of 45° was arranged about a circle proportionally to the sines of the angles. Dr. Strache said that each mirror ought really to be of the total size of the lamp; and, in his view, it was necessary to know the coefficient of the reflection of each mirror in relation to the angle of incidence. Dr. Eitner added that these measurements could not be so accurate as the preceding ones. Dr. Ott asked at what distance from the ground it was necessary to take the measurements—1 or 1.50 metres? Dr. Brodhun replied that in Germany gas engineers measured at 1.50 m.; the electricians, at 1 m. M. Weiss suggested that it was desirable to arrive at an agreement as to this height. Mr. Butterfield said that in England, a Committee was examining the question; but up to the present no report had been made. It was composed of gas engineers and electricians, and had been nominated by three Societies—the Institution of Gas Engineers, the Institution of Electrical Engineers, and the Illuminating Engineering Society. The President then thanked Dr. Eitner for his interesting paper, which would be sent to the technical societies participating in the Commission and to the National Laboratories—at the same time asking them to make observations and suggestions upon it. A *résumé* of the replies would be distributed among the members, so that conclusions could be come to at the next session.

The President then announced that M. Sainte-Claire Deville had brought a burner which was intended to measure the absolute flame lighting power. The gentleman referred to lighted the burner and explained its working, and gave some interesting information concerning it. An extract of the results obtained will be published in the "Transactions" of the session. Meanwhile, it may be mentioned that the burner was described and illustrated in the "JOURNAL" for March 28 last, p. 916.

Thursday, July 27.

Mr. Butterfield read the paper, on the "Corrections for the Effects of Atmospheric Conditions on Different Photometric Flame Standards," which was given in last week's "JOURNAL," p. 288.

M. Brodhun remarked that a criticism of the paper was for the moment impossible. One could, however, be glad that the results were not contradictory to those ascertained before. It was only as regards high pressures that there was any disagreement at all with MM. Liebethal and Paterson on the subject of the Harcourt and Hefner standards. It seemed that in the tests the chambers were too small; so that it was necessary to make permanent corrections. Moreover, the curve showing the influence of pressure exhibits an incomprehensible bend. It was certainly a question to be elucidated. The President asked if tests had not been made under natural conditions, but at high altitudes—800 to 1500 or 2000 metres. Were there such stations in Germany or Austria? M. Kusminsky replied that there was a station having gas in Austria at an elevation of 1500 metres. Dr. Strache said he would ascertain if there were suitable places in Austria which might be interesting from this point of view. M. Weiss proposed to ascertain the value for the Hefner at Zürich at the Schlieren Laboratory (470 m.), at Uetliberg (900 m.), and at Säntis (2000 m.) and at the Jungfrau, if necessary.

In reply to the President, Mr. Butterfield said there were not suitable places in England. Dr. Strache said the influence of the atmosphere could be ascertained with a comparative electric lamp. With gas-lamps and flame-standards the effect was eliminated—being the same for the one as for the other. M. Brodhun remarked, as to the influence of carbonic acid and humidity, that it was very difficult to ascertain, seeing that one is not master so as to vary these elements. Liebethal had carried out work on the subject, which would be published shortly, but it was not in that a question of the effect of pressure. Dr. Eitner thought that the relative correction for pressure would be necessary in future tests, as one regulated the electric lamp with a Hefner.

Mr. Butterfield said he thought the experiments had been very exact; the chamber was large enough for the conditions to be almost natural; and the carbonic acid only varied 0.1 per cent. The variation of pressure did not exceed 2 mm. There was agreement with M. Liebethal beyond a pressure of 660. Dr. Eitner called attention to a passage in a paper by M. Liebethal, where he gave results showing how the intensity varied with the

pressure. Mr. Butterfield said tests had been made with the spermaceti candle. The results were:

At 474 mm., it gave 75 per cent. of the English candle ;
 „ 308 mm., „ 40 „ „ „ „
 „ 150 mm., „ a small blue flame ;
 „ 127 mm., it went out.

The President asked if Mr. Butterfield had found differences at the beginning and at the end of a test, in order to see the effect of water vapour due to the operator. Mr. Butterfield replied that an Assmann hygrometer had been used, and a variation of from 0.72 to 0.75 per cent. had been found in the moisture. The amount of carbonic acid was 0.125 at the beginning and 0.125 at the end. The President observed that gas saturated itself with water vapour in passing the meter. How could it be arranged to measure the gas dry? M. Brodhun thought it would be possible to dry the gas by collecting it in a dry holder or by using petroleum in the meter. Dr. Strache suggested that one might use paraffin by slowly turning the meter. Dr. Eitner thought it would suffice to dry by means of chloride of calcium and make the correction corresponding to the water vapour absorbed. The President hardly thought this would be sufficient, owing to the large volume of air necessary.

Dr. Colman said he had made tests, but thought that error was introduced by drying the gas, because benzene was absorbed by chloride of calcium. M. Sainte-Claire Deville was of a contrary opinion, and also, after tests made in Paris, thought the differences due to dry or moist gas negligible. Dr. Colman said that chloride of calcium, by absorbing water, gave a liquid which physically absorbed benzene. M. Sainte-Claire Deville said it was always necessary to operate with columns of dry chloride of calcium. The volume of liquid was always slight, and likewise the error. Air could also be dried by cooling it to at least 22°, with a flow of one metre per hour. The President thought the correction necessitated by the moisture, referred to by Dr. Eitner, was a fiction. How could one calculate the velocity of the moist gas from the velocity of the dry gas and the vapour? Dr. Eitner replied that if the orifice corresponded to the Bunsen law, one could calculate the rate of flow according to the density and the pressure. The President asked how the effect of the moisture on the rate of flow was to be reckoned when the temperature varied; and Dr. Eitner answered by saying that one calculated the velocity according to the densities, by taking the density of the mixture.

This concluded the morning's discussion. In the afternoon,

Dr. Strache described a method of regulating the height of the flame of the Hefner lamp by means of a thermo-couple. A translation of his communication is given on p. 358. In reply to M. Brodhun he said that a slight obliquity of the flame involved a variation in the deviation of the indicator.

M. Sainte-Claire Deville spoke on absolute lighting power. In 1903 and 1907, the Commission had, he said, considered the subject. Since then, MM. Mayer and Schmidt, at Carlsruhe, had verified the work of M. Sainte-Claire Deville by taking into account a correction of 15 per cent. for water gas. M. Sainte-Claire Deville proposed the replacing of the examination of illuminating power by that of calorific power—the latter being better defined. He asked if the Commission was sufficiently informed on the question. He thought that such substitution would be useful. Dr. Strache said he had shown that the effect of flame temperature was relative to the economy of the lighting. At Carlsruhe, it had been found that the higher the temperature the better was the result. But one had always worked by regulating the consumption for a given number of calories, instead of having a constant consumption. To investigate the effect of temperature, he had added carbonic acid, which at once lowered the calorific power and the temperature. By adding hydrogen, the calorific power was lowered, but the temperature was raised. Naturally, the volume was also changed; but by carburetting the gas, to obtain the same calorific power, the raising of the temperature was always an advantage. For example:

With 0 per cent. of CO ₂	5 calories
7½ „ „	6 „
25 „ „	9.25 „
33 „ „	13.7 „

With benzene, there was an increase of 6.6 to 8.1. With acetylene, a 7.07 increase was obtained. He did not combat the proposal of M. Deville; but he did not think it was necessary to admit an exact proportion between the calorific power and the lighting power. He would be glad if there were a Committee to draw up a resolution. The figures obtained in his investigations were given in detail in a paper of which a translation appears on p. 358.

M. Sainte-Claire Deville said that Dr. Strache had not defined incandescent lighting power. It was necessary to burn each gas in a suitable burner. If not, it was needful to regulate the draught each time, in order to obtain the best result. He had used a No. 1 Auer burner by providing it with a distinct supply, and by regulating it so that whatever gas was used, the outlay of heat was the same. A test was made with a separate supply, and another with a normal one. A gas of 4000 calories requires 3.75 times its volume of air, and gives 2.4 litres to the carcel. A gas of 9000 calories (gross calorific value) gives 15 litres to the carcel. If artificial air is introduced, the efficiency is improved. With poor gas, there is the same outlay per carcel. With rich gas, the outlay

is 11.7, instead of 15. These tests have shown that the problem to ascertain what is the power is far from being reached. When one reheats with hot air, it is rather the speed of the air than its temperature which is important. The same thing occurs with gas. The speed of the afflux of heat is the real factor. M. Deville thought he could come to an agreement with Dr. Strache in defining illuminating power. The President observed that, in fact, the calorific power described the gas better than its illuminating power. The replacing of the latter by the former was not an ideal, but was perhaps a practical, solution. A large number of Technical Societies wished it. Dr. Strache said he hoped for this substitution; but he did not agree with a statement being made of proportion between calorific power and illuminating power. Moreover, M. Deville had found that it did not exist with water gas. It would be better to omit the references to proportion. The President asked within what limit was there proportion; and M. Deville replied for all coal gas, and even with a mixture of water gas. Dr. Colman supported the view of Dr. Strache, but said it would be difficult to introduce in England the substitution asked for, because the illuminating power was stipulated by law, and only in a special case was there reference to both calorific power and to lighting power. The Institution of Gas Engineers would oppose any extension of this dual test.

Mr. Butterfield, at the President's request, explained the functions of the Gas Referees, and said that in the case quoted the lighting and the heating power were both ascertained every day. If they were not satisfactory, there was a penalty. Dr. Colman added that English engineers were not opposed to the introduction of calorific power, but only to having two stipulations. Moreover, they could not make the proposal to Parliament. M. Böhm thought the tests of MM. Strache and Deville were not comparable. Dr. Eitner said that it would be necessary to take into account the burner in the definition of illuminating power. The flame ought to be such that it exactly filled the mantle. In Germany, the substitution would be effected gradually. With this view, they had there begun to allow a calorific power of between 5000 and 5200 calories per cubic metre; the illuminating power being 10 to 12 Hefners per 150 litres. Dr. Colman advocated the fixing of the definition of calorific power, if they adopted the resolution concerning it. The President said they should adopt the calorific power of the physicists. Dr. Colman said the heat of combustion was the gross calorific power. M. Deville thought one ought to consider the water as vaporized [Session 1903], in conformity with the Junkers indications. In summer the results were different from winter. Both the President and M. Deville considered it better to keep the definition of 1903. Dr. Strache said that in Austria they had begun to accept the gross calorific power. He proposed that the International Photometric Commission recognize the heat of combustion as a fundamental measurement, and that the illuminating power remains outside the resolutions, as the gas is used for lighting, heating, and for motive power. The President thereupon proposed a Sub-Committee, who were appointed, consisting of MM. Deville, Eitner, Weiss, and Colman, to consider the scheme of this proposal.

The Commission later on expressed their opinion that, having regard to the methods of employing gas at present in vogue, the determination of the illuminating power of gas-flames has lost its significance, and that the determination of calorific power ought to take the place of the determination of illuminating power as the essential criterion of the value of gas.

The Commission then passed to the consideration of internal administrative matters, such as the increase of the members. The President cited the example of the electricians, who gave only one vote to each country, whatever the number of delegates. He proposed to give to each country as many votes as it had representatives. M. Brodhun pointed out that they could not come to a decision, as they had not the views of the societies of which they were delegates. Dr. Strache suggested that they discuss the number of members, and then the method of voting. To come to a decision relating to the unit of luminous intensity, it would be necessary to have the electricians associated with them. Dr. Colman thought it best to discuss first the method of voting, or to discuss both questions together. If the number of members was increased, the solution would depend on the number present. It would be the same if the number of votes was equal to the number of delegates. It would be otherwise if each country had one vote. M. Kuminsky said that the societies with which he was connected voted by countries. The President said that as certain decisions might have a commercial interest, it would be logical that the number of representatives be proportionate to the population. In any case, regard should be had to the importance of the countries. Dr. Colman opposed a vote according to the number of members present.

After further discussion, the Commission voted unanimously in favour of a vote by countries. They then passed to the consideration of the increase in the number of members. Dr. Strache proposed to leave it to the societies to send whatever number of delegates they pleased. It would be necessary to see what should be the financial contribution of each country. It would be logical for the societies to pay in proportion to the number of their delegates. Mr. Butterfield thought, however, that a limitation of the number of members would be useful. Dr. Eitner considered that the increase of numbers would lead to want of unanimity. It would be better to increase the number of delegates of countries which had but one, and even two per country was too few. M. Weiss said each country ought to be invited to send up to six

delegates. The contribution could be separated into two parts—one absolute for the country, and the other additional according to its commerce and population. Dr. Eitner thought it was not necessary to nominate more than six members per country. After further observations, the discussion was adjourned. The eventual decision will be found recorded below.

Friday, July 28.

The President showed the spectro-photometer of M. Thovet, of which a description is given on p. 359, after which Dr. Eitner said that nine years ago he had constructed an analogous apparatus. It was formed of an ordinary spectroscope; but the slit coincided with the limit of the two sight spaces of a photometer. When the lighting was equal, the limit disappeared. This was able to be effected by a suitable choice of the angle of two parallelipedes which were placed under the screen. The scale was visible at the same time as the spectra; the latter being seen as two rectangles touching one another. One saw at once in one slit of the eye-piece 1-50th of the length of the spectrum, or even 1-200th if necessary. The apparatus was made by Zeiss.

Dr. Strache having read his paper on "An Absolute Unit of Light," of which an abstract translation is given on p. 358, M. Weiss said he thought there was too much diversity in the sensibility of the human eye for a strict solution to be possible; one of the reasons, for example, being the varying fatigue of the eye for each colour. The proposal of Dr. Strache was, however, one for examination. M. Brodhun found it very difficult to agree upon the curve of sensibility of the eye with the wave length, so as to arrive at a practical solution. Much remained to be studied—that of the dark body not being finished. Dr. Strache said there was already progress, as actually everyone measured heterochrome sources by eye. The question was sufficiently important to go on with. Moreover, the distribution of energy in the spectrum of a dark body was now almost completely investigated. The President did not oppose the course indicated by Dr. Strache, but thought one would have to await better results from improvements in the spectro-photometers, as with them differences of shade and the fatigue of the eyes were no longer important. Certain investigations in the region of the spectrum could therefore be made. M. Brodhun thought it would be necessary to consider an analogous curve to that of Lummer, so as to reduce the relative results from different colours to only one of them. The President observed that towards the ends of the spectrum, the sensibility of the eye was rather weak, so that one need not know the curve with exactness. Also, each observer would read the curve of Lummer for himself. Dr. Strache said, in short, that he proposed to study: (1) The comparison of different regions of the spectrum between themselves; (2) the determination of the radiation of dark bodies; and (3) the construction of an apparatus. Dr. Eitner supported Dr. Strache, and thought a Sub-Committee should examine the question. The President said it was a rather special one to be sprung on National Laboratories. Dr. Strache added that, once formed, the Sub-Committee could themselves apply to National Laboratories. This was agreed to.

The question of the re-election of members was next raised by the President; and Dr. Eitner asked whether the Commission or the institutions would have the nomination of them. The President answered that it would be the institutions who would elect them after each session. Dr. Eitner fancied this might interfere with the continuity of their work; but the President thought otherwise, as the members interested would be re-elected. M. Deville remarked that it must be left to the institutions to arrange to be represented by old and new members. Dr. Eitner said he would hesitate to take part in the work of a Sub-Committee if he was not sure of re-election. Dr. Strache supported M. Deville, who said the Commission should be made up only of those active members elected for a single session.

Re-assembling in the afternoon, the President announced the results of the Sub-Committees which had been appointed—the one on "The Comparison of the Vernon-Harcourt, Hefner, and Carcel Standards," and the other on "The Substitution of Calorific Power for Lighting Power." The latter is given on p. 358. The former is as follows:—

The Sub-Committee, consisting of M. Vantier, President, and MM. Brodhun and Laporte, have calculated the modifications brought about in the relationship of the luminous intensities of the three lamps—Carcel, Hefner, and Vernon Harcourt—by the change in the atmospheric conditions of normal working of the Vernon Harcourt lamp, which was indicated in a letter of Mr. Glazebrook, Director of the National Physical Laboratory.

According to the terms of this letter, the normal atmospheric conditions for the working of the Vernon Harcourt lamp are: Height of barometer, 76 cm. of mercury; humidity, 8 litres of water vapour per cubic metre of dry air, instead of the conditions previously given: Height of barometer, 76 cm. of mercury; humidity, 10 litres of water vapour per cubic metre of dry air.

Using the co-efficient of 0.066 per litre of water vapour given by Mr. Paterson, the relative values accepted in 1907 become after this correction:

- Carcel = 10.75 Hefner remains Carcel = 10.75 Hefner.
- Vernon Harcourt = 10.95 Hefner becomes Vernon Harcourt = 11.10 Hefner.
- Vernon Harcourt = 1.020 Carcel becomes Vernon Harcourt = 1.035 Carcel.

And in calculating the table of double entry:

	Carcel.		Hefner.		Vernon Harcourt.
Carcel	1	..	10.75	..	0.965
Hefner	0.0930	..	1	..	0.0900
Vernon Harcourt.	1.035	..	11.10	..	1

The decisions of the Committees were unanimously adopted. Questions of internal administration were next discussed. The President called to mind that there had been agreement as to the increase in the number of delegates, but not as to their number. Herr Drehschmidt asked that he might prepare a scheme of regulations which could be submitted to the institutions of which they were delegates. The President said that this was exactly what they were discussing. Did they think they should state a maximum number of delegates for each country, that this maximum should be six, and that it ought to be the same for all countries? Dr. Eitner thought everyone was agreed to increase the number to six for those countries which had four, and to two or three for those which had one. M. Deville proposed to allow every country to have the same number up to the fixed maximum. It was eventually unanimously decided to adopt the numbers of six and three in place of six and two.

The question of re-election of delegates was then further considered. M. Deville said the institutions could be written to after each session that their delegates had practically resigned, and that they were invited to renominate them or appoint others. Dr. Colman said the duties of a delegate ought to go on from one congress to the next. If he worked, he would naturally be re-elected. M. Deville thought it was necessary to anticipate a revision by the technical institutions of the list of their delegates, and that after, or on the eve of, each session. Dr. Colman thought this revision ought to be after the sessions; and M. Weiss was of the same opinion. There was further discussion on the point; but no decision was arrived at.

Passing on to consider the question of funds, the President asked if an annual credit was necessary, or should they wait for a sum to be repaid. M. Deville was in favour of an annual allowance for current expenses, and in addition each session should have to provide a credit for research work. Dr. Colman said he was authorized by his Institution to promise their quota of the bureau expenses; but as regards other work, he had no authority. The President said it would be necessary to ask the technical institutions if they were agreeable to subsidize the work. Dr. Eitner said it would be necessary to decide this question in principle without having any particular work in view. M. Weiss thought it would be better to draw up beforehand a programme of work. On the President's suggestion, this matter was also left undecided and carried over to another session.

The subject of the admission of members representing electrical groups was then considered. M. Brodhun was in favour of it; but it was necessary to come to an understanding with the electricians. M. Laporte desired that the electricians and the gas engineers should agree on the same unit. In Germany, Dr. Eitner said, the gas engineers always consulted the electricians. The President said that in France, the *gaziers* were present on the Electro-Technic Committee.

The resolution proposed was: "The International Photometric Commission are of opinion that, for questions common to both gas and electrical industries, the electricians be invited to participate in the meetings." M. Deville thought the electricians ought to be invited for the whole session, when common questions would be considered. Dr. Strache said that as in each session the unit of light would be discussed, the electricians would be always invited. The President remarked that the presence of the electricians would be permanent perhaps, but facultative. The resolution was unanimously adopted with the addition suggested by M. Deville.

The next point raised by the President was the number of votes by which a decision could be obtained which might be described as emanating from the Commission. Unanimity could not be expected. He would willingly accept that it should be four-fifths of the members. Dr. Eitner saw no inconvenience from this; but a vote of the majority could not force a country to carry out the decision. The President said it was, however, necessary to decide on the effect of the decisions of the Commission, which might not be unanimous. Dr. Eitner supported the principle of the majority to decide if a scientific question had been sufficiently elucidated. The President put it to the vote; and it was decided that four-fifths should be required to carry the *imprimatur* of the Commission—that is, four-fifths of the votes expressed.

M. Deville raised the question as to the number of electricians to be admitted to the Commission. Dr. Eitner proposed one delegate from each country taking part in the International Commission of Electricians. The President said the International Commission of Electricians could be asked to send the number of delegates they thought fit. It was the Commission authorized by the technical societies that ought to give the invitation. M. Laporte gave the information that the International Electro-Technical Committees met only every four years. There would be too long to wait for the nomination of the electrical delegates. Mr. Butterfield suggested that when common questions arose the technical institutions would be able to decide that a certain number of gas delegates be replaced by electricians. The President thought this proposal would touch the dignity of the Commission, who ought to issue the invitations. The Commission decided that their bureau should invite the National Electro-Technical Committees of the International Commission to delegate one electrician

per country to take part in the discussions on all questions of common interest. The following morning (Saturday, July 29), this decision was modified by the President's suggestion, unanimously adopted, to invite two electricians for countries having six delegates, and one for those which have three delegates.

Saturday, July 29.

The question of the unit of intensity was discussed. Dr. Strache said that he was very glad that America, England, and France had agreed on the same unit; but for the moment it could not be accepted as international. He did not wish that the unit should be chosen under the form of an incandescent electric lamp, because the luminous rays were not alone interesting. He would like the new unit to be in simple relation to the Hefner, which could at the same time be maintained. As a simple proportion, 9/10 is admissible; but it ought to be sanctioned by the Commission. M. Brodhun said it seemed to him that they should first discuss the question of the nomenclature of the unit. The President said this would be difficult if they had not the elements on the other questions. M. Brodhun replied that the thing was simply to discuss this future denomination. Dr. Eitner said they were speaking only of the denomination, because they were satisfied that the new unit would be 1.1 Hefner. For England, nothing is changed; and they hoped it would be the same for France. They could not speak of the new unit as international, for they could not adopt it. The word "international" ought to be reserved for a new unit really adopted by all countries. A sub-committee could be nominated to try for the realization of an objective unit. One of the three names suggested—normal kerze, normal candle, standard candle—might be chosen. M. Brodhun, in the name of the Reichsanstalt and Electrical Committees taking part in the International Commission of Electricians, had to oppose the use of the term international unit. One ought not to diminish the sense of the word "international."

M. Deville inquired whether the height of the flame of the Hefner could not be increased a little, so as to increase its intensity about $\frac{1}{10}$ th, in order that the countries which used this standard might realize an intensity near to the unit. M. Brodhun said this would necessitate very long investigation. It would be necessary to re-make all the investigations into the Hefner to see what would be the effect of external conditions. Dr. Eitner said he had been engaged on the increase of the height of the Hefner flame, but this made the lamp a great deal less satisfactory, because the flame became much more changeable. The new standard thus effected would be much more difficult to reproduce than the old Hefner lamp. M. Deville said the Hefner could be used by bringing it a little nearer the photometer. Dr. Eitner replied that it could not be done, because the difference of 11 per cent. was too great. It was impossible for them to change the standard. In commerce, they would be compelled progressively to indicate the two units. Dr. Colman said English gas engineers would be glad of an agreement or an international unit; but they appreciated the point of view of the Austrians and Germans. They were not of opinion that the word "international" should be used—at least, not until it was unanimously decided upon.

In the name of the Institution of which he was delegate, he accepted the dimensions of the new unit. He advocated the name of "standard-candle," which they already had. Dr. Eitner said they could give three names to the unit: Standard-candle, standard-kerze, and standard-bougie. Dr. Colman thought the word "bougie" would lead to misunderstandings. It was not desirable to say "Hefner kerze" (candle), but "Hefner-einheit" (unit). If the Commission requested this change, it would be effected little by little. M. Brodhun said they could not arrive at a decision, because he did not know the opinion of the Reichsanstalt. In Germany, one talked at first of the Hefner light, and it was only after the congress of Geneva, when it was thought the Hefner was going to become international, that one spoke of the Hefner candle. In Germany, one said simply candle, and it would be difficult to make this practice disappear. But it might be considered. Dr. Eitner was of the same opinion as M. Brodhun; but he did not think there was any great confusion due to the word candle. Moreover, outside Germany, one always said Hefner and not Hefner candle.

M. Laporte said one did not always know, when reading a book, whether it was referring to a Hefner candle or a standard candle. It would be very useful to avoid these confusions by simply saying Hefner or Hefner unit. The same applied to English works. Dr. Eitner believed that in literature one said only Hefner candle. This did not lead to confusion. The President read a letter from M. Van Rossum and M. TERNEDEN, who said that the international unit ought to be voted by the Commission; but they did not think it would be practically realized. M. TERNEDEN said in Holland they used the Hefner kerze and the English candle, and they were not confused. M. WEISS said in Switzerland gas engineers and electricians used the word Hefner kerze, and there was no other denomination. M. BÖHM said in Italy they had the carcel and the decimal candle (*bougie décimale*) in the gas industry, while the electricians used the Hefner kerze. The President pointed out that Italy had adhered to the international candle. He thought that it was possible to arrive at a resolution giving satisfaction to the countries which had already agreed. This would indicate progress. He thought they should abstain from using the word international, which was something excessive at a time when Austria, Germany, and Switzerland did not accept it. It might perhaps be convenient to call the new unit, decimal. M. Brodhun

remarked that they recognized the advantage of a simple ratio between the Hefner and the new candle. As to the word decimal, he did not think that it ought to be used in view of the uncertainty of the ratio existing between a Violle unit and the new unit.

The President said the results of M. Violle had not shown important variations, as was thought. M. Violle had compared his unit to the Hefner, but previously to the tests on the Hefner by the Reichsanstalt—that is to say, when it had not been really well defined. M. Brodhun said he only wished to indicate the difficulties which might arise from the word decimal. The President said that if the new investigations made it possible to use the Violle unit, they would have perhaps to change the co-efficient by $\frac{1}{10}$ th. Dr. Strache said they had not to discuss the Violle unit. He preferred the word standard to decimal. The President said the word standard was not a good one for France. He preferred normal. A Sub-Committee would be appointed to consider the following points: (1) To take note of the agreement; (2) to recognize the progress; (3) not to use the word international; (4) to propose another denomination (two or three names); (5) to advise the separation of the words candle and Hefner.

M. Brodhun said they were in agreement on the first four points; but as to the fifth, he was not authorized to decide. It seemed difficult to change the denomination without changing the dimension. Dr. Eitner thought that his Society did not wish to change the word Hefner-kerze. There was no inconvenience in it outside Germany. M. Laporte did not share this view. In many instances there was confusion. The President proposed the Sub-Committee to consist of MM. Brodhun, Eitner, Colman, and Laporte.

In the afternoon, the President read the suggested resolution proposed by the Sub-Committee on the International Unit of Intensity. The resolution, unanimously adopted, is as follows:—

The Sub-Committee, consisting of M. Th. Vautier, President, and of MM. Brodhun, Colman, Eitner, and Laporte, propose that the International Photometric Commission adopt the following resolutions:

The International Photometric Commission take note of the agreement concluded between the National Physical Laboratory of England, the Bureau of Standards of America, and the Laboratoire Central d'Electricité of Paris, to maintain with a common accord a common illuminating unit, such as:

1 decimal candle = 1 English candle = 1 American candle, and that 1 Hefner unit be considered as 0.9 of this common unit.

They record that this agreement, to which the gas and electrical industries of a certain number of countries have adhered, realizes notable progress by reducing the number of units in use from four to two.

They consider that it would be better not to give the name international to a unit which has not been accepted by certain important countries.

They are of opinion that it would be convenient to give to this common unit in the different countries a name such as "standard candle" (*bougie normale*) or "decimal candle" (*bougie décimale*).

They express the wish that each of these units may not be described under the simple name of "bougie," "kerze," or "candle," but under the full name, in order to avoid confusion.

The President then read propositions made by M. Blondel in a recent number of the "Illuminating Engineer." These are reproduced on p. 360. Upon them, M. Brodhun said there was a mistake, as it was not with the decimal candle that the different standard lamps had been compared, but with the Carcel lamp. Further, it would be necessary in Germany to change the denominations which were already usual; and the Germans were tied by the decisions actually adopted by the electricians and gas engineers. In the place of "lux," one proposed "lumen per cm.²," and the "lux" was already generally used. One could also say "millilumen," but it was too long an expression. M. Laporte said it was better not to give a name to a unit of lighting in order to keep symmetrical with the radiation, but the term "decalux" might be introduced. M. Brodhun said the International Commission indicated by J_0 the average spherical intensity, while there was J_s . Further, why write either $\frac{dF}{dS}$ or $\frac{F}{S}$? Dr. Eitner associated himself with M.

Brodhun. There was an advantage in passing to the C.G.S. system; but was this advantage real, if a new unit was introduced? It was best to pause before coming to a decision.

The President proposed to take note of M. Blondel's proposition. A Sub-Committee would make a report on this question for the next session. It could take the opinion of the technical institutions. If the proposition was adopted, each would change his system a little; but that would be less important than the advantage of having established unification. Dr. Eitner said the replacing of the square metre by the square centimetre was only a question of calculation, but it was necessary to keep the "lux" which had entered into practice. Dr. Strache supported the proposal of the President because it was requisite to know the opinion of electricians. Dr. Colman also thought there should be a Sub-Committee. The President proposed a Sub-Committee of MM. Brodhun, Laporte, Kusminsky, Paterson, and Hyde. This was unanimously adopted. The Commission took note of the propositions made by M. Blondel in the name of the Illuminating Engineering Society.

The President said it remained to elect a Sub-Committee on

the proposal of Dr. Strache for the investigation of an "Absolute Unit of Light." Specialists were necessary. He proposed MM. Brodhun, Laporte, and Strache, and other delegates as may be chosen, or who desired to take part. Dr. Strache said, in addition to those named, they might have the assistance of MM. Kusminsky and Butterfield.

Dr. Eitner reported that M. Weiss would like a Sub-Committee to be formed to investigate the variations of the Hefner at altitudes. He could then prepare a programme and ask for a fund. It would be well to have colleagues who could easily reach Zürich, for example, MM. Ott and Eitner. Mr. Butterfield said he could prepare a programme in writing but could not be present. M. Deville said that M. Weiss could prepare the programme and give the date. The members who desired would be able to come. Dr. Eitner said it would be enough officially to authorize M. Weiss to make the investigations and to have collaborators for the purpose.

MM. Strache, Brodhun, Laporte, Kusminsky, Butterfield, and Hyde were appointed to this Sub-Committee.

The President then proposed that the next gathering should be in three, and not four, years. It was understood that, in case of urgency, the Commission could be called before then. It was agreed to meet in three years. The President then said: "I am glad to see that harmony has reigned among us, and I thank the members who have been good enough to come and contribute to our work. It may be hoped that this will be even better in the fourth session."

Dr. Eitner added: "Before we separate, I beg you to allow me to call your attention to the work done. We have succeeded so well, thanks to the goodwill of all, and to the labour of the President. I thank him in the name of all."

This concluded the third session of the International Photometric Commission.

THE PAPERS, &c., SUBMITTED AT THE PHOTOMETRIC COMMISSION MEETING.

IN last week's number of the "JOURNAL," pp. 288-90, there was reproduced the text of the paper read at the International Photometric Congress, at Zürich, by Mr. Butterfield—entitled, "Corrections for the Effects of Atmospheric Conditions on Photometric Flame Standards"—the joint production of himself, Dr. Haldane, and Mr. A. P. Trotter. This was the most extended written communication made to the meeting; but others were also submitted, and are here reproduced, either in full or in abstract.

METHODS OF PHOTOMETRIC MEASUREMENT.

By Professor Dr. EITNER, of Karlsruhe.

Since the labours of the Commission with regard to the question of photometric units have reached a certain conclusion by definitely establishing the ratio of their light intensity, the next task of the Commission appears to be to come to an agreement as to the methods of photometric measurement. A suggestion by Privy Counsellor Bunte, to request the delegates to report upon the methods usually employed in the various countries, in order to obtain a basis for possible standards, was approved of by the President; and I therefore undertook to report upon the methods used by us for the measurement of light.

In my opinion, the Commission has to consider—

- I.—The measurement of the intensity of light.
- II.—The measurement of illumination.

I.—THE INTENSITY OF LIGHT.

The intensity of light is always measured by comparison of the illumination or brightness produced by the source of light on a white diffusely reflecting surface, with the illumination or brightness produced by the unit of light or by an intermediate source of light of known strength on a surface of identical properties. The illumination of the two surfaces the brightness of which is to be compared is equalized by reducing the amount of light sent out by the stronger source; and the proportion of the light-intensities is calculated by the proportionate diminution of the stronger source of light.

The methods of diminishing the intensity of light for the measurements which have to be considered, are—

- (1) Alteration of distance (law of distances).
- (2) Alteration of angle of incidence (cos i — law).
- (3) Diaphragm (rotating sector discs and the like).
- (4) Optical diminution (smoke glasses, polarization, &c.).

The alteration of distance is the method most frequently employed, and exclusively with bench photometers, which are the most important type from the point of view of an agreement upon methods of measurement. Observations can be made according to two principles.

(a) The sources of light to be compared are fixed at the two ends of the bench at a constant distance apart, and the photometer screen is shifted between them till its two sides appear to be equally bright. This process affords the advantage that the sources of light need not be moved, and so can be kept free from vibration. There is, however, the disadvantage that the observations must be made with varying and frequently unfavourable illumination intensities on the screen. Values below 10 candles and above 80 candles become consequently insusceptible of measurement unless for these light-intensities benches of special and suitable length are used.

(b) The source of light to be measured is fixed at one end of the photometer-bench, and the standard source of light is rigidly fixed at a constant distance from the screen. The distance is so arranged that an illumination is produced on the screen at which the normal human eye is most sensitive for differences in brightness (about 10 lux). With the photometers of the Chemico-Technical Institute of the Technical High School at Karlsruhe, the illumination produced by the standard source of light is exactly 10 lux (distance of light unit from screen $\frac{1}{\sqrt{10}}$ m. = 31.6 cm.). In this case,

when adjusting the screen for equal brightness on both sides, one has simply to multiply by 10 the square of the distance (measured

in metres) of the source of light which is being tested from the photometer screen, in order to find its light-intensity.

This method makes it possible to measure any intensity of light, however great, with the same most favourable illumination of the screen. The disadvantage is that using the standard light direct for comparison, the Hefner lamp has to be shifted together with the screen and flickers. For very exact observations, it is therefore necessary to replace the Hefner lamp by an electric intermediate source of light which, if worked below normal power, produces 10 lux. The lamp must be supplied with an absolutely constant electric current of definite voltage, if possible from an accumulator battery exclusively used for this purpose. The current is adjusted by a resistance with small temperature constant, and can be measured to an accuracy of 0.1 per cent. An alteration of the current by 0.1 per cent. corresponds to an alteration of light-intensity by 0.4 to 0.5 per cent. with carbon filament lamps. The ratio is less favourable with metal filament lamps. The measurement of tension at terminals, instead of current, does not exclude grave errors, and can therefore not be recommended.

The measurement of large light-intensities requires, with this method, very long photometer-rooms (measuring in length for 1000 candles about 11 metres, with a length of photometer-room of 15 metres), and arrangements for moving the photometer-table along its axis, in order to obtain the proper distance from the source of light to be measured. The method yields, however, the most accurate results. If the Hefner lamp is first put at the end of the photometer instead of the source of light to be measured, and is compared with the intermediate standard, and subsequently, after removal of the Hefner lamp, the light is measured, a substitution process is obtained which eliminates all errors of the photoped, and therefore permits the most certain measurements. This method is generally used at the Chemico-Technical Institute of the Technical High School at Karlsruhe, and at the Experimental Station of the German Association of Gas Engineers.

PHOTOPEDS.

For exact measurements, only those photopeds are employed where the fields of vision are in direct touch, and not separated by a dark line. The photopeds of Lummer and Brodhun and of Martens comply with this requirement. If the colour of light is quite equal, the "photometer for equality and contrast" (Lummer and Brodhun) is employed. For the measurement of light of different colours, intermediate standards with interposed coloured glasses are used, which mitigate the colour contrast. The observations are here taken by the substitution method. It is important in the case of all photometers that the fields of vision to be compared should have a minimum apparent size of 4 square centimetres. In exceptional cases, the flicker photometer is used for the comparison of sources of light strongly differing in colour.

DISTRIBUTION OF LIGHT INTENSITY IN SPACE.

(a) *Mean Horizontal Light-Intensity.*—The simple measurement of the light-intensity in one direction is in most cases insufficient for the determination of the efficiency of a lamp. For lamps having an axis of symmetry, and showing the highest intensity in the vertical plane through its centre, the mean light-intensity is often determined in this plane, and is called the "mean horizontal light-intensity." It is assumed that the axis of symmetry is vertical (as in upright incandescent gas-burners). For the measurement of mean horizontal values, the axis of symmetry is put in vertical position, and observations are taken in ten directions of the horizontal plane, differing from each other by 36°, by turning the burner 36° after each observation. The average of the ten measurements is the mean horizontal value. In the case of electric incandescent lamps, the axis of symmetry can also be put in a horizontal position or parallel with the axis of the photometer bench. By mirrors which rotate around the lamp in a vertical plane, the light emitted by the lamp at right angles to the axis of symmetry can be reflected on the photometer screen; taking care that the direct light is cut out. Allowing for the coefficient of reflection of the mirrors, the mean horizontal light-intensity of the lamp can be obtained direct by this method.

(b) *Vertical Distribution of Light-Intensity.*—For the valuation of lamps, the distribution of light in space in the vertical plane

is very important. This is determined by measuring the light-intensities in a plane through the axis of symmetry at various angles by means of angle photometers or mirrors. The results are plotted in the known manner in polar curves. If the lamp has different values in different planes of symmetry at the same angle of radiation, the mean value for each angle must be determined in the same manner as the mean value for the horizontal plane. These mean values are used to plot the distribution curves.

(c) *Mean Light-Intensity in Space*.—For the measurement of the total light effect of a lamp, the mean space light-intensity is determined. This can be calculated from the values obtained under different angles of radiation, by multiplying these values by the magnitude of the corresponding spacial angles, and dividing the sum of these products by the total spacial angle. If the values at the angles $\alpha_1, \alpha_2, \alpha_3 \dots$ measured against the axis of symmetry which is assumed to be vertical, and whose direction below corresponds to the angle 0° , and if, further, the angle distances of the different directions of measurement are each equal to the n th part of the total plane angle ($= \frac{2\pi}{n}$), then the mean spherical light-

intensity is represented by the recognized formula—

$$J_s = \frac{\pi}{n} \sum J_a \times \sin \alpha.$$

In similar manner, the mean hemispherical light-intensity for the lower hemisphere J_{su} , and for the upper hemisphere J_{su} , can be calculated by adding up products from 0° to 90° and from 90° to 180° respectively, and dividing by half the spacial angle.

The lower hemispherical value would therefore be—

$$J_{su} = \frac{2\pi}{n} \sum_{\alpha=0}^{90} J_a \times \sin \alpha$$

and the upper hemispherical value

$$J_{su} = \frac{2\pi}{n} \sum_{\alpha=90}^{180} J_a \times \sin \alpha.$$

This method of calculation of the spherical light-intensity from the data of observation at various angles can be employed with all kinds of lamps, and is to be recommended. For electric lamps, integrating instruments may also be used—for instance, the spherical photometer of Ulbricht. But their constants have to be redetermined from time to time.

II.—ILLUMINATION.

The illumination of a surface is measured by placing in the position to be examined a white diffusely reflecting surface, and comparing its surface brightness with that of a similar surface which is illuminated by the standard lamp or another source of light of known intensity, and the illumination intensity of which can be measurably altered. When both surfaces appear to be equally bright, the illumination is equal, and the illumination intensity produced by the standard can be read off. For these measurements are employed the street photometers of Weber, Krüss, and Brodhun, the illumination meter of Martens, and the universal photometer of Beechstein. The accuracy of these instruments must be checked by comparison with known illumination intensities.

The unit of illumination is one lux—i.e., the illumination produced by the unit of light, the Hefner candle, when radiating upon a surface at right angles from a distance of a metre. In order to obtain the mean horizontal illumination of a room (say) at table height, the plan of the room is divided into sections of a form and size which allows a calculation of their area, and the illumination of which will show small differences only at various points when measured, so that the value obtained for the centre of each section can be taken as its average without appreciable error. The area of each section is then multiplied by the illumination value found for it, and the sum of all these products is divided by the total area of the room. The figure obtained is the mean horizontal illumination of the room for the plane of a definite height. When measuring the illumination of streets and open places, it is usual to plot the results on the plan, and connect points of equal illumination by curves.

A SUGGESTION IN REGARD TO INVESTIGATIONS ON AN ABSOLUTE UNIT OF LIGHT.

By Dr. HUGO STRACHE, Professor at Vienna.

The distribution of energy in the spectrum of an absolutely black body is known. The distribution of light in this spectrum can be determined with ordinary photometers. The proportion of the energy in a ray of particular wave-length to which the eye is sensitive as light can thus be ascertained. Lummer has determined on these lines the curve showing the sensitiveness to light of the eye as a function of the wave-length. A means is thus afforded of obtaining an objective photometric method, and of finding a basis for a unit of light expressible in terms of absolute measures.

If the rays of light from any source are allowed to fall on a radiation measurer, the red rays have a far more powerful action than the blue. The maximum effect on the eye, however, occurs in the green. Consequently, the action or effect of light cannot be determined by a simple radiation measurement. If, however, only that portion of the red radiation which corresponds with the

effect on the eye is allowed to fall on the photometer, by screening off the corresponding portion of this radiation, and seeing how this corresponds for any wave-length to the relation established by Lummer's curve, a value is obtained for the radiation in the energy measured which is proportional to the effect of light on the eye.

It is only necessary, in order to make such a measurement, to resolve the light into a spectrum, and by the interposition of a diaphragm to reduce the red waves and the blue waves so that they correspond with Lummer's curve, collect the rays together again by means of a cylindrical lens, and allow them to fall on an apparatus for measuring radiation. The diaphragm should therefore be cut so that it corresponds with Lummer's curve.

In this manner, the illuminating intensity is expressed in terms of absolute measures, such as calories. All the difficulties attendant on the photometry of lights of different colours are avoided by this method. A comparison of the effect of different colours on the eye must, however, have been once for all carried out; and this has already been done by Lummer. This difficulty occurs only in the first instance when the curve of the sensitiveness to light of the eye is being established. It will, however, differ for different eyes. But the mean from a great number of observations by different people can be taken; and finally a conclusive international agreement could be reached as to the form of this curve, representing expressly the sensitiveness to light of an average eye. Once such a curve has been agreed upon, photometry would be possible in which the eye would no longer be employed as a means of observation. The illuminating intensity being, with such a photometer, expressed in terms of absolute measures, it follows that the unit of light can be also similarly expressed, and that flame standards with their disabilities will no longer be required, but the unit will instead be expressed on the C.G.S. system.

Having regard to the importance of this question, the author proposes to move the appointment of a Sub-Committee to report to the International Photometric Commission whether they regard the attainment of this end in the manner indicated as practicable, and what measures should be adopted to achieve a definite solution of this question.

NOTE ON A METHOD OF FACILITATING THE SETTING OF THE HEIGHT OF THE FLAME IN THE HEFNER LAMP.

By Dr. HUGO STRACHE, Professor at Vienna.

It is well known that it is of great importance, when using the Hefner lamp, to set the height of the flame very exactly; and, moreover, the proper setting of the flame in exact observations must be constantly controlled by a second observer. In order to avoid this evil, a thermo-couple connected with a milli-voltmeter, and consisting of two superposed crossed wires, is employed at a height of 5 mm. above the tip of the flame—that is, 45 mm. above the base of the flame. The height of the flame is set in the first instance by exact observations, and the deflection on the milli-voltmeter is read. In subsequent observations, the indication of the milli-voltmeter is referred to in order to obtain a more rapid and a more exact reading than that of the direct reading of the height of the flame. When the tip of the flame is blown even very little to one side, the deviation of the milli-voltmeter becomes considerably less. Photometric measurements have, therefore, to be made at the moment when the deviation is at the maximum. If the thermocouple is connected with a mirror galvanometer, the maximum deviation can be observed by an optical signal. If the thermo-element is connected with a relay which closes a circuit having a strong current, an acoustic signal can be arranged for the correct setting of the Hefner lamp. Only one observer will then be necessary.

FLAME TEMPERATURE AND INCANDESCENT LIGHTING POWER.

By Dr. HUGO STRACHE, of Vienna.

M. Sainte-Claire Deville has shown by a very interesting and wide research on maximum illuminating power that, by the use of different mixtures of gas in an incandescent burner, its illuminating power is nearly in proportion to the heat of the combustion of the gas. It is clear from these investigations that the variations are nearly 15 per cent., if gas is used containing a great deal of hydrogen and having a low calorific power. The production of light is better with these poor gases.

Dr. Mayer has made similar investigations with ordinary burners having no artificial incoming air. The same result was arrived at—namely, that mixtures rich in hydrogen produce a better effect per calorie used, but that the variations are so slight that in practice it can only be said that there is a relationship between illuminating and calorific power. In his researches, the variations are nearly the same as in those of M. Sainte-Claire Deville.

It may now be shown what are the results obtained by adding carbonic acid to the gas instead of hydrogen or carbonic oxide, because this undoubtedly lowers the temperature of the flame. The experiments were limited to the use of burners without artificial incoming air, as this corresponds to the conditions under which the gas is used in practice. The best method would have been to choose for each gaseous mixture the suitable burner and mantle giving the best results; but then really comparable values would not have been obtained. It was, therefore, necessary to carry out the series of tests with the same burner and the same

mantle, and in each case to arrive at the best return by means of an adjustable opening. The gas pressure was kept constant. It was always 30 mm. On the contrary, the amount of gas and of air were regulated so that the maximum efficiency might be attained. This adjusting was freshly done for each test. Both vertical and inverted incandescent burners were used.

The investigations made in common by Dr. Fritz Kropf and myself gave the results set forth in the tables below. They show that the presence of carbonic acid in the gas has a very important effect on the amount of heat given out in the incandescent burner per candle and per hour, to such an extent that in many cases double the amount of heat had to be used as compared with gas free from carbonic acid. So that, if the investigations of M. Sainte-Claire Deville and Dr. Mayer have shown that the yield becomes better if the calorific power of the gas is lowered by the addition of hydrogen or carbonic oxide, the present investigations indicate that the yield becomes a great deal less favourable if the calorific power of the gas is reduced by the addition of carbonic acid. The two facts are explained by the changing of the temperature which is produced by the changing of the volume of the flame. Hydrogen diminishes the volume of the flame, and thereby raises the temperature. Carbonic acid, on the other hand, diminishes the volume of the flame and considerably reduces its temperature. There is thus put in evidence the great influence of the temperature of the flame on the illuminating power of the gas in incandescent burners; and it can no longer be said that there is a proportion between calorific power and illuminating power, if it is a question of gas of very different flame temperature.

In conclusion, tests were made with gas having its flame temperature lowered by the addition of carbonic acid, but the calorific power of which had been restored to the same value by carburetting. Both after being carburetted with benzene, and with acetylene, the effect of the carbonic acid showed itself by reducing the efficiency.

INVESTIGATIONS ON THE EFFECT OF CARBONIC ACID ON THE EFFICIENCY OF INCANDESCENT GAS BURNERS.

By Dr. HUGO STRACHE and Dr. FRITZ KROPF.

Coal gas from the Vienna municipal works at Simmering was used. This gas contained carburetted water gas. Its gross heat of combustion varied between 4800 and 5300 calories per cubic metre. So as to have gas of constant composition for each series of tests, it was collected in a special gasholder, and mixed with varying quantities of carbonic acid. In order to have a gas free from carbonic acid, it was led through a mixture of quicklime and caustic soda. Otherwise, the precautions were as indicated above.

TABLE I.

CO ₂ .	Consumption, Litres at 0° and 70 mm.	Gross Heat-ing Power, Calories per M ³ .	Horizontal Lighting Power, Hefners.	Gas Consumption per Hefner-hour.	Heat Given off per Hefner-hour.
0°0	123	5335	114	1·08	5·78 Cal.
3°8	130	5140	119	1·11	5·71
11°2	145	4760	91·6	1·58	7·46
21°0	175	4255	75·4	2·32	9·85

TABLE II.—Small Vertical Burner.

0°0	73·6	4844	64·0	1·13	5·46
2°9	79·0	4740	62·9	1·17	5·55
7°5	84·0	4522	59·1	1·42	6·42
11°0	92·4	4356	60·5	1·53	6·66
16°6	87·5	4090	46·5	1·88	7·20
25°8	98·5	3670	38·9	2·52	9·25
33°4	128	3300	31·6	4·05	13·37

TABLE III.—Inverted Burner.

0°0	74·5	4820	77·9	0·96	4·62
3°0	77·4	4680	78·5	0·98	4·58
10°8	70·0	4315	60·3	1·17	5·05
14°2	69·0	4155	49·0	1·41	5·87
17°8	79·9	3986	52·4	1·53	6·11
24°3	85·5	3683	44·9	1·91	6·85
28°2	88·2	3520	35·3	2·50	8·80

TABLE IV.—Small Vertical Burner—Gas Carburetted with Benzene.

6°0	75	4810	54	..	6·68
10°0	84	4940	54	..	7·69
15°6	81	4600	46	..	8·10

TABLE V.—Small Vertical Burner—Gas Carburetted with Acetylene.

3°5	72	4830	63	..	5·51
9°4	72	4860	60	..	5·82
12°0	80	4830	56	..	6·90
18°7	81	4800	55	..	7·07

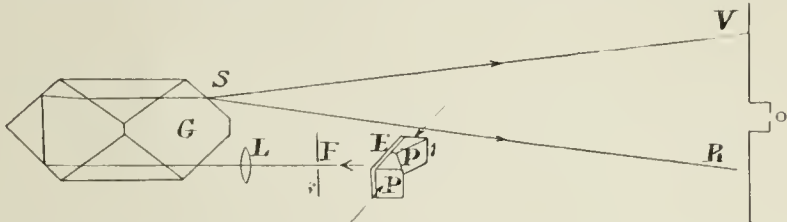
The calorific power was ascertained by means of the Jünkers calorimeter. The average illuminating intensity was ascertained by the Lummer-Brodhun photometer.

A TECHNICAL SPECTRAL PHOTOMETER.

By J. THOVERT.

The comparison of the brightness or relative intensity of sources of light in the different colours of the spectrum is of fundamental importance. In technical laboratories, spectral photometric measurements are still but little used. This is due to the spectral photometer being, generally speaking, complicated, costly, and troublesome to handle. The apparatus about to be described was constructed in order to provide the technical man with an instrument almost as simple in character as the ordinary photometer, and manipulated in the same way on the photometer bench, with the exception that the observations have to be repeated for the different colours of the spectrum.

The construction of this apparatus depends on the following facts: The eye looking at the spectrum produced by an apparatus for decomposing the light, sees the whole field of the instrument in the colour in which the rays reach the pupil. If this is a photometric field of vision—i.e., if the sum of the adjacent zones maintains different illuminations—the brightness will be comparable in the same colours, and after changing the position of the eye in the spectrum, the different colours can be observed. This result is obtained in the author's apparatus by the arrangement shown diagrammatically in the accompanying sketch. The transparent photometer screen E receives through the totally



reflecting prisms P P¹ the different illumination of the sources of light which are to be compared, and which are set up at the sides. There is placed on that side of the screen a horizontal slot F, an objective L, and a decomposing lens G, formed of a pentahedric prism, which serves to give the ray of light its original direction, and consequently avoids obstruction. The arrangement is such that the image of the slot F, owing to the passage through the prism, is seen dispersed over the whole height V R. At "o" there is a cap with a small opening, against which the eye is placed, and the field will be seen in one colour in any colour varying from red to violet, according as the position of the cap is shifted between R and V. The field is observed as two adjacent zones, of which the brightness is equal by shifting the instrument between the two sources of light under comparison as in ordinary photometers. The eye-piece can be provided with a glass adapted to the observer's sight; for the rest the field of vision appears, owing to the greater distance at a somewhat small but sufficient angle for the observer.

The maximum illumination is obtained when the whole opening at "o" is used by the pupil. In a model which was exhibited, a rectangular slot 3 mm. by 2 mm. has been used as the opening for the eye, and admits of a very satisfactory utilization of the pupil. The width of the slot in F depends on the dimensions and arrangements of the optical parts employed. The observation of the spectrum is the more exact the wider is the distance between R and V. The eye-piece, in consequence of the law of prismatic decomposition, will obtain from a more or less extended field of radiation, rays of a particular colour which can be indicated according to the wave-length, thereby admitting of direct readings being made. In consequence of the great extent of the blue radiation, and the small brightness of sources of light at the ends of the spectrum, the observation at wave-lengths of less than 0·50 μ becomes difficult.

In order to facilitate observations, a second slit has been made at F, three times wider than the first. This can be shifted by a rack. At O, the ordinary eye-piece is replaced by a small telescope giving slight enlargement which shows at its eye-piece the part of the spectrum bounded by a rectangular opening 9 mm. by 6 mm. Thus the observations can be extended as far as is required. In practice, spectral photometric measurements may be regarded as satisfactory if they are made at equal intervals of time in wave-lengths ranging from 0·48 μ to 0·68 μ . The two observations at 0·48 μ and 0·5 μ are obtained by using a sighting piece of greater brightness, in place of the ordinary diaphragm. Obviously, smaller instruments can be constructed on the same principle for less exhaustive observations. A half-size model would probably suffice for technical purposes, and would be lighter and handier than the pattern hitherto made.

The ratio of the sizes would be reduced by using a simple sighting piece in such a manner that the spectrum is decomposed into three principal zones—viz., red, green, and blue. There would thus be obtained a three-coloured spectrum, which can be applied to any photometer. This simplified decomposition into the colours can only be used on sources of light with a continuous spectrum, and is not sufficient for the observation of such lights as those of flame arc or mercury vapour lamps.

PHOTOMETRIC DIMENSIONS AND UNITS.

The question of photometric dimensions and units has been discussed by physicists at different times. It was the principal topic of a somewhat important discussion at the Congress of

Electricians in Geneva in the year 1896. At that time, as a result of a report of M. Blondel, the Chief Engineer of Bridges and Roadways, a system was worked out having as its basis the bougie-décimale, the metre, and the second. The bougie-décimale was then supposed to be represented with sufficient exactness by the Hefner unit. Since that time, different changes have taken place, among which stands foremost the agreement between the National Laboratories of the United States, France, and England, on the use of a so-called international candle common to the three countries, which, by a happy coincidence, has almost the same value as the bougie-décimale. [It is well known that the bougie-décimale, or Violle candle, is the twentieth part of the platinum unit as defined by M. Violle, and that it was adopted in 1889 by an International Congress of Electricians at Paris as a photometric unit.]

The comparison of the Hefner unit and the Vernon-Harcourt candle with the bougie-décimale was, on the other hand, the matter of very exact measurements by the different National Laboratories. The results of these measurements were adopted by the International Photometric Commission at its session in 1907. These measurements have shown that the Hefner unit is equal to 0.90 of the international candle; so that all measurements which have been made in Germany with the Hefner unit can easily be converted into international units. It appears to the experts of the different countries that the time has now arrived to bring the international system and the photometric dimensions again into unison. This matter had been taken up in the year 1910 in the United States by the Illuminating Engineering Society, under the Presidency of Dr. Alex. C. Humphreys. A Special Sub-Committee for Photometric Units, consisting of Mr. Sharp (President), M. Blondel, Messrs. Kenelly, Nichols, and Rosa, have worked out a series of definitions which are given in the table attached to the report of the Illuminating Engineering Society in November, 1910. [For further particulars as to the report here referred to, see "JOURNAL," Dec. 27, 1910, p. 931.]

These definitions deviate very little from those which had been formerly adopted at Vienna. The centimetre has been preferred to the metre as a unit of length in order to make the system more universally international in character, as the Anglo-Saxon countries have not yet adopted the metric system but only the c.g.s. system. On the other hand, the international candle has been adopted as the unit. The definition of specific radiation which M. Blondel had brought forward at Geneva, but which was not adopted there, has been reinstated. Practice has shown that this specific radiation is quite usable. Finally the introduction of the centimetre as the unit of length has led to the lux, or candle-metre, giving place to the lumen per square centimetre, as a unit of illumination. This unit has the advantage that it carries its own definition with it.

A NOTE ON ILLUMINATING ENGINEERING NOMENCLATURE.

By Professor A. BLONDEL, of Paris.

[From the "Illuminating Engineer," May, 1911.]

The remarks on the above subject of a correspondent in a recent number of the "Illuminating Engineer" (March, 1911, p. 176) lead me to make a few comments on illuminating engineering nomenclature. I beg to protest against the proposed introduction of a so-called "secondary unit" of intrinsic brilliancy, and for several reasons.

(A) The unit is quite useless since the Sub-Committee on Units have already defined "intrinsic radiation" (as I had previously done at the International Electrical Congress at Geneva in 1896) as the quotient of the luminous flux emitted by a surface by the radiating area of the surface. It is easy to see that when this is

applied to a diffusing surface of albedo unity the intrinsic radiation is exactly equivalent to the illumination (*éclairage*) expressed in lumens per square centimetre. For example, an ideally white surface absorbing absolutely no light, placed at a distance of 1 metre from, and facing, a source of light yielding one candle, receives 1 lumen per square metre, or one ten-thousandth of a lumen per square centimetre. This last figure, therefore, is also a measure of its intrinsic radiation. If one presumes that the diffusion follows the law of Lambert, the intrinsic brilliancy presented to the eye, at an angle β to the normal, will be—

$$\frac{1}{10,000} \times \frac{\cos \beta}{\pi} \text{ candles per sq. cm.}$$

If the albedo is less than unity, if it is equal to $1 - a$ let us say, a being the coefficient of absorption, the intrinsic brilliancy becomes simply—

$$\frac{1 - a}{10,000} \cdot \frac{\cos \beta}{\pi} \text{ candles per sq. cm.}$$

If, on the other hand, the surface does not follow the Lambert law, but some complicated function of the angle of emission of the form $f(\beta)$, the intrinsic brilliancy finally becomes—

$$\frac{(1 - a) \cdot f(\beta)}{10,000 \cdot \pi} \text{ candles per sq. cm.}$$

All this is quite clear and serves both to show the utility of the physical quantity "intrinsic radiation," and at the same time to demonstrate the futility of introducing a secondary unit.

(B) The secondary unit proposed (or "surface brightness"), also presents the fundamental defect of being based purely and simply on two suppositions—namely, that the albedo is unity, and that the surface follows the Lambert law. In the previous propositions I have not made any assumption of this kind, and the last formula is completely general and applies whatever the nature of the surface.

(C) Moreover, in my opinion, there is no special scientific desirability to distinguish between light emitted by a self-luminous surface and light radiated by a diffusing illuminated surface. On the contrary, it is preferable to treat both alike as sources of light.

(D) The word "surface brightness," has no special meaning attached to it, and does not satisfy any new need. The "intrinsic radiation," on the other hand, does correspond with an actual practical want—namely, the desirability of expressing the total flux of light emitted by a luminous surface which does not comply with the law of Lambert. In general, one measures intrinsic brilliancy in a direction perpendicular to the surface; but this does not suffice to define completely the emissive power of a source. The intrinsic radiation, on the other hand, does enable us to express the total luminous efficiency.

I hope that these remarks will serve to show that the propositions of the Sub-Committee are the result of well-founded deliberations; and, without pretending that they are above criticism, I yet do not consider that they require modifications on the lines suggested by "An Engineering Correspondent."

There are, however, a certain number of accessory photometric quantities which it would be desirable to add to the existing list, with a view to facilitating the comparison between various sources of light. Some such quantities are summarized in the accompanying table. These various symbols need not be included in an official list at present, and may be taken into consideration at a later stage. They should, however, commend themselves to those interested in the technicalities of the subject. It may also be suggested that their tentative use would help to promote a much needed international uniformity in publications on illuminating engineering, and would be of value in supplying precise definitions of the physical quantities on which this subject is based.

Physical and Practical Characteristics of Sources of Light.

J_{ϕ}	=	MEAN SPHERICAL LUMINOUS INTENSITY, expressed in international candles.*
J_r	=	MEAN HORIZONTAL LUMINOUS INTENSITY, expressed in international candles.
c_{\max}	=	INTRINSIC BRILLIANCY (<i>Eclat Intrinsèque</i>) measured in the direction of maximum intensity and expressed in international candles per sq. cm.
P	=	POWER CONSUMED by a source,† expressed in watts (a portion of which is dissipated by radiation, and the remainder by conduction and convection).
P_{ϕ}	=	POWER CONSUMED PER CANDLE (or specific consumption of power), expressed in watts per international spherical candle.
$R = \int_0^{\infty} R_{\lambda} d\lambda$	=	TOTAL POWER RADIATED by a source, expressed in watts. (R is the power emitted by a source in the form of radiation of wave-length comprised between 0 and ∞).
$R_e = \int_{\lambda=0.4\mu}^{\lambda=0.8\mu} R_{\lambda} d\lambda$	=	AVAILABLE USEFUL POWER for lighting purposes, expressed in watts (radiation comprised between the limits of wave-length 0.4μ and 0.8μ).
$\frac{R_e}{R}$	=	RATIO BETWEEN THE USEFUL POWER AVAILABLE FOR LIGHTING PURPOSES, and the TOTAL POWER RADIATED (or radiant efficiency).
$\frac{R_e}{P}$	=	RATIO of the USEFUL POWER AVAILABLE for lighting purposes and the TOTAL POWER CONSUMED by a source.
$\frac{R_e}{J_{\phi}}$	=	MECHANICAL EQUIVALENT OF LIGHT, expressed in watts per international candle.
$\frac{Q}{J_{\phi}}$	=	TOTAL HEAT DISSIPATED PER HOUR, expressed in gramme-calories.
$\frac{Q}{J_{\phi}}$	=	TOTAL HEAT DISSIPATED PER HOUR, PER CANDLE, expressed in gramme-calories per candle.

(*) The symbol is furnished with a horizontal projecting bar to avoid all confusion; either with a zero or with an ϵ .

(†) This power or energy consumed per second by the source of light can be calculated, for flame sources, by multiplying together the quantity of combustible burned per second by the calorific heat and the energy equivalent of the calorie.

MODERN DIESEL OIL-ENGINES.

In view of the increased attention now being given by gas managers to the above-named engines—from the fact that, as shown by the paper published in the "JOURNAL" for the 11th ult. (p. 106), they will be the means of utilizing some of the residual products of gas manufacture—it may be of interest to reproduce portions of a paper giving particulars of these engines, submitted by Mr. F. SCHUBELER, of London, at the Institution of Mechanical Engineers meeting held in Zürich a fortnight since.

The author began by reminding his audience that it was the original intention of the inventor of the Diesel engine to burn coal direct in the working cylinder. This, however, proved to be impossible, as the unburnt residues could not be removed. Consequently, only oils, and these of composite properties, would be used as fuel. He then went on to say that the propositions made by different designers for dealing with liquid fuel varied principally in the arrangement of the air-pump and the construction of the fuel-valve. For instance, Haselwander and Trinkler used the working cylinder, so to speak, as the first stage of the air-pump by extracting air during the compression stroke from the former as soon as a certain pressure (about 100 lbs.) was reached, and only producing the differential pressure for the injection air (700 lbs. to 900 lbs.) in the actual air-pump. Haselwander had his air-pump combined direct with the working piston by a differential arrangement; whereas Trinkler provided a special air-pump in the cylinder cover. Other designers proposed an intermediate process between those of the ordinary gas-engine and the Diesel engine. Thus Sabathé advocated compression up to about 300 lbs., and artificial ignition of part of the fuel. The Brons motor, as still carried out by the Gasmotoren-Fabrik Deutz for smaller units, has similar features.

Generally, however, it can be stated that most of the above-mentioned propositions have disappeared, and some have not even been carried out; all of them giving place to the Diesel principle with the following characteristics: Compression in the working cylinder up to the ignition temperature of the fuel (about 500 lbs. or about 1000° Fahr.), and creation of the pressure of the injection air (600 lbs. to 850 lbs. per square inch), by means of which the fuel is introduced atomized into the cylinder in an independent multiple-stage air-pump. It is only natural, said the author, that the development of this principle caused some difficulties in the beginning. In the hitherto known steam-engine, the working process takes place partly in the boiler and only partially in the working cylinder. The boiler, which has no moving parts, deals with the heaviest part of the process, and furnishes the working fluid in a refined state to the working cylinder; whereas with the Diesel engine the whole process has to be dealt with in the working cylinder. That it has been possible, within a comparatively short period, to develop this engine to such a degree as to enable it to compete successfully with the steam-engine also for large units, is proof of the present-day skill and thoroughness of engineering. Mr. Schubeler stated that, as regards reliability, the Diesel oil-engine can now be considered as fully equal to the steam-engine; it being only a question of economy in each individual case which of the two prime movers takes preference.

There was one principal difficulty which had to be overcome. The extreme high pressures and temperatures of the Diesel process put a limit to the dimensions of the cylinders, which will hardly exceed a diameter of 30 inches. This corresponds to an approximate cylinder output of 300 to 400 H.P., assuming 150 revolutions per minute of the shaft and the ordinary Otto cycle. Theoretically there would be nothing in the way to obtain any desired output by arranging any number of cylinders side by side. Practically, however, it is not advisable to provide for more than six cranks, as a larger number would produce an inadmissible twisting of the shaft. Furthermore, such units require a great amount of space, and would become extremely costly.

These reasons called forth the necessity of seeking other means by which to increase the specific cylinder output of the ordinary single-acting Otto-cycle engine. For this there are the following possibilities: (1) By carrying out the single-acting Otto-cycle machine as a double-acting one; (2) by adopting the single-acting two-stroke cycle working process; and (3) by adopting the double-acting two-stroke cycle working process. The double-acting Otto-cycle cylinder under the first possibility corresponds approximately to a doubling of the cylinder output. Almost the same result can be obtained by the procedure under the second, which, however, necessitates, as will be explained later on, the provision of special scavenging pumps. The solution under the third possibility would theoretically even quadruplicate (in fact, about 3.4) the output of the ordinary Diesel engine cylinder, and mean the adoption of the usual working process of steam-engines also for the oil-engine.

The author tried to throw a little more light on the foregoing solutions, in order that their respective advantages and disadvantages might be seen. He explained that the subject had not developed so far as to permit any definite statement with regard to which of the solutions would be ultimately adopted for the large Diesel units. It had, however, been ascertained that for smaller and medium size units the single-acting Otto cycle took the preference—this involving the smallest working strain on the cylinder. Though this type of engine necessitates a more or less frequent

cleaning of the internal parts, especially of the exhaust-valves, the author said he was informed that such machines had worked for periods of six to eight weeks without interruption, even in cement factories and in mills. He then proceeded to make the following remarks.

The normal type of the single-acting four-stroke cycle engine is a vertical one with trunk piston and without special crosshead. This has not only the advantage that the wear and tear of the piston is very slight, but also others with regard to the construction of the fuel-valve and the symmetric shape of the combustion chamber. The space required is comparatively small, which is frequently to-day an important advantage, and permits of good utilization of the foundations upon which the enormous free forces of the cylinders are transmitted vertically. The horizontal type, which is carried out by various firms, is specially suitable where small heights are essential, and resembles in its construction that of the normal gas-engine. The free forces are more awkward to deal with, and some difficulty also arises with regard to the formation of the combustion chamber and the introduction of the fuel into the cylinder.

The author proceeds first with the single-acting two-stroke cycle engine. The first trials with a Diesel engine of this type were made some ten years ago. Owing, perhaps, to the choice of too small an output, and also some other inadequacies, this first attempt was not repeated for some time. It may be useful to recall some of its principal features. An exhaust-valve is dispensed with; the piston uncovering (at the end of its outward or downward stroke) slots arranged in the cylinder wall through which the burnt gases escape from the cylinder. By means of a special scavenging pump, an air pressure of about 4 lbs. is produced. This lightly compressed air enters the cylinder through a valve arranged in the cylinder cover, drives the burnt gas out of the cylinder, and fills the latter again with a new charge of air as soon as the piston in its upward motion covers the slots. The air-valve being closed, the air is compressed as in the ordinary Otto-cycle engine, and also the fuel introduced in the same way at the end of the upward stroke. The whole process of driving out the gases and the refilling of the cylinder takes place within a very short time at the end of the outward or downward stroke. The length of the slots is about one-fifth of the stroke. With the ordinary Otto-cycle machine, two entire strokes are available for this process, giving, however, thus only half the number of impulses which can be obtained with the two-stroke cycle type.

As to the two-stroke cycle process, this is the same as the well-known one employed with the highly-developed gas-engine of Körting or Oechelhaeuser. It will be seen from the following that it is even more suitable for the Diesel engine. The two-stroke cycle gas-engine scavenges also at the stroke end with fresh air; the difference, however, being that already at this stage of the process the combustible mixture is introduced into the cylinder by a special gas-pump, and this even before the exhaust slots are entirely closed. It therefore cannot be avoided that part of the combustible gases escape unused in the exhaust—creating thereby a possible danger for the engine. With the Diesel engine, the fuel is only introduced at the end of the compression stroke; thus preventing any losses of fuel and danger of pre-ignition. The Diesel engine has, furthermore, the advantage that the rather bulky and power-absorbing gas-pump can be dispensed with. It has also been ascertained that two-cycle gas-engines show an increased fuel consumption at partial loads; whereas the two-stroke cycle Diesel engine has, with smaller load, consumptions which only differ slightly from those obtained by normal load.

With regard to the fuel consumption in general, it must, of course, be expected that the consumption of the two-cycle engine is somewhat larger with respect to the effective output than for the single-acting Otto-cycle engine. This must amount at least to the percentage of the energy absorbed by the air-pumps. There must also be another increase due to the short clearing and filling process of the cylinders, which does not allow as perfect a scavenging as with the four-cycle engine. With the latter under its worst conditions, about 7 to 10 per cent. of the cylinder volume (representing the compression space) is liable not to be fully replaced by fresh air.

As a main advantage, it may be mentioned that the turning moment is much more favourable; and consequently the revolving masses for obtaining a certain degree of cyclic variation are much lighter. The two-cycle engine furthermore guarantees a better starting and better conditions for regulation, which is specially important for direct coupling with alternators. The space required is considerably smaller, and the engine is also lighter, and therefore cheaper. To give a figure, the difference in price between an ordinary single-acting four-cycle and a single-acting two-cycle engine for a capacity of 1000 H.P. already amounts to from 25 to 30 per cent., which figure would have to be considerably increased if larger units were compared. Furthermore, the consumption of lubricating oil is somewhat smaller per horse power, as the same cylinder and bearing dimensions are sufficient for producing about double the output.

It still remains for reference to be made to the chief advantage of the two-stroke engine—that is, the elimination of the exhaust-valve (or two with larger units). Some difficulties cannot be avoided with the latter, as soon as it attains larger dimensions. Generally speaking, the fewer working parts coming into contact with the hot gas the better. The scavenging-valve (or valves) in the cylinder cover may be dispensed with. Only some of the cylinder slots are then used as exhaust slots; the remainder,

on the opposite side, being utilized for the introduction of the scavenging air. A special shape is given to the top of the piston to guide the current of air and guarantee a thorough removal of the burnt gases. The scavenging-valve is thus removed from the high temperatures, and only the fuel-valves and starting-valves are exposed to them.

It is self-evident that, for the continually advancing engineer, the problem of the double-acting Diesel engine was attractive, especially as he already had excellent models in the gas-engine, for which the stuffing-box problem may be regarded as solved. On the other hand, it must be admitted at once that with the Diesel engine the conditions to be dealt with are much more unfavourable, only to mention the higher pressure. It will therefore be preferable to avoid the difficulties with the stuffing-box in the first instance, and to develop the new type on the lines of the single-acting four-stroke cycle engine; this all the more as the gain in output is practically the same.

To go at once to the double-acting two-cycle engine without first gaining experience with the single-acting engine, seems to the author not to lie in the course of a natural development, and to be somewhat risky. As to the design of an engine of the latter type—viz., the double-acting two-stroke engine—this favours the provision of a special crosshead and also the horizontal arrangement. This being so, it may be derived from gas-engine and steam-engine practice that, for the support of the pistons, a rear stuffing-box with bearing support for carrying the weight of the pistons has to be provided, which is certainly far from being desirable. In addition, great inconvenience is caused by the piston-rod having to pass through the combustion chamber, and necessitating an eccentric introduction of the fuel. The combustion process must therefore be far more unfavourable, and the construction of the valve-gear more complicated. The proper setting of the two compression clearances on both sides of the piston is not so simple as with the single-acting engine, where, by a shortening or lengthening of the connecting-rod, the compression can be proportioned to any amount desired. With the double-acting machine, a compromise has always to be made; and the length of the piston-rod has to be provided for an average compression on both sides.

The constructive details of the various types of Diesel engines may be described together, as a large number of the component parts remain the same whether used for one type of engine or another. This applies especially to the fuel-pump, fuel-valve, air-pump, piston, &c. The air-pumps are to-day generally carried out as two-stage or three-stage piston-pumps with inter-coolers. Whereas smaller units have, as a rule, an air-pump attached to each cylinder, driven by a lever from the connecting-rod, it is a general practice to provide for larger units one large common air-pump producing the injection air for three or more cylinders. The pump may be arranged either horizontally or vertically at one end of the bed-plate. This arrangement reduces the number of engine parts to be controlled, and also the first cost. The valves are generally metallic ones, which alone are able to stand the high temperatures.

For lubricating the cylinders, special small oil-pumps—that is, one for each cylinder—are provided. For bearings, connecting-rods, &c., forced lubrication is generally advocated. The pump for the forced lubrication is driven direct from the shaft, and may be a piston or cog-wheel pump. The motors fitted with forced lubrication are totally enclosed; the dripping oil being gathered in the bed-plate, and sucked up again by the pump after having passed through filters and coolers. Oil-holes are bored in the shaft and connecting-rods, which take the oil from the bearings up to the respective crosshead pins and other places where lubrication is required. The cylinders are always cooled—the pistons only from a certain size upwards.

For piston cooling, several solutions are possible; in most cases, a telescopic arrangement being provided. The disadvantage of this solution is the necessity of providing a stuffing-box to prevent leaking water getting into the plate and mixing with the lubricating oil. A very simple arrangement for cooling the piston, which does not require any stuffing-box, and the working of which is absolutely reliable, deserves mentioning. With this arrangement, the water does not entirely fill the cooling space of the piston; the water being only squirted against the highly-heated surfaces, and draining off through a pipe which surrounds the spray-pipe. By this arrangement all additional pressures and strains are eliminated. Some firms use oil for piston cooling. This may have some advantages; but, on the other hand, it has the disadvantage of a smaller cooling effect, owing to the smaller specific heat and the smaller coefficient of transmission of this liquid.

With regard to the regulating process of the Diesel engine, in practically all types the fuel-valve is operated through levers and rollers by cams fixed on a side shaft, which open the valve during from 10 to 15 per cent. of the stroke, irrespective of load. The amount of fuel allowed by the regulator for any specified load accumulates around the fuel-valve spindle in a space filled with the highly-compressed air, which at the opening of the spindle forces the oil through an atomizer into the cylinder. At smaller loads, the regulator acts upon the fuel-valve in such a way as to reduce its quantity. The fuel-pump has a constant stroke, and the regulating of the fuel quantity takes place by the governor acting upon the suction-valve, through which part of the fuel thus flows back into the suction-chamber. If a greatly reduced oil quantity is delivered to the fuel-valve, or, in other words, at small loads, it may happen that no ignition is effected, probably on

account of the great air surplus extinguishing the forming flame. To avoid this, the air pressure has to be reduced at smaller loads, which is done by hand in the case of smaller engines. Should this regulation be forgotten, no danger arises from the engine; the result being only a decrease in the number of revolutions until the regulator again delivers a somewhat increased fuel quantity. For larger engines, and especially where the conditions for synchronizing are more stringent, the regulation of the injection air is done automatically by the regulator.

A question which is of the greatest interest both to the manufacturer and to the client is the choice of fuel. It is certainly very surprising that the results of chemical analyses of different fuels do not furnish exact information with regard to the suitability of the fuel for Diesel engines, so that this can only be decided by the actual tests. It happens that oil of a certain composition is quite satisfactory, whereas another of an absolutely similar consistency is unsuitable. It may be stated here that there is a large selection of cheap liquids available, the most important being crude mineral oils and mineral oil residues (crude naphtha, mazout), gas oils—that is, the intermediate products of oil refineries from which the lightest constituents, such as benzine and petroleum have been distilled—and the gas-oil tars of water-gas works. More recently it has been found possible to utilize the bye-products of the distillation of coal and paraffin, tar, solar, and paraffin oil. Explosions or danger of fire on account of the high flash-point are eliminated; and any quantities of such fuel may be stored without danger, and without being subject to the restrictions made by law.

The various working conditions of Diesel oil-engines naturally require different types. The piston speed is generally between 600 and 1000 feet per minute; and it cannot be reduced below a certain limit, as otherwise the slightest leakage could prevent the compression attaining the required amount. It can, however, be as low as 180 to 200 feet per minute for continual service.

For standard slow-speed single-acting four-cycle engines, the number of revolutions lies between 150 and 300 at the respective capacities of 1000 to 1500 H.P. These engines have the best fuel consumption, but have also the disadvantage that they are heavy and expensive. For this reason, a single-acting multiple-cylinder high-speed four-stroke cycle engine was created, which is especially suitable for direct coupling to dynamos. The speed varies between 220 and 350 revolutions per minute at units varying between 1000 and 100 H.P. These high-speed types, if suitably designed and carried out by first-class manufacturers, are just as reliable in service as the slow-speed ones. They have, however, a slightly higher fuel consumption. On account of their smaller first cost, they are especially suitable where the Diesel engine is intended as a stand-by. Single-acting two-stroke engines, with outputs ranging between 700 and 3000 H.P., are carried out with speeds of 160 to 140 revolutions per minute.

The author next dealt with the application of the Diesel oil-engine for ship propulsion, and concluded as follows: One word is required as to the thermal conditions of the engine. The calorific efficiency may attain 30 to 40 per cent.; 25 to 30 per cent. is lost in the cooling water; the rest is contained in the exhaust gases. Of the latter, about 20 per cent. can eventually be utilized for heating purposes; and in adding also the heated cooling water, the total efficiency of a Diesel unit may go up to 80 per cent., which is certainly remarkable. With regard to the actual costs per B.H.P. hour, in assuming a fuel price of 50s. per ton (which is certainly an outside figure), this will amount to about 0.11d. to 0.13d., or about 0.16d. to 0.2d. per kilowatt-hour. These are the figures maintained during actual service, assuming, of course, that the engines are kept in good condition.

RADIATION IN EXPLOSIONS OF COAL GAS & AIR

By W. T. DAVID, B.Sc., of Trinity College, Cambridge.

[Abstract of a Communication to the Royal Society.]

This paper contains the results of experiments on the radiation emitted by mixtures of coal gas and air during explosion and subsequent cooling carried out in the Engineering Laboratory at Cambridge. In the first part, measurements of the total radiation emitted by gaseous mixtures of various strengths and densities are given; and the second part consists of an investigation into the transparency and emissive power of the hot gaseous mixtures after explosion.

The gaseous mixtures were exploded in a plain cylindrical cast-iron vessel 30 cm. in diameter and 30 cm. in length, and were in all cases ignited by means of an electric spark in the centre of the vessel. Into one of the end covers there was screwed a gun-metal tube, which carried at its inner end a plate of diathermanous substance (a plate of fluorite was generally used), and behind it was placed a platinum bolometer with a blackened surface. The bolometer thus received all the radiation from the hot gaseous mixture which was transmitted through the plate of diathermanous substance. In order to measure the heat received by the bolometer, its rise of electrical resistance was measured. The galvanometer, whose deflections were proportional to the rise of resistance of the bolometer, was of low period, and carried a light concave mirror by means of which a spot of light was focussed

on to a revolving photographic film rotating at a known speed. Thus a continuous record of the rise of resistance of the bolometer, and therefore of the heat received by the bolometer, was obtained. At the same time, and on the same film, a continuous record of the pressure of the gaseous mixture was also taken by means of a Hopkinson optical indicator.

The main results obtained from the experiments are:

PART I.

When mixtures of coal gas and air of various strengths, at atmospheric density, are exploded in the vessel when its walls are blackened over with a thin layer of dull black paint.

(1) The total amount of heat lost by radiation to the walls of the vessel up to the moment of maximum pressure is roughly proportional to the product of the third power of the maximum absolute temperature attained into the "time of explosion."

(2) The total radiation lost to the walls during explosion and subsequent cooling is about 25 per cent. of the heat of combustion of the gas present in the vessel.

(3) The emission of radiation in the initial stages of cooling after explosion is a function of the time from ignition as well as of the temperature. The emission varies very rapidly with the temperature and the time from ignition.

(4) In weak mixtures (and probably also in strong mixtures) the rate at which radiation is emitted is a maximum some time before the attainment of maximum pressure, and probably occurs at the moment when the flame fills the vessel.

(5) Weak mixtures radiate much more powerfully in the initial stages of cooling after explosion than stronger mixtures do when they have cooled to the temperatures as the weaker mixtures have in this epoch.

(6) Carbon dioxide emits radiation about twice as strongly as an equal volume of water vapour at the same temperature does.

In explosions of mixtures of the same strength but of various densities.

(7) The total heat lost by radiation per cent. of the heat of combustion of the gas present in the vessel up to the moment of maximum pressure decreases as the density increases.

(8) Denser mixtures emit radiation much more strongly than thinner mixtures—especially at the moment of maximum pressure and in the initial stages of cooling. The emission varies approximately as the square root of the density.

PART II.

The following results refer to experiments made in a vessel of the same dimensions whose walls were silver-plated, and therefore could be made reflecting or absorbent at will. The experiments were made with the bolometer placed at some distance behind the plate of fluorite, so that the emission was measured from a cone of gas of small solid angle.

(9) The intrinsic radiation from a gaseous mixture at any given temperature after explosion depends largely on the reflecting power of the interior surface of the explosion vessel, and also on the size of the vessel. The greater the reflecting power, or the greater the size of the vessel, the greater the intrinsic radiance. This effect is probably due both to greater vibratory energy and to greater transparency of the gas in the larger vessels and in the reflecting vessels.

(10) (a) Gaseous mixtures after explosion in a vessel with reflecting walls are very highly transparent to the radiation which they emit at maximum pressure and throughout cooling. (b) Gaseous mixtures after explosion in a vessel with black walls are very highly transparent at the moment of maximum pressure and also in the initial stages of cooling. Later on in the cooling, they become fairly opaque.

[(11) to (14) refer to coal gas mixtures of same strength but of different densities.]

(11) The ratio of the intrinsic radiance from a definite thickness of gaseous mixtures of the same strength at any given temperature when the walls of the explosion vessel are reflecting to that when the walls are black, decreases as the density increases.

(12) When the walls of the explosion vessel are black, the transparency of a thickness of gas inversely proportional to the density at any given temperature increases as the density increases.

(13) (a) The intrinsic radiance from a definite thickness of gaseous mixture at any given temperature after explosion in the vessel with black walls varies as the square root of the density. (b) The intrinsic radiance from thicknesses of gas inversely proportional to the density varies as the fourth root of the density.

(14) The intrinsic radiance corrected for absorption from $1/D$ cms. of the gaseous mixtures at any given temperature in the vessel with black walls seems to decrease as the density (D) increases.

(15) The radiation (after correcting for absorption) from the hot gaseous mixture after explosion varies with the temperature approximately as Planck's formula for a single wave length of 3.6μ . This at high temperatures ($1800^\circ \text{C. abs. to } 2400^\circ \text{C. abs.}$) varies approximately as the square of the absolute temperature.

Many of the above results may be explained in terms of the following theory. A molecule, as it describes its free-path, loses energy owing to the emission of radiation, and gains energy owing to the absorption of energy from the ether; and the vibratory energy of the molecule will increase or decrease according as the absorption is greater or less than the emission. During collision with another molecule, there will be a transference of energy between the vibratory energy and the rotational and translational

energies, which, as Mr. Jeans has shown, will be very rapid if the duration of collision is comparable with the periods of vibration of the molecule. In the case of carbon dioxide and steam at high temperatures, the duration of collision between the molecules is probably short in comparison with the periods of their low-frequency vibrations; and the vibratory energy of the molecules will, therefore, tend to take up during collision a value such that the energy in each of the vibratory degrees of freedom equals that in each of the rotational and translational degrees. During collision, therefore, the vibratory energy of the molecules will tend to take up a value which is proportional to the absolute temperature; but during the free-path there may be considerable departure from this value if the energy density in the ether is above or below a certain value, and the time of description of free-path is not very short. The average value of the vibratory energy of the molecules will, therefore, depend not only upon the temperature of the gas, but also upon the value of the energy density in the ether, the rate at which the molecules emit radiation, the time of description of free-path (inversely as the density of the gas), and the rate of partitioning of energy during collisions. From result (4), it is highly probable that the violence of combustion during explosion causes a considerable part of the energy of combination to pass into the form of internal vibrations of the carbon dioxide and steam molecules. Part of the energy in these vibrations is lost by radiation; but the greater portion is transformed into rotational energy and translational or pressure energy.

CORRESPONDENCE.

[We are not responsible for opinions expressed by Correspondents.]

The Publicity and Special Purposes Committee of the Institution of Gas Engineers.

SIR,—I have pleasure in informing you that, at the meeting of the Bradford City Council held yesterday, the recommendation of the Gas Committee to contribute, upon the 2s. 6d. basis, to the Publicity and Special Purposes Fund of the Institution of Gas Engineers was agreed to without opposition and confirmed.

CHAS. WOOD.

Bradford, Aug. 2, 1911.

SIR,—In your issue of the 1st inst., the name of this Company is included in the list of undertakings promising support to the Publicity and Special Purposes Fund. It will perhaps prevent misunderstanding if you permit me to point out that my Directors have promised support only to the Special Purposes section of the Committee's work.

F. M'LEOD, Secretary,
South Metropolitan Gas Company.

709, Old Kent Road, S.E., Aug. 2, 1911.

Corrosion of Service-Pipes.

SIR,—I had expected that my previous letter on this question would be the last with which I need trouble you. The somewhat remarkable letter from Mr. M'Leod in your last issue, however, claims some reply.

It would be as easy as it is tempting to follow Mr. M'Leod in the somewhat acrimonious tone he has contrived to give to this discussion. Personalities have, however, no attractions for me. Whether any other of your readers has discerned any traces of "irritation, lack of candour," or undue consideration of "personal dignity," I do not know. But I am quite certain that they were not present to my own mind. It is well to remember that abuse is not argument. It merely betokens a weak case.

The question at issue really resolves itself into this, Is it a misnomer to speak of a subsoil admittedly containing acids as acidiferous? To my mind, the question only admits of one answer.

May I, in conclusion, remind Mr. M'Leod that two of the most elementary maxims of controversy are: (1) Never impute unworthy motives to your opponent; and (2) give your opponent credit for the same sincerity which you claim for yourself. Both these are transgressed in his last letter.

Leeds, Aug. 3, 1911.

WALTER HOLE.

Belfast Gas-Works Report.—When the minutes of the Gas Committee came before the quarterly meeting of the Belfast County Borough Council, Mr. Curley said he was glad to find that the report on the gas-works for the past year (*ante*, p. 122) had been so satisfactory; and he hoped in future, after the necessary changes had been carried out at the works, they would have even more gratifying reports.

The Pipe-Contract Dispute at Lincoln.—At the meeting of the Lincoln City Council last Tuesday, the Mayor (Mr. C. H. Newsum), alluding to the recent action by the Staveley Coal and Iron Company, said it had been argued that it was not the Corporation's business to go into the Law Courts at all; but he differed. They did not go into Court until they were absolutely certain of the case; and then they owed a duty to commercial morality. They had won the case because justice was on their side; and there were two men in particular to whom the citizens owed a debt of gratitude. He referred to their Town Clerk (Mr. W. T. Page), and the Water-Works Engineer (Mr. N. M'K. Barron). Mr. Milner, while agreeing with everything the Mayor had said, thought a great deal of credit was due to the man who tested the pipes at the other end, because had it not been for him the action might possibly not have been brought.

PARLIAMENTARY INTELLIGENCE.

HOUSE OF LORDS.

The following further progress has been made with Bills:—

Read a second time and committed: St. Helens Corporation Bill.
Bills reported: Halifax Corporation Bill, Ipswich Corporation Bill, Margam Urban District Council Bill, Rotherham Corporation Bill, St. Helens Corporation Bill.

Bills read the third time and passed: Belfast Corporation Bill, Gloucester Corporation Bill, Ipswich Corporation Bill, Local Government Provisional Orders (Gas) Bills (Nos. 1 and 2).

HOUSE OF COMMONS.

METROPOLITAN WATER BOARD (NEW WORKS) BILL.

After the second reading of this Bill on Monday last week,

Mr. EMMOTT (the Chairman of Ways and Means) moved: "That the Standing Orders relative to the committal stage of Private Bills be suspended, and that the Bill be ordered to lie upon the table."

Mr. NIELD, who had given notice of motions for the rejection of the Bill, and, in the event of its being read a second time, for its re-committal, said the County of Middlesex had very serious objection to the measure unless some protection was afforded to those whom they represented. The district in which it was proposed to construct reservoirs Nos. 6 and 7 was mainly occupied by cottagers and small holders who required an ample supply of water if they were to carry on their business at all. There was a danger that the wells upon which they depended would be deprived of water by the pumping operations necessary in the construction of these reservoirs; and all the Middlesex County Council asked for was protection to persons living within two miles against any temporary interference with their water supplies caused by the works.

Mr. MILLS remarked that during the construction of the reservoirs pumping operations would be necessary, and their effect would be to abstract the water from the wells in the surrounding neighbourhood. What he desired was that the Water Board should be compelled to insert in the Bill a provision that compensation should be given to the owners of such wells. He asked the House to re-commit the Bill in order that it might be arranged that the proposed reservoirs should be placed in situations in which they would be as useful and as cheaply constructed as they would be in the positions now indicated, and that they should not interfere with a pretty reach of the Thames.

Mr. J. WARD said the proposed works were subsoil reservoirs, and therefore must be placed in a low-lying area. The average depth of the trenches to be formed would be about 30 feet. The experience he had gained during many years of work beside the Thames led him to believe that there was not the slightest ground to fear the dangers suggested by the honourable members who had spoken. The desire appeared to be to put as many obstacles as possible in the way of the Water Board. Speaking with practical knowledge, he did not believe that any of the suggested works would have the dire effects honourable members had imagined. He had listened to much of the evidence given before the Committee who had considered the Bill, and he thought that the proposals now in it were reasonable, and carried with them no danger to private interests.

Mr. BURNS said the Bill had been before a Joint Committee, by whom it had been under discussion from March to June. A large number of witnesses gave evidence, and 64 petitioners were heard. Originally, the proposal was for eight reservoirs on the banks of the Thames. The Water Board were well advised in withdrawing the proposal for No. 8, and later Nos. 2, 3, and 4 were struck out by the Committee. In the result, only three of the eight reservoirs remained; and those nearest the river were not to be proceeded with. The objections to the Bill were quite general. No specific injury had been shown, and no particular danger proved. The Middlesex County Council alone were complaining; but, as they could not give any evidence of damage, why should the Water Board and the public be put to unnecessary expense? On mere allegations of the possibility that somebody might be injured, and without any evidence, it was not fair that the vast undertakings of the Water Board should be further handicapped. He appealed to the House not to hamper the Board's operations, and defer works which were necessary in order that London might enjoy a cheap, permanent, and continuous water supply.

Mr. JOYNSON-HICKS said the right honourable gentleman had no right to make a point of the fact that five of the eight original reservoirs had been withdrawn. This was done because they ought never to have been included; and assuming that the Committee were right in striking them out of the Bill, it was an act of folly to have included them. It had never been suggested that the reservoirs were going to be filled by subterranean water, but that during the period of their construction the underground water would be temporarily drained for a considerable distance. It was admitted by the promoters of the Bill that this would be the case; and he contended that if damage should occur, the House ought to see that adequate compensation was provided for the benefit of the people who were dependent on the water for their livelihood.

After some remarks by Mr. GLYN-JONES and Sir FREDERICK BANBURY, Mr. Emmott's motion was agreed to.

The following further progress has been made with Bills:—

Lords Bills read a second time and committed: Gas Orders Confirmation Bills (Nos. 1, 2, and 3), Rhondda Urban District Council Bill [Lords].

Lords Bills reported: Gas Orders Confirmation Bills (Nos. 1 to 4), Merthyr Tydfil Corporation Water Bill, Rhondda Urban District Council Bill.

Lords Bills read the third time and passed: Gas Orders Confirmation Bills (Nos. 1 and 3), Kingston (Hull) Corporation Bill

UXBRIDGE GAS ORDER.

Gas-Mains and Steam-Rollers.

The Gas Orders Confirmation (No. 4) Bill, which includes a Provisional Order promoted by the Uxbridge Gas Company, came before the Select Committee of the House of Commons presided over by Sir EDWIN CORNWALL on Aug. 3.

Mr. C. C. HUTCHINSON, K.C., and Mr. PADDON appeared for the promoters; and the petitioners opposing the Bill, the Hertfordshire County Council, were represented by Mr. HONORATUS LLOYD, K.C., Mr. TYLDESLEY JONES, and Mr. G. HALSEY.

Mr. HUTCHINSON explained that the Order provided for an extension of limits of supply of the Uxbridge Gas Company, and for empowering the Company to maintain, continue, and enlarge existing gas-works and to supply gas in the parishes of Flaunden and Sarratt, in Hertfordshire, and the parishes of Chenies, Amersham, Penn, Little Missenden, Great Missenden, and part of Hughenden in Buckinghamshire. The Hertfordshire County Council were petitioning for a protective clause, which should save them from liability for any loss or damage caused by, or arising out of the reasonable exercise of, their powers or duties as a road or bridge authority. This the promoters were willing to concede them in principle; but the point in dispute was as to the interpretation of the word "reasonable." The County Council desired it to be enacted that the use by them of a steam-roller or other engine not exceeding 15 tons in weight should be deemed to be not an unreasonable exercise of their powers or duties. The promoters could not admit this at all. Up to 1906, the Company had exercised their powers in relation to the breaking-up and making of roads under the Gas-Works Clauses Act, 1847. In 1906, however, when the Company came to Parliament for an extension of area, the Middlesex County Council submitted that the traffic had so changed—that it had become heavier and more frequent, that it consisted so much of motors and traction-engines and so forth—that the provisions of the 1847 Act were hardly applicable to the present day. Parliament was convinced, and put upon the Company a clause (No. 54 in their 1906 Act) which gave to the County Council protection in addition to what they had under the Act of 1847. The Middlesex County Council had had five years' experience of this, and had found it satisfactory. It was proposed in the Bill to give the same protection to the Buckingham and Hertford County Councils. The former were satisfied, but not the latter, who demanded greater protection than Middlesex, where the traffic was much heavier and more frequent. The House of Lords Committee had decided that the Hertford County Council's demand was unreasonable [*ante*, p. 182], and he hoped a like decision would be come to in this House.

Mr. Harry Jones, examined by Mr. PADDON, said he had had special experience of gas undertakings in Hertfordshire, Buckinghamshire, Middlesex, and Essex, extending over forty years. He had never known any friction or trouble to have been occasioned by gas companies and local authorities working under the Gas-Works Clauses Act of 1847. He had always been able to satisfy the surveyors, and had never been before the Justices on the question of laying pipes, &c.

Mr. HONORATUS LLOYD, in cross-examination: Are you aware that the Hertford County Surveyor told the House of Lords Committee that the roads have a weak foundation?

Witness: If so, he must be careful what weights pass over them.

Assume that the roads have a weak foundation, we use steam-rollers of 12½ tons and sometimes 15 tons, and you are yet willing to lay your pipes therein?—I am subject to the opinion of the Justices whether I am deep enough to be safe.

And you want to cast upon the County Council the burden of paying you damages in the event of the pipes being broken?—If they have been using a steam-roller of a particular weight, I know the road has a solid foundation, and that therefore I would be safe there. If a similar roller to that which has been used is brought to the roads again, and used reasonably and fairly, then I do not mind.

I want to be able to maintain my own roads with a 15-ton roller as in the past?—I dispute that a 15-ton roller is a reasonable instrument. A 6-ton roller is now more usual.

In re-examination, witness said that all the Company wanted was to prevent the County Council using appliances in an unreasonable manner, and of an undue weight in certain cases. If one of the Company's pipes were broken, the question to be decided by the Courts would be whether there had been reasonable user of the road.

Mr. Charles Carpenter, the Chairman of the South Metropolitan Gas Company, in reply to Mr. PADDON, said he was familiar with the conditions under which gas undertakings round London were carried on. The Gas-Works Clauses Act, 1847, had been found satisfactory. The situation was briefly that if a gas undertaker laid his mains in a road having regard to the traffic that obtained prior to his laying them, with all due care, and in the way the latest knowledge and practice dictated, and if a steam-roller of any weight broke the mains, then the question to be decided was whether the mains were properly laid or whether the steam-roller had been improperly used. But if the clause asked for by the Hertfordshire County Council was granted, with its provision that the use of any steam-roller or other engine which did not exceed 15 tons in weight should not be deemed to be an unreasonable exercise of the road authority's powers and duties, it would stop the Court from considering whether the use of the road was reasonable or unreasonable. Thus, however well the pipes were laid, the Company would be unable to get any redress from the Court. He regarded the use of 15-ton rollers as a retrograde step. The South London local authorities were using lighter rollers, and found them more satisfactory. The effect of the clause would be to deprive the Company of their common law right by stopping the Courts from deciding what was reasonable or unreasonable. Under certain circumstances, the use of even a 5-ton roller might be unsafe on a road with a weak foundation—for instance, after a flood, frost, and thaw.

Mr. HONORATUS LLOYD, cross-examining: Suppose the road has a weak foundation, and the Company, knowing the whole of the facts, ask to be allowed to lay mains, no matter at what depth, under certain conditions it may be unsafe?

Witness: Yes.

Suppose the Justices decide 3 feet, that you lay the pipes at this depth, and they are injured, then you want the ratepayers to pay you? —Yes; because the County Council ought not to use a steam-roller under such conditions.

Mr. HUTCHINSON said he did not think the Hertfordshire County Council required any more protection; but he was willing, if the Committee thought fit, to allow them the following clause:

The County Council shall not be liable for, or in respect of, any damage or injury to any mains, pipes, or other works of the undertakers laid down or constructed under the powers of this Order in or on any highway, or bridge, or the roadway over a bridge, or the approaches thereto, caused by the reasonable use of road-rollers and other road plant, or resulting from reasonable exercise by the County Council of the powers vested in them.

Mr. HONORATUS LLOYD intimated that he did not intend to call any witnesses on behalf of the County Council, but would confine himself to stating their case. The Company, he said, were asking for the privilege of coming into Hertfordshire and laying their mains in the roads. These roads had weak foundations, and the County Council used upon them 12½-ton and 15-ton steam-rollers. Being warned that those were the existing conditions, the Company nevertheless asked for the privilege of laying mains, and to be under the common law only. He submitted that, under all the circumstances, it was only reasonable that the protection of the limit of weight should be allowed the Council. What harm could this 15-ton condition do? So far as the clause the Company offered was concerned, he would rather have it than nothing; but it did not go far enough. To his mind, the clause was worth very little. He doubted whether it was worth sufficient to justify the alteration of the general law.

The CHAIRMAN: The Committee do not think you require any special protection at all.

The Committee found the preamble of the Order proved; and the Bill, without amendment, was ordered to be reported to the House for third reading.

SWANSEA GAS BILL.

House of Commons Committee.—Wednesday, Aug. 2.

(Before Sir EDWIN CORNWALL, Chairman, Sir WILFRED LAWSON, and Mr. RONALD M'NEILL.)

The Swansea Gas Bill, introduced in the Lords, came to-day before a Committee of the House of Commons, constituted as above. The Bill was strongly opposed in the Lords by the Swansea Corporation, who now appeared merely in relation to the adjustment of a clause; a settlement on the merits having been arrived at.

Mr. HUTCHINSON, K.C., Mr. TYLDESLEY JONES, and Mr. SZLUMPER represented the promoters; and Mr. VESEY KNOX, K.C., and Mr. REES WILLIAMS appeared on behalf of the Swansea Corporation.

Mr. HUTCHINSON explained that the Bill enabled the Company to increase their capital, and authorized the compulsory acquisition of lands for gas purposes. The opposition was directed to the question of the lands; the capital asked for having been granted in the other House. It was conceded by the Corporation that the Company must have land powers of some kind; the existing works being now very cramped. It was absolutely essential that the Company should be able to put up works which would hereafter provide for turning out something like double the present output. The Company proposed to extend the existing site by acquiring the property which bound the works on the Wellington and Bathurst Streets sides. The Corporation did not object to this. The Company also proposed to ask Parliament to authorize for manufacturing purposes a piece of land known as Vetch Field, a short distance from the existing works; this having been purchased by agreement some years ago. The other House passed this clause in face of the opposition of the Corporation. The promoters, however, as fellow-townsmen, had since recognized that there might be something in the Corporation's objections, and had agreed not to use Vetch Field for the manufacture of gas, and not to ask for powers in relation to certain property adjoining, by which means they had hoped to extend Vetch Field. The only point now outstanding was as to the form of the clause giving the Company power to use Vetch Field for purposes other than the manufacture of gas and residual products. In the clause which the promoters put forward, they did not declare specifically that the lands were not to be used for manufacturing purposes. They did not consider this necessary, as under the general law they could not manufacture on other than lands scheduled for manufacture.

Mr. G. T. Andrews, the Engineer to the Company, stated that they had paid £472 per annum for the last ten years for Vetch Field, in the hope of later on getting power to manufacture. The Company now withdrew the powers they sought in this connection, simply and solely to meet the views of the Corporation. Vetch Field would be used for storage purposes.

Mr. VESEY KNOX asked for the addition to the clause of words binding the Company not to use the lands for the manufacture of gas, or the manufacture, conversion, or treatment of residuals.

Mr. HUTCHINSON argued that if such words were inserted they should certainly be qualified by the phrase "unless hereafter authorized by Parliament."

The CHAIRMAN said he did not like such references to future parliamentary action.

Mr. VESEY KNOX declared that the position of the Corporation was that when the time came for an extension of the manufacturing works the Company should go out of the town, as had been done in Edinburgh and in other places. The Corporation did not want two manufacturing works in the town.

Mr. HUTCHINSON, after some further discussion, proposed the insertion of these words: The Company "shall not manufacture gas, or manufacture or convert residual products, or matters producible therefrom, on such lands."

Mr. VESEY KNOX, having accepted the proposal, the clause was so amended.

The "stand-by" clause in the Bill gave rise to some discussion, on a report from the Local Government Board calling the attention of the Committee to the matter. By this clause, the Company have power to charge up to a maximum of 25s. per quarter to consumers of gas who keep their meters and pipes connected with the mains for purely stand-by purposes, while using some other power or illuminant.

The CHAIRMAN, after various questions to Counsel, said he was surprised that the Corporation had not strenuously fought this clause, which seemed to him most oppressive and unreasonable.

Mr. TYLDESLEY JONES argued that the amount named was the maximum, and was reduced to 5s. per quarter to small users. It was not fair, he said, for the Company to be held as a sort of convenient reserve force, after they had expended capital in providing something which was for the public convenience, unless they had some recompense for doing so.

After further discussion, the Committee decided that the charge should not be imposed in the case of users of gas for domestic purposes only; and with this alteration the Bill was ordered to be reported for third reading.

LEGAL INTELLIGENCE.

Dowson and Mason Gas Plant Company, Limited.

Mr. Justice Neville had before him, in the Chancery Division of the High Court of Justice, on Monday last week, a petition for sanction to the reduction of capital of the above-named Company. Counsel explained that the petition has been presented on the ground that the capital had been lost. The Company was incorporated in June, 1905; the objects being to enter into certain agreements with Messrs. William Beardmore and Co. for carrying out experiments with regard to petrol motor engines. The capital was £60,000, in £1 shares, of which 42,007 had been issued. It was proposed to cancel 21,000 of these shares, which were held by Mr. Beardmore personally and by his Company, both of whom assented. His Lordship made the order.

Damage to Water-Mains by Sewerage Operations.

At an adjourned sitting of the Windsor County Court on the 29th ult., his Honour Judge Howland Roberts gave his decision in a case in which the Slough Water Company brought an action against the Slough Urban District Council in respect of a broken water-main in the Stoke Road on Aug. 30, 1910. There was a counter-claim by the Council against the Company for damages in respect of the main. The claim was for £46 18s. 9d., and the counter-claim for £29 6s. 8d.; and the question was as to who was liable for the fracture of the main and the consequent damage. His Honour decided that it was the result of the negligence of the Council in insufficiently ramming the soil in the trench at the place where the break occurred; and he gave his decision for the plaintiffs. The parties had agreed that damages should be assessed at ten guineas; and judgment was given for this amount. A fuller report of the case will appear next week.

Horley District Gas Company.

In view of the half-yearly meeting of this Company called for Thursday, the report and accounts for the six months ended the 30th of June have been issued. The Directors state that there was a very satisfactory increase of nearly 8½ per cent. in the sale of gas compared with the first half of last year; and there is every probability of this upward movement continuing, as a request has been made by the residents of Hookwood for the Company's mains to be extended to that neighbourhood, and the Directors have decided to comply with it. The accounts show that the revenue was £5322, compared with £4976; and the expenditure £3644, against £3478. The balance carried to the profit and loss account is £1678, compared with £1498 this time last year. The amount applicable for distribution is £1361; and the Directors recommend the payment of dividends at the rates per annum of 5 per cent. on the preference stock, 6 per cent. on the "A" stock, and £4 4s. per cent. on the "B" stock, all less income-tax. The working statements in the accounts show that, under the supervision of Mr. R. Seymour Tobey, the Manager and Secretary, 1790 tons of coal were carbonized in the production of 20,757,400 cubic feet of gas—being at the rate of 11,596 cubic feet per ton. The quantity of gas sold was 18,722,300 cubic feet; leaving 7·37 per cent. unaccounted for. The Company have 633 ordinary and 903 prepayment consumers—a total of 1536; and there are 821 stoves fixed. When the arrangements for the supply of Hookwood are completed, additions to these figures will, of course, follow. To meet this extension, and for the general purposes of the Company, as announced in the "JOURNAL" last week, the Company are inviting tenders for the balance of the 4 per cent. debenture stock (£4400) and (£1440) of additional "B" capital stock.

York United Gas Company.—At the half-yearly general meeting of this Company last Wednesday, the Directors reported that the balance of profit amounted to £8772. Adding the interest on the reserve fund (£366), and after payment of the interest on the debenture stock (£618), there was left a surplus of £8520, which it was recommended should be appropriated as follows: Dividend at the rate of 4 per cent. per annum on £50,000 of preference stock (less income-tax), £942; dividend at a like rate on £370,000 of consolidated ordinary stock (less income-tax), £6968; carried forward, £610. During the half year, 889 yards of additional mains were laid, 238 meters fixed for new consumers, and 720 cookers, grills, &c., 95 gas-fires and radiators, and 1842 lights fixed. In the absence of Mr. J. R. Hill (the Chairman) through illness, Mr. James Melrose (the Vice-Chairman) presided, and moved the adoption of the report; and the motion was carried. The dividend recommended was declared, and the Directors were thanked for their services.

THE GASLIGHT AND COKE COMPANY.

The One Hundred and Ninety-Ninth Half-Yearly Ordinary General Meeting of the Proprietors was held last Friday, at the Chief Office, Horseferry Road, Westminster—Mr. CORBET WOODALL (the Governor) in the chair.

The SECRETARY (Mr. Henry Rayner) read the notice convening the meeting; and the seal of the Company having been affixed to the Register of Proprietors, the report (given in the "JOURNAL" last week) was taken as read.

FIRST CENTURY AS A STATUTORY COMPANY.

The GOVERNOR: Ladies and Gentlemen,—This meeting is, as the notice has told you, the 199th which the Company has held since it received its Charter. Its first century as a Statutory Company will have been completed, and its second opened, when we assemble, as I hope we all may, in February next. Most of us will, I think, be content if we open the new century with a report equally satisfactory as that which I have now the pleasure to submit for your adoption.

CAUSES CONTRIBUTING TO THE SATISFACTORY RESULTS.

I have once more to remind you that the accounts do not compare on equal terms with those of the corresponding half year of 1910. The price of gas was again reduced at the opening of the year; and this reduction affects the profits prejudicially by more than £50,000. Yet, owing to circumstances which I will explain later, the balance of the revenue account is greater by £17,000, and exceeds by more than £103,000 what is needed for the payment of the dividend recommended. Among the causes which have contributed to this satisfactory result, one of the most important is the improved condition of the capital account. During the half year we have expended of additional capital, £45,653. Of this, £7926 was upon manufacturing works and plant, and the remainder upon mains, meters, and stoves. Against this expenditure of £45,000 there is a credit of £124,000; so that the capital actually employed is less now by £79,000 than it was at Christmas last. Or, it may be more correct to say, the floating balance of capital is increased by this considerable sum. The credit is made up in part by depreciations of works, plant, meters, &c.; the remainder from the sale of surplus land. The Company's large works at St. Pancras were closed for manufacture in 1904. The site, except the portion (about one-half) used for storage, has now been sold to the Great Northern Railway Company; the proceeds of the sale necessarily being applied in reduction of capital. The large sum represented by the plant abandoned at St. Pancras and elsewhere is being gradually redeemed by the operation of the redemption fund, to which we have now contributed £140,000 out of dividend account. As I have remarked before, the closing of the St. Pancras and other expensive stations, and the concentration of the manufacture where the production can be more economically conducted, has contributed largely to the improvement of the Company's returns. The charge for dividend and interest on capital shows a steady reduction.

GAS AND RESIDUALS.

The revenue account tells a tale of improvement all along the line. There is an increase in the sale of gas equal to $4\frac{3}{4}$ per cent., or 591 million cubic feet. Had the price of gas not been reduced, the revenue due to this greater sale would have been £77,000. As it is, we have covered the loss and have £17,000 to the good. Putting it in another way, our consumers have been supplied with 591 million cubic feet at a charge to them of less than 7d. per 1000 cubic feet. The items of revenue which grow or decline automatically with an increase or decrease in the number of consumers all show improvement—meter-rents, £3000; stove-rents, £4000; fittings, £8000. Residuals also all show increases. Coke yields £49,000 more than in the corresponding half year; breeze, £4000; tar, £12,000; ammoniacal liquor, £13,000—together, £78,000.

ON THE EXPENDITURE SIDE.

Looking to the other side of the sheet, we find that while coal cost £47,000 more and coke used £4000, we spent on oil £14,000 less; so the gross cost of raw material was more by only £37,000. Setting this against the improvement in residuals (£78,000), you will find that the net cost is less by £41,000, which is highly satisfactory. This net cost of coal is one of the lowest in our records, though the gross cost was somewhat high. The quantity of gas made per ton of coal carbonized is greater by 430 cubic feet. The cost of purification is more by £6000, due to a partial return to the use of lime. The amount spent on repairs and renewals of works is £50,000 more than last year. Of the spare plant at our stations, much was antiquated and uneconomical; and this we have been steadily reconstructing on better lines. So long as the expenditure brings in a good return, it will be cheerfully provided for. The cost of meter and stove repairs continues to grow with the number of our consumers. A reduction of £10,000 in the cost of fittings is a matter for regret, as it is due to a falling off in the rate of increase in the number of prepayment consumers connected. In the half year to June, 1910, the number was greater by 6000. While it would be foolish to generalize from the experience of one half year, yet this fall does remind us that there is a limit to the number of possible prepayment consumers in our district, immense though it be. It also justifies the policy adopted by the Directors of acquiring the undertakings of neighbouring small companies, and so obtaining fresh fields for the enterprise of the Company.

CO-PARTNERSHIP BONUS AND PROPRIETORS' DIVIDENDS.

The co-partnership bonus has increased by £3700, consequent on the last reduction in the price of gas. The apportionment of the Company's extra profits in the past two years has hardly been liberal to the shareholders. There have been two reductions in price, giving, together, to the consumers more than £200,000; the co-partners have twice had their bonus increased by $\frac{3}{4}$ per cent.—the aggregate of the two being £7000; while the stockholders have had one addition of 1s. 4d. per cent. for one half year only, costing £5000. The explanation lies first of all in the reduction of our standard price from

3s. 3d. to 3s. 2d. in 1909; and, secondly, in the addition of £10,000 per annum made this year to the redemption fund. This fund was introduced by the Company's Act of 1903, and it works in such a way that every third penny taken off the price of gas in respect of which the Company distributes an extra dividend makes it necessary for a further sum of £5000 per half year to be carried to the redemption fund; and this extra contribution happens to occur when the price of gas is reduced from 2s. 8d. to 2s. 7d. per 1000 cubic feet. The price was reduced in January; and therefore the shareholders are called upon to contribute the extra £5000. If it were not for this contribution, the increase in dividend for the half year would be at the rate of 2s. 8d. per cent. per annum, instead of 1s. 4d. as it is.

PUBLIC LIGHTING.

Public lamps have cost £4000 more, though the revenue derived from them is less by £6000. Some expenditure has been undertaken in introducing improved burners and lanterns; the new burners giving a much better light for a reduced quantity of gas. In the balance-sheet there is an item of over £40,000 marked as "Alteration of street-lamps." This is made up of sums due from various lighting authorities in our district for work which we have executed for them, and which they will repay by instalments.

SPECIAL PURPOSES FUND.

A sum of £20,000 has again been carried to the insurance fund, which now stands at the satisfactory figure of £213,000. Under the Company's Act which received the Royal Assent in June, we are empowered to form a "special purposes fund" to which will be carried the moneys now standing at the credit of the insurance fund.

FINANCIAL RESULTS AND DIVIDEND RESTRICTIONS.

Quoting the first paragraph of the report—

The accounts for the past half year show that, after providing for fixed charges, setting aside £15,000 towards the redemption fund, and contributing £20,000 to the insurance fund, as shown in account No. 9, there remains a profit balance of £456,129 4s. 11d. The amount brought forward from the previous half year being £625,688 7s. 4d., there is a total sum available for distribution of £1,081,817 12s. 3d., out of which the Directors recommend a dividend on the ordinary stock at the rate of £4 14s. 8d. per cent. per annum, which will absorb £382,467 10s. 8d., and leave the sum of £699,350 1s. 7d. to be carried forward to the credit of the current half year.

A fairly healthy financial statement. The amount carried forward is a substantial one, but not more so than the security of the Company's dividends justifies. I have had several letters from shareholders complaining that, in view of the largeness of this amount, a higher distribution of dividend is not to be made. These shareholders have not acquainted themselves with the conditions of our Act of Parliament, under which an increase of dividend cannot be made except upon a further reduction in the price of gas. It is only a short time ago that complaint was made that a dividend was recommended which required for its payment a larger sum than had been earned in the half year. Since then the dividend has been thrice increased, and the price of gas reduced four times. These reductions in the price of gas have meant a relief to consumers equal to a present annual saving of £400,000; and we are confident further reductions will in due course take place.

PRUDENCE FIRST.

We are determined, however, so far as possible, to avoid risk of having to retrace our steps and return to a higher price; and to this end a considerable reserve is essential. Circumstances have latterly been favourable to the Company. Adverse fluctuations in the prices of coal and residuals, upon which we so largely depend, might in a short period make a large inroad upon our savings. The Directors are quite satisfied that the course they are pursuing is the right one; and they have no intention of departing from it.

THE NEW ACT—EXTENDING THE COMPANY'S FRONTIERS.

As I have already mentioned, the Company's Bill in Parliament received the Royal Assent on the 29th of June, having had to meet but slight opposition. By it we shall shortly obtain a largely extended district beyond our north-east frontier, which can be economically supplied with gas from our chief works at Beckton. This, I think, should be a matter of congratulation. The new districts will be taken over on the 1st of January next, when the present works will be closed and dismantled.

NATIONAL INSURANCE AND THE COMPANY'S EMPLOYEES.

The National Insurance Bill introduced by the Government is a matter of considerable interest to the Company and its employees. That the Bill, if passed, will be a great advantage to the workers of the country generally is beyond question. At the same time, it is certain that if it is accepted by us in replacement of our present provident funds the result will be materially to the disadvantage of the Company's employees. These provident societies, which have been in operation for a considerable period, are managed largely by Committees appointed by employees, and are working excellently. The workmen have held meetings with the members of their Committees at each of the manufacturing and other stations of the Company. Following upon these meetings, I interviewed the Committees. The report brought by each was to the effect that, if possible, the men should not be brought under the operation of the Act, but that the funds should remain, as now, under the direct control of the Company. I was greatly pleased to find that these opinions had been formed after careful perusal of the Bill itself and the discussions which have so far taken place in Parliament. Observations made by a large number of the Committee members showed an appreciation of the fact that their interests, both in regard to the provident funds and in other directions, are carefully safeguarded by the Board. A letter has been addressed to the Chancellor of the Exchequer asking whether it would be possible that this

Company's men may be left outside the purview of the Act; the Company guaranteeing the solvency of the funds.

COAL PURCHASES.

With regard to the future, the Directors have to report that the coal purchases for the next twelve months have been completed at satisfactory prices. This again is a matter of congratulation, especially as the prices for residuals continue good, and the prospects in this direction are excellent.

POSITION OF EMPLOYEE CO-PARTNERS.

The number of co-partners is now 9257; the total amount of their interest in the Company being £103,581 of which £45,752 is held by the co-partners themselves in the form of stock.

MOTION FOR THE ADOPTION OF THE REPORT AND ACCOUNTS.

I beg leave to move: "That this meeting do agree with and confirm the report of the Directors and the Auditors' report and statement of the accounts of the Company as transmitted to the proprietors on the 27th ult."

Mr. ULICK J. BURKE said he had great pleasure in seconding the motion.

The GOVERNOR: We shall be very pleased to hear any observations any shareholders choose to make.

A SHAREHOLDER'S REMARKS.

Mr. W. A. HOUNSOM did not propose for one moment to follow the wonderful figures which had been dealt with by the Governor—wonderful in their magnitude, and also in the success written large across every page of the report—but he rather wanted to take another course. He was very much tempted at the last half-yearly meeting to say a word or two, but they were then, as a Company, face to face with Parliament. On such an occasion as that, he thought it was perhaps wise that the least possible should be said on his side of the table. But they were to-day looking back on a successful Bill, which was now an Act; and he could not help asking for the reasons which had led to the success which had been achieved. It was not many years since that a Bill of the Company in Parliament meant grave anxiety and protracted sittings in Committee; but, during the last half year, the Parliamentary Committee-Room had been changed, so far as this Company were concerned, from a fighting ground to a conference room, and a conference room in which the Committee, the Counsel, and those associated with the Company, more especially the Governor and the officers, had met together with, it might be, a difference of opinion, but they had met together to consult as to how the best possible could be done for all parties connected with the Company, their consumers or customers, employees, and stockholders. The success which had been achieved was, he thought, the happiest augury for the future of the Company. The Governor had, in a few words, referred to the new territory which had been secured, which was so important for the Company's advancement and so important to the well-being of the consumers; they now had a new district. This achievement was, a few years ago, impossible; and he wished to ask his fellow proprietors whence came this great change, and how was it that this meeting, though it might be few in numbers but representing interests so great, could look back on such a great success? He had noticed that Lord Haldane, when speaking the other day at prize givings at a secondary school, said that the greatest quality of that school, which was full of energy and modern spirit, was that it had broken away from tradition. *Mutatis mutandis*, he was prepared to apply these words to the Gaslight and Coke Company. Tradition was only magnificent if it enshrined a lofty ideal; but hide-bound tradition, the tradition of the dead man's hand applied to parchment which prevented anything in the shape of forward movement, was accursed. He congratulated the Board on having broken away from the wrong sort of tradition; and he appealed to his fellow proprietors for the sympathy which was needful with regard to those on his side of the table. The Governor had alluded to some questions of increased dividend and so forth; but he (Mr. Hounsom) appealed to the proprietors to get away from the old-fashioned idea that they were a mere dividend-paying machine, and to take the human interest in its concerns which was now taken by the Board, and which was having such far-reaching effects in connection with the development of the Company's work and its progress. Of course, times of stress might come. It was all very well to meet there to hear these glowing figures; but he wished to develop in the proprietors the feeling of interest which should make the Company one great whole in its progress forward. Every day they won the confidence of their customers, for whom they desired to secure the best means of using the commodity they made. So far as the employees were concerned, the steps taken were bringing them into closer touch with the Company as a whole. Co-partnership tended to the stability of the Company; and it was gratifying to all the stockholders to know that from time to time they took a more and more intelligent interest in the concern, so that they might progress on the highest and best lines, and that in the future they might look forward to increasing usefulness to all who were associated with the wonderful and far-reaching success of the Company. (Hear, hear.)

REPLY BY THE GOVERNOR.

The GOVERNOR: If there are no other observations, I have only to thank Mr. Hounsom for the encouraging and inspiring words which he has on more than one occasion spoken to us, and which he has followed up to-day. I think there is a great deal in the suggestion that the shareholders should be as one with us as apostles of gas, going up and down among their friends and doing the best they can to make known the advantages we are able to bring to them. Mr. Hounsom quoted Lord Haldane with regard to breaking away from tradition. Only the other day we had the pleasure of seeing Lord Haldane at Beckton—I merely mention this incidentally as it may be of interest to you—to inspect our rifle-ranges; and we paraded some 350 Territorials for his inspection. He was good enough to say that he had never seen rifle-ranges better than those which we provide at Beckton. Whatever we do, we try to do as well as we can.

The resolution was put, and carried unanimously.

THE DIVIDEND.

The GOVERNOR: The Secretary will now read the minute of the Court of Directors recommending dividends for the past half year.

The SECRETARY then read the Directors' minute of July 18 as to dividend.

(1) That the sum of £15,000 be set aside out of the divisible profits of the Company for the half year ending on the 30th day of June last towards the redemption fund, in accordance with the provisions of the Company's Act of 1903, and

(2) That a dividend as follows for such half year be declared—viz.:
On the 4 per cent. consolidated preference stock, at the rate of £4 per cent. per annum.
On the convertible 5 per cent. preference stock, at the rate of £5 per cent. per annum.
On the 3½ per cent. maximum stock, at the rate of £3 10s. per cent. per annum.
On the ordinary stock, at the rate of £4 14s. 8d. per cent. per annum.

Subject to deduction of income-tax.

The GOVERNOR: I beg leave to move the adoption of the recommendations.

Mr. BURKE: I beg to second that.

The GOVERNOR: Before putting it to the meeting, I may say that the resolution will be a shorter one after this half year, because the "convertible 5 per cent. preference stock" has been dealt with under our Act, and will no longer appear.

The resolution was carried unanimously.

The GOVERNOR: I think I can go so far as to say that in the year coming the dividend will be an increasing one, and that consumers, co-partners, and shareholders will together rejoice in the alteration then to be made. That completes the business of to-day; and I thank you for your attendance.

VOTES OF THANKS.

Mr. F. H. PILLEY said the Governor had told them the business was concluded; and now he had the privilege of moving a very hearty vote of thanks to the Governor and Directors for the admirable way in which they had managed the affairs of the Company. They had not to look back many years when the meeting room used to be crowded, and they had an abundance of speakers. But, apparently, the confidence of the shareholders was now expressed by vacant seats. He knew it was customary for the Governor to record his sense of the labours of their officers, and he would not anticipate this; but he wanted to express, from his side of the table, his most hearty thanks to the Directors for their great energy and constant devotion to the interests of the Company. (Hear, hear.)

Mr. J. REESON had much pleasure in seconding the motion. It was most gratifying to him to hear such a resolution passed every half year, because it indicated the increasing prosperity of the Company.

The resolution was carried unanimously.

The GOVERNOR: Mr. Pilley, Mr. Reeson, ladies, and gentlemen—On behalf of my colleagues and myself, I thank you for this resolution. We always value it very much, and especially when we feel it has been earned. I have now the greatest pleasure in proposing that our best thanks be given to the officers and the workmen of the Company for their services during the past half year. From top to bottom, so far as I can judge, all are working cordially and heartily for the good of the Company; and the success which has been so far achieved is largely due to this fact. I beg to propose the resolution.

Mr. BURKE had very great pleasure in seconding it.

The resolution was carried unanimously.

Mr. D. MILNE WATSON (the General Manager): Mr. Chairman and gentlemen,—It is my duty and pleasure to reply on behalf of myself and fellow officers and workmen to the hearty vote of thanks which you have accorded to us. I have so often said how much we appreciate a vote of thanks half year by half year, that I may seem to repeat myself. But we do feel very deeply from our hearts, and we do appreciate very strongly, what you have so kindly said. No one appreciates more than do the officers and men the glorious success attained by the Company during the past half year.

Gas Cooking-Stoves as Cupboards at Warrington.—At the meeting of the Warrington Town Council last Tuesday, Alderman Pierpoint (the Chairman of the Gas Committee) said the Gas Engineer (Mr. W. S. Haddock) had reported that in many cases where prepayment cookers had been fixed they were not used. The Committee had therefore decided that all further cases of the supply of these cookers should be refused unless a minimum consumption of gas was paid for. He believed certain people in Warrington used the cookers as cupboards. It was only right that the Corporation should insist upon a minimum consumption of gas.

Grantham Water Company.—The seventy-fifth ordinary half-yearly meeting of this Company was held last Tuesday; Mr. J. G. Thompson presiding. The Directors laid before the shareholders the accounts for the six months ended June 30, which showed a balance upon the revenue account of £2813. They proposed that £2000 of this sum should be applied in the payment of a dividend at the rate of 5 per cent. per annum for the half year, and that the balance should be carried forward. The Chairman moved the adoption of the report, and said there had been an increase in the consumption of water during the past six months; but they had really met it without difficulty, and were able to look to the future without anxiety. The report was adopted.

Reduction in Price at Salford.—The Salford Town Council, at last Wednesday's meeting, confirmed recommendations of the Gas Committee that the price of gas should be reduced 2d. per 1000 cubic feet to ordinary consumers, and that the quantity of gas supplied for 1d. through prepayment meters should be increased from 27 to 30 cubic feet as soon as possible. The Mayor (Alderman Phillips), who is Chairman of the Gas Committee, explained that the recommendations were in fulfilment of a pledge he gave some time ago. The reduction to ordinary consumers takes effect as from the reading of the meters for the quarter ending the 30th prox. The present price of gas in Salford is 2s. 9d., with a discount of 4d. if paid within a month; and there is a graduated scale for users of large quantities.

SOUTH SUBURBAN GAS COMPANY.

The Half-Yearly Meeting of the Company was held last Friday, in the new Livesey Memorial Hall, Lower Sydenham—Mr. CHARLES HUNT in the chair. The holding of the meeting at the works was an innovation; and the Directors and officials were highly gratified at the largeness of the attendance.

The ENGINEER (Mr. S. Y. Shoubridge), in the absence of the Secretary (Mr. Charles M. Ohren), through critical illness at home, read the notice convening the meeting; and the Directors' report and the statement of accounts [see *ante*, p. 310] were taken as read.

IN MEMORY.

The CHAIRMAN: In rising to move the adoption of the report and accounts, my first words must be of welcome to this building. It has been erected, I may say, by loving hands in memory of one whose great services, not alone to this Company, of which he was for so many years the Chairman, but to the whole gas industry, can never be forgotten; but whose chief claim to be remembered must always be his whole-hearted devotion to everything relating to the welfare of employees, and notably his establishment and consistent advocacy of co-partnership. Having determined upon this building as the form which our memorial to Sir George Livesey should take, it was not difficult to decide that it should be made as complete as possible, without undue expenditure, for the purpose for which it is intended; and proprietors will have full opportunity after the meeting of judging how far this intention has been carried out. They will, I am sure, join with the Directors in hoping that this Livesey Memorial Hall may long be a source of comfort and enjoyment to the employees of the South Suburban Gas Company.

BUSINESS EXPANSION.

It is, I hope, of happiest augury, on this occasion, that the accounts of which we have to ask your approval cover one of the best half years ever experienced by the Company. In the first place, there has been a gratifying improvement in the consumption of gas, as shown by the substantial increase of 3.65 per cent., exclusive of that which has been derived from the Festival of Empire Exhibition at the Crystal Palace. This increase, though somewhat discounted by the fact that it compares with a half year in which there was a slight decrease, is satisfactory, because under modern conditions it is increasingly difficult to secure additional consumption. The record of meters in use shows every half year an increase in the number of consumers; but the consumption per consumer is constantly growing smaller. This is partly due to the large and increasing proportion of small or prepayment meter consumers, and partly also to the economy of incandescent lighting, by which is obtained for the same consumption of gas from six to eight times the light of the old flat-flame burners. The effect of these changes is almost imperceptible from year to year; but it is apparent enough over a series of years. Thus since 1890, or twenty years ago, the total number of consumers on the books of the Company has risen from 11,789 to nearly 40,000; while in the same period the average consumption per consumer has dropped from 61,369 to 33,777 cubic feet. It is true that a larger number of small consumers is preferable to a small number of comparatively large ones, because greater stability is given to the business by the wider basis which numbers afford; and in this view the position of the Company has greatly improved during the last few years. For the increase of consumption, however, we rely largely upon heating and cooking appliances; and I am glad to say that the progress made with these continues to be very satisfactory. Mention is made in the report of the increasing proportion of cookers to meters in use; and to this may be added that whereas formerly cookers alone were applied for, it is now becoming quite usual for the householder to include one or two gas-fires, and perhaps a hot-water circulator, in his requirements. The prospects of the Company are distinctly encouraging in this respect, as shown by the progressive revenue derived from the hire of these appliances.

COMPANY'S WORK AT THE FESTIVAL OF EMPIRE EXHIBITION.

The figures given in the second paragraph of the report show that the consumption of gas has been materially assisted by the Festival of Empire Exhibition at the Crystal Palace, where, in addition to that which is used in connection with the special installations to which I will presently refer, a great deal of gas is being used by exhibitors for a variety of purposes, including lighting, heating, cooking, and motive power, the revenue from which for the current half year promises to be considerable. It was partly in anticipation of this supplementary consumption, as it may be called, and also in the hope that it might become more or less permanent through the renewed popularity of the Palace, that emboldened the Directors to make the bid which has enabled them to prove the possibilities of town gas as a source of power as well as of light on a far larger scale than has ever before been attempted, or perhaps called for. There is every reason, I think, to be satisfied with the result. Naturally, the lighting of the Palace and grounds with high-power gas-lamps forms a great attraction to the general public, and it has, I may say, called forth encomiums from all sides. The huge gas-engines, on the other hand, appeal very strongly to the initiated in such matters, for they are a triumph of mechanical skill. They mark a distinct advance in the construction of internal combustion engines, being, as stated in the report, the largest that have ever been worked from a town supply of illuminating gas. The makers, the National Gas-Engine Company, are to be heartily congratulated upon their notable achievement; and I may take this opportunity of acknowledging, on the part of the Directors, their effective co-operation, as also that of the James Keith and Blackman Company, who have carried out the lighting arrangements to the entire satisfaction of the Board. We desire also to record our appreciation of the services rendered in this connection by the Company's Chief Engineer, Mr. Shoubridge, and, as acting under his directions, their Chief Outdoor Superintendent, Mr. Baldry. Both have given unremitting attention to the very large amount of additional and onerous work which has devolved upon them; and they have been loyally supported by the veritable army of employees engaged in carrying out their instructions.

ADDITIONAL EXPENDITURE AND INCREASED RECEIPTS.

With regard to the accounts, the broad outstanding feature that cannot but engage attention is the fact that the Company are in the very fortunate position of having been able to meet somewhat large additional expenditure not only without diminution, but with an actual, though small, increase of the net profit available for dividend purposes. Works, mains, fittings, &c., all figure in the expenditure side for larger amounts than in previous half years; but I think I can say that in this respect high-water mark has for the present been reached, and that in the immediate future at any rate the amounts charged to repairs are likely to be somewhat less rather than more. The credit side of the accounts shows how this additional expenditure has been met. There is first of all a considerable increase in the receipts for gas, consequent upon the larger consumption; next, nearly £600 more in rents received for meters, stoves, &c.; and last, but by no means least, another all-round increase in the returns for residuals. Coke heads the list of these with no less than £3918. The value of this important residual showed for two or three months signs of slipping back, and at one time sales were made below last year's prices; but I am glad to say that a recovery has now set in. Much the same may be said of sulphate of ammonia, but with this difference, that prices for it have been uniformly higher than those of last year.

SULPHATE OF AMMONIA IMPROVEMENTS.

At our last half-yearly meeting, I spoke of the obligation we are under, in common with other makers of this material, to the Sulphate of Ammonia Committee for the propaganda work in which they have been for many years engaged. There can be no doubt that this has contributed to the improved position of affairs, as shown by the increase in the value of sulphate of £2 per ton on the average; and it would be less than grateful—in fact, unbusinesslike on our part—were we disposed to withhold any reasonable contribution that may be needed to the annual expense of spreading information as to the uses and properties of this very valuable fertilizer. The claim is made for it that, with proper use, crops can be obtained twice as great as the average for the United Kingdom, from which it would appear that its users are deserving of the famous commendation bestowed by the philosopher King of Brobdingnag upon "whoever could make two ears of corn, or two blades of grass, to grow upon a spot of ground where only one grew before." And in this commendation I am not sure that producers—to wit, the South Suburban Gas Company—are not entitled to share. At any rate, I am sure you will agree that Mr. Shoubridge and his assistants deserve well of this Company when I tell you that the increase during the last two years in the quantity of ammonia recovered per ton of coal carbonized represents an annual value to the Company, at present prices, of about £2000. Tar is the least important of the residuals, but it figures in the accounts for an additional £1150; and the latest prices are the highest that have been realized for many years. The remarkable improvement which has recently taken place in the value of this residual is almost entirely due to the increasing demand for it for road-making purposes.

THE NET RESULT.

The net result of the half-year's trading, after providing for payment of the bonus of 6½ per cent. under the co-partnership scheme, is £23,623, or about £1000 more than was earned in the corresponding half of last year. This will suffice for payment of the statutory dividends, leaving to be carried forward £2235 more than last half year.

REDUCTIONS—PRESENT AND PROSPECTIVE.

With regard to the future, it will have been gathered from the report that our coal is now costing less than it was last half year; and, in accordance with what has always been the settled policy of this Company, the price of gas has been reduced by 1d.—to 2s. 4d. per 1000 cubic feet. This is less than has ever before been charged for gas in the history of the Company; and the Directors hope it may be possible, should no unforeseen circumstances occur, to make a further reduction at no very distant date. In the meantime, the present reduction will entitle proprietors to an extra 3s. 4d. per cent. on the dividend, making this £5 16s. 8d. per cent. To the employees it means another ½ per cent. bonus, increasing it to 7 per cent.

GAS WORKERS AND THE NATIONAL INSURANCE SCHEME.

Coming now to the last paragraph of the report, in which reference is made to the National Insurance Bill, it may be desirable to point out in what way this Bill, as at present drafted, materially affects the interests of the Company's employees. This, let me say, is a workman's question, pure and simple; and the only object of the Directors is to do what they can on his behalf. There is already, as you know, a sick fund in connection with the works, the membership of which is voluntary, but which embraces practically all the workmen—the benefits being guaranteed by the Company. This fund was established as far back as the year 1880; so that in support of the present position there is an experience of 31 years to appeal to. It is nominally under the management of the Company; but the Co-partnership Committee are from time to time consulted with regard to it. Without going too much into detail, it may be sufficient to say that for a contribution of 3d. per week, the workman is provided with medical attendance and medicine; and in case of sickness, 12s. per week sick benefit for the first thirteen weeks, and 6s. per week for the second thirteen weeks. The average cost of administering the fund, exclusive of book-keeping and stationery provided by the Company, but inclusive of sick visitor, has for the last five years—namely, from 1906 to 1910 inclusive—been 4.70d. per week per man. Of this sum, the workman's share has been 2.99d., and the Company's share 1.71d. The details are here for each year, if anyone would like to have a copy. In comparison with this, the Bill before Parliament provides that the contribution of each workman shall be 4d. per week, and that there shall be a contribution from the employer of 3d. and from the State of 2d. per week per man. This makes 9d. per week in all, as compared with 4.70d. the cost of maintaining the Company's sick fund. The benefits to be secured to the workmen are medical attendance and medicine, 10s. per week in case of sickness for the first thirteen weeks, and 5s. per week for the second thirteen weeks—being 2s. and 1s. per week less than he now obtains for the smaller contribution of 3d., to say nothing of the proposed increase in

Workmen's Sick Fund.

Year.	No. of Mem- bers.	Annual Contributions.		Average. Per Member, Per Week.		Total Cost per Week.
		Company.	Members.	Company.	Members.	
		£ s. d.	£ s. d.	d.	d	d.
1906	515	191 19 7	349 2 9	1'72	3'10	4'82
1907	488	178 14 7	324 2 9	1'69	3 05	4'74
1908	508	232 11 6	332 7 9	2'10	3 02	5'12
1909	547	209 16 4	329 18 9	1'77	2'80	4'57
1910	542	152 0 6	350 6 0	1'29	3'00	4'29
				8'57	14'97	23'54
Average for five years				1'71	2'99	4'70

the employer's contribution and that of 2d. by the State. It must be said, however, that additional benefits are provided by the Bill, in the shape of maternity allowance and sanatorium benefit; and there is also what is called "disablement" benefit, which in the case of this Company is already to a great extent met by the superannuation fund. All these combined do not, however, anything like make up the difference between the present cost of 4'70d. per week per man and the 9d. proposed by the Bill. The subject has been very carefully considered by the Co-Partnership Committee; and, so far as can be gathered, there is no objection at all, on the part of the workmen, to the increase of contribution from 3d. to 4d., and there is certainly no objection on the part of the Company to paying 3d. per week per man instead of about 1½d. But there is a very natural desire that benefits shall be secured proportionate to these increased payments, instead of the benefits being actually reduced as proposed by the Bill. As it is clearly the object of the Chancellor of the Exchequer to work through existing agencies, such as the various friendly societies, and this sick fund has proved itself to be a very efficient, as well as an economically managed, agency, there is surely no reason why it should not be approved as such, and left to manage its own affairs and administer its own funds. All that is asked for is autonomy for this and similar funds, either by recognition as "approved" societies, or by exemption of such funds in connection with statutory companies, under the first schedule of the Bill, as is already conditionally provided for in the case of employment under the Crown or "any local or other public authority." If proprietors can assist the employees in this direction, by bringing pressure to bear in any quarter in which they may have an interest, they will be doing a service to them. I may say that deputations from the workmen have already interviewed various members of Parliament on the subject, and have received many promises of support; while our colleague Sir Fortescue Flannery is actively interesting himself in his place in Parliament in securing the necessary amendments. It is said objection may be taken to this and similar funds on the ground that they have not received the formal sanction of the proprietors, are not registered under the Friendly Societies Acts, and that no actuarial valuations have been made of their liabilities. Such objections are surely puerile in the face of accomplished facts; and I need hardly say they can easily be met. Our own fund has been tacitly, if not formally, approved by you for the last 31 years; and your formal approval can, we are sure, be had for the asking. With regard to registration, the Directors have no wish to stand in the way of any regulation that may make the position of the contributors more assured, although it is not easy to see how this may be possible. Actuarial valuations can only be necessary in the event of fixed contributions from the Company being adopted, since the expenses of administering the fund show no increase during recent years; and whatever may be the deficiency, it will continue to be borne by the Company so long as the fund exists on its present footing. This, I think, completes the remarks I desired to make; and I now beg leave to move the adoption of the report and accounts.

Mr. ROBERT MORTON seconded the motion, which was unanimously carried.

The DEPUTY-CHAIRMAN (Mr. Jabez Light) proposed the declaration of a dividend at the rate per annum of 5 per cent. on the preference stock, and 5½ per cent. on the ordinary stock, less income-tax. He remarked that the half-year's working had been most satisfactory in every respect. There was not one single unsatisfactory feature. Summed up in few words, they had had a larger consumption of gas, and at the same time higher prices for residuals. These two items almost explained their position. The 1d. reduction in the price of gas that they were making would mean about £3000 to the benefit of the consumer in the current half year.

Mr. W. G. WALLER (one of the Workmen-Directors) seconded the motion. In doing so, he said he must take the opportunity, on behalf of the employees, of thanking the proprietors for building the magnificent hall in which they were assembled, and for placing it at their disposal for recreation. For many years past, it had been found that the existing recreation room was quite inadequate for the purposes for which it was required. Therefore, this fact alone made the hall the more acceptable.

Mr. H. GUNDRY, in proposing a vote of thanks to the Chairman and Directors, remarked that they owed a debt of gratitude for the able way in which they conducted the affairs of the Company. He should like to congratulate them upon the happy thought that resulted in the holding of the meeting at Lower Sydenham, as this enabled them to see the new and magnificent hall, and how the dividends were earned. It would be of the greatest interest to the proprietors to inspect the works. He desired to include the staff in the resolution.

Mr. T. P. HILL seconded the motion; and it was very heartily carried.

The CHAIRMAN, acknowledging the vote on behalf of himself and his colleagues, remarked that it gave them very real pleasure to have

such a large audience that day. The Board were in fear and trembling lest the departure from the customary practice of holding the meeting in London should result in a smaller attendance than usual. On the contrary, it had been so successful that he thought it would encourage the Directors to repeat the experiment. With regard to the vote of thanks to the Engineer, the Secretary, and the staff generally, it had usually been the Chairman's privilege to propose it. But Mr. Gundry had included it in the resolution he had moved; and he (the Chairman) need not say how heartily the Board concurred in what had been said in appreciation of the services of the officers.

Mr. SHOUBRIDGE (called upon by the Chairman) thanked the proprietors for their kind vote of thanks. The officers and employees generally really felt that the Directors and proprietors were a great deal too good to them. Not only did they give them a bonus every year, but they had this year provided them with the excellent building in which they were meeting, and for it they could not be thankful enough. They would all try in the future to show they heartily appreciated the kindness and considerate treatment shown to them.

THE WORKS OF THE SOUTH SUBURBAN GAS COMPANY.

Notes Obtained During an Inspection by Proprietors.

The proprietors of the South Suburban Gas Company, at the close of their meeting last Friday, inspected the works at Lower Sydenham under the personal guidance of the Engineer (Mr. S. Y. Shoubridge), his chief assistant (Mr. John Whimster), and other members of the staff. The Chairman (Mr. Charles Hunt) and other Directors also accompanied the large and interested party.

It is a long time since information concerning the works was published; and therefore it may be of interest to run lightly over the principal features. The works were built in 1854; and the area covered by them is 45 acres. The district of supply extends to 15 square miles. The number of men employed on the works is 380; and on the district 220—total 600. The number of ordinary consumers is 21,000; of pre-payment consumers, 18,800; of cookers in use, 27,900; of meters, 39,800; and of fires, &c., 5800. The total manufacturing capacity of the works per 24 hours is: Coal gas, 11 million cubic feet (920 tons of coal); and carburetted water gas, 2 million cubic feet—total, 13 million cubic feet. The quantity of coal carbonized last year was 120,000 tons; gas produced, 1,450,000,000 cubic feet; coke, 70,000 tons; tar, 1,150,000 gallons; and liquor, 3,650,000 gallons. The total storage capacity of the gasholders is 8½ million cubic feet; and boosters are used for increasing the pressure in the mains.

Regarding the carbonizing plant, No. 1 retort-house has a capacity of 1,100,000 cubic feet per twenty-four hours. The house contains 70 retorts on the inclined system, tapering from 24 in. by 16 in. to 21 in. by 16 in. by 20 ft. long, in ten beds of sevens, heated on the regenerative principle. No. 2 retort-house has found other employment. No. 3 retort-house has a capacity of 4,600,000 cubic feet per twenty-four hours. It contains 260 retorts, on the horizontal system, 22 in. by 16 in. by 22 ft. long, in twenty-six beds of tens. The retorts are charged and discharged by De Brouwer machinery, worked by electricity generated by gas-engines and dynamos. The coke is removed by an endless chain of the De Brouwer type. The coal is received in railway waggons, which are mechanically emptied into an elevator, which raises it into hoppers for feeding the charging-machine. No. 4 retort-house has a capacity of 2,300,000 cubic feet per twenty-four hours. It contains 144 retorts on the horizontal system, 21 in. by 15 in. by 20 ft. long, in eighteen beds of eights. The retorts are charged and discharged by West's machinery driven by compressed air. The coke is removed in a similar manner to that in No. 3 house. No. 5 retort-house has a capacity of 3,000,000 cubic feet per day. It contains 186 retorts, on the horizontal system, 22 in. by 16 in. by 20 ft. long. These retorts like those in No. 3 house are charged and discharged by De Brouwer machinery; but in this case the power used is compressed air, instead of electricity, and is supplied by air-compressors situated in the exhauster-house. The coke is removed from the house as in No. 3 house, by a De Brouwer conveyor; but this house is fitted with additional plant for putting coke direct into railway waggons.

There are two sets of carburetted water-gas plant, each of 1 million cubic feet per day capacity, together with exhausters and blowers. Adjoining this building is the boiler-house, containing four steam boilers, 8 ft. diameter by 30 ft. long, which supply all the steam used in the works. At the back of the carburetted water-gas building is a set of five purifiers, 40 ft. by 22 ft. by 5 ft. deep, for purifying the carburetted water gas.

The exhauster-house (which is a handsome building) contains two sets of exhausters of 300,000 cubic feet capacity per hour, and one set of 250,000 cubic feet capacity per hour. Also situated here are two air-compressors, for supplying the power to the retort-house machinery in Nos. 4 and 5 retort-houses.

An interesting feature is the water supply provided for domestic and other purposes on the works. It is obtained from an artesian well of a depth of 257 feet; the water being pumped into a tank at the top of a fine water-tower, which is 85 feet above ground-level.

The condensers, washers and scrubbers, purifiers, station meters, and mechanics' shops were also inspected. Then in the meter-repairing shop, it was found that thirty men are employed; the number of meters repaired per annum being about 6000. In the stove-repairing shop, 24 men find occupation; the number of stoves and fires repaired per annum being about 11,000.

A further feature of the works is the plant for the manufacture of fire-bricks. By it the whole of the fire-bricks used on the works are made by the Company's own men; and by doing so, it is stated that a saving of upwards of 40 per cent. is effected in the cost. The visitors were highly interested in seeing how the disused retort material is again brought into service in the making of new material.

Three locomotives find occupation on the works for shunting the coal and coke trucks.

BRENTFORD GAS COMPANY.

The Half-Yearly Meeting of the Company was held on Wednesday last, at St. Ermin's Hotel, Caxton Street, S.W.—Mr. ULICK J. BURKE in the chair.

The SECRETARY (Mr. William Mann) read the notice convening the meeting; and afterwards the Directors' report and the statement of accounts were taken as read.

A HIGHLY SATISFACTORY POSITION.

The CHAIRMAN, in moving their adoption, said he should like to call attention especially to two very noteworthy and satisfactory statements in the report—the one referring to the expansion of business in every department, and the other in the opening statement as to an amount of £124,081 being available for dividend. Here they had practically, in few words, the history of the undertaking during the half year ending June last; and the results, he thought the proprietors would agree with him, were highly satisfactory. It had been the custom to, at the meetings, enter as closely as was desirable into the details of the accounts in comparison with the corresponding period of the preceding year, in order to bring to notice any variation there might be. But, after looking carefully through the present accounts, he found very few points that called for special comment or explanation. The work had been carried on with consistent energy and attention, and had resulted in a steady development in output, with a reduction in the general cost of manufacture, in spite of such development. In other words, put into figures, they had during the half year sold 70 million cubic feet more gas, at £570 less cost for manufacturing wages. He thought it would be agreed that this was eminently satisfactory; and that it was a position of which their General Manager and Engineer (Mr. A. A. Johnston) and his officers might very justly feel proud. He (the Chairman) could only say they had earned the hearty thanks of the Board by the assiduity and attention that had brought this about.

A GOOD RESIDUALS HALF YEAR.

Then, turning to the accounts, the most noticeable difference found among the few differences there were to refer to occurred in the item of residuals. It was very satisfactory, for instance, to find that coke had brought in as much as £4000 more than in the corresponding period of last year; and he thought that this was satisfactory in one special way, because it showed that coke was finding more and more its position as a heating agent generally—in the household and elsewhere. In addition to the £4000 increase in coke, as much as £1700 more was obtained from ammoniacal liquor. This might be taken to be due a good deal to the greater return from sulphate of ammonia.

RECONSTRUCTIONS AND EXTENSIONS.

Then, on the other side of the accounts, it was seen that distribution charges had been less by as much as £7437, under the heading of repairs and maintenance of mains. This £7437 very largely represented expenditure incurred through a long period of reconstruction work. He (the Chairman) warned the proprietors that they would have to go through this, and they did go through it, until they came to the final payment for the 30-inch main from Brentford to Southall, which had been in hand for some time, and which was now completed and paid for. Then under the same heading would be noticed a reduction of £2800 in the cost of repairs and renewals of meters and stoves. This was due to depreciation being calculated on a more approved basis, which, in the opinion of the Directors, quite adequately dealt with the stock in this respect. This was practically the history of the concern in the past half year.

FURTHER REDUCTION IN PRICE.

Then he wanted specially to turn attention to the paragraph in the report which said: "The continued expansion of business in every department gives the Directors great satisfaction. They regard it as very encouraging, and feel that it justifies a further reduction of 2d. per 1000 cubic feet in the price of gas, which they propose shall take place as from Michaelmas next." A statement of this kind in the report of a board of directors of a gas company was one of the most satisfactory items they could mention. It was indicative not only of progress, but also of stability. He regarded it as the first policy of a gas company to reduce the price of gas as much as possible. It must in this relation be remembered that there were two points to consider. One was that they had already recently had a reduction which made the price 2s. 7d. instead of 2s. 9d. per 1000 cubic feet; and there was another point.

DAYLIGHT CONSUMPTION—THE LADY DEMONSTRATOR.

They happened to know that the increase in consumption was largely contributed to by the Sunday consumption for cooking. This Sunday consumption to-day bore a larger proportion in the output of gas than it used to do. This was the daylight consumption; and, being so, it represented a certain economy in capital, seeing that capital that would otherwise be lying idle during the daylight hours was being employed. It also showed the greater development of the consumption of gas on the heating and cooking side of the business. This was a branch it behoved gas companies to develop as much as possible. In this connection, he should like to acknowledge the assistance that the Company had received from their lady demonstrator—Miss Royle—and her assistant. Perhaps they were apt to overlook the advantages they derived from their help. Their work encouraged cooking and heating by gas in an intelligent form. The amount of ignorance that existed in connection with both cooking and heating they found was very great; and these ladies, through the exercise of considerable patience and tact, had been enormously useful in developing this branch of the business. He was sure the proprietors would be glad to recognize the advantage so derived.

THE GREATER LONDON RAILWAY BILL.

Then he came to the opposition the Company had to offer to the Greater London Railway Bill. It would be recollected that in February last, he warned the proprietors that there was a cloud hanging over the undertaking in the shape of the Greater London Railway Bill. He

could not tell the proprietors adequately how important the action of the Bill was to them. The promoters proposed to go right through their works—to carry their line right across the land the Company had at Southall which was scheduled for manufacturing purposes, and therefore to cut off the land resources of the Company for future development. To him, and he was sure to other people, it was perfectly marvellous, after the experience of 1906, that the promoters of this railway scheme should have proposed to go on with this particular part of their project. They must have realized that this was statutory land granted to the Company in 1881, after a careful and expensive inquiry, not only for their then present use, but for future development. But after that, these promoters again came to them this year in very much the same easy, semi-ignorant way, and proposed the very same thing. The Company had to oppose the Bill as in 1906; and they were successful in this. But the Board could not help feeling that it was rather unfair to the Company. For promoters of a railway scheme to rush on to statutory land like this was very much like having a bull in a china shop. In 1906, the "bull" broke a considerable amount of china for which he did not pay. Very much the same amount of breakage had been done on this occasion; and yet they did not get a shilling of the cost they had incurred. But they had turned the bull out, and that was the best thing of all.

Mr. R. J. N. NEVILLE, M.P., in seconding the motion, remarked that the Chairman had not fully alluded to the fact that it had been decided to reduce the price of gas by 2d. from the ensuing Michaelmas. The Chairman had pointed out that there had been a reduction in the price by 2d. within the past twelve months; and within a few months after the twelve months, there would have been a reduction of 4d. This was the best possible criterion of the success of the Company. It was their object to reduce the price of gas, because they obtained more customers; and if they were successful in this, it tended to increase the dividend—that was to say, as the price of gas went down, the dividends went up. The number of the Company's consumers was largely increasing, and so was the revenue. The gift to the consumers of 4d. within a few weeks of twelve months was a large one indeed. It amounted, he believed, to the sum required for a half-year's dividend; so that this showed the Company were going on by leaps and bounds. Of this they could not possibly have a better indication than the fact that they were able to reduce the price of gas. The Chairman had alluded to the fact that they were doing extra business at less cost. The capital employed per ton of coal carbonized was being reduced in consequence of the larger usage of gas. The result of the past year's working was that the capital per ton of coal had gone down by something like 3s. 2d. He thought they must congratulate themselves and their officers upon the splendid returns for the half year.

The motion was carried unanimously.

On the proposition of the CHAIRMAN, seconded by Mr. NEVILLE, a dividend was declared for the half year at the rate per annum of 5 per cent. on the 5 per cent. preference stock, at the rate of 13 per cent. on the consolidated stock, and at the rate of 10 per cent. on the new 1881 stock, all subject to income-tax.

Proposed by Mr. DEAR, and seconded by Mr. FINNIS, a hearty vote of thanks was passed to the Chairman and Directors, and the officers and staff of the Company.

The CHAIRMAN, in the course of his acknowledgments, remarked that he hoped the consumers would, for a time at all events, be satisfied with the price of 2s. 5d. per 1000 cubic feet of gas.

COMMERCIAL GAS COMPANY.

The Half-Yearly Report and Accounts.

The following is the report for the six months ended June 30 last which the Directors of the Commercial Gas Company will present at the half-yearly meeting on Thursday.

The revenue account shows a net profit for the half year of £66,587 5s. 4d., which, added to the balance of £52,032 7s. 4d. brought forward, produces a net revenue balance of £118,619 12s. 8d. Deducting therefrom £8504 6s. 4d. for interest, there remains standing to the credit of the net revenue account a balance of £110,115 6s. 4d. available for dividend. The Directors recommend the payment of dividends at the rates of £5 9s. 4d. per cent. per annum on the 4 per cent. stock of the Company, and of £5 6s. 8d. per cent. per annum upon the 3½ per cent. stock, both less income-tax. The balance of the net revenue will be carried forward to the next half year.

Mr. Hubert Dynes Ellis has resigned his position as Secretary of the Company; and the Directors have appointed the Accountant, Mr. Frederick John Bradfield, in his stead. A resolution will be submitted to the proprietors to determine the amount of Mr. Bradfield's remuneration. The Directors announce with much regret the death of their esteemed colleague Mr. John Giles Pilcher, who was for twenty years a Director of the Company. In conformity with the Acts of Parliament regulating the Company, they have elected Mr. Hubert Dynes Ellis to the seat on the Board thus vacated.

The accounts accompanying the report consist of the usual set of statements. They show that the paid-up stock on the 30th of June amounted to £996,405; that £1,076,875 had been added by conversion, making £2,073,280; and that £149,298 remained unissued out of the total authorized capital (including premiums) of £2,235,000. The total amount borrowed on the above-named date was £339,062 10s., and £135,937 10s. was added by conversion; making a total of £475,000, and leaving £79,226 to be borrowed, out of the £550,000 authorized. Capital account receipts amount, with premiums, to £2,606,065 4s. 5d. The expenditure stands at £1,450,370 8s. 5d., with a nominal amount of £1,212,812 10s. added by conversion—together, £2,663,182 18s. 5d. There is consequently a balance of £57,117 14s. carried to the balance-sheet. A sum of £1134 was expended during the half year on new and additional mains, services, &c.; but as £736 is credited for meters, stoves, prepayment meters, and fittings, the net expenditure stands at

£398. The reserve fund amounted at the close of the half year to £36,312; and the insurance fund to £32,538. The following is the

REVENUE ACCOUNT.			
Expenditure.			
Manufacture of gas—			
Coal and oil, including dues, carriage, unloading, and trimming	£88,161	5	1
Salaries of Engineer and officers at works	2,897	18	8
Wages (carbonizing)	10,142	12	0
Purification, including labour	1,875	17	5
Repair and maintenance of works and plant, materials and labour (less £327 11s 6d. received for old materials)	34,338	17	10
	£137,416	11	0
Profit sharing		3,370	15 10
Distribution of gas—			
Salaries and wages of officers (including rental clerks)	£4,862	13	1
Repair, maintenance, and renewal of mains and services, material and labour	7,170	3	10
Repair and renewal of meters	2,334	8	4
" " " " stoves	10,176	6	2
" " " " prepayment meters and fittings	11,164	5	8
Incandescent mantle maintenance	687	6	10
	56,395	3	11
Public lamps—lighting and repairing		2,396	9 4
Rent, rates, and taxes		14,577	10 7
Management—			
Directors' allowance	£1,250	0	0
Company's Auditors	75	0	0
Salaries of Secretary, Accountant, and clerks	1,281	17	3
Collectors' salaries and commission	1,697	10	4
Prepayment meter collection	2,175	3	0
Stationery and printing	1,008	6	4
General charges	2,014	0	11
	10,501	17	10
Bad debts		516	19 7
Law and parliamentary charges		201	4 8
Superannuations and allowances		1,5 8	13 9
Official officers, &c.		138	9 11
	£207,033	16	5
Balance carried to net revenue account		66,587	5 4
	£273,621	1	9

Receipts.			
Sale of gas—			
Per meter (No. in use, 105,191) at 2s. 4d. per 1000 cubic feet	£187,219	12	4
Public lighting and under contracts	5,655	7	3
	£192,874	19	7
Less discounts and allowances	4,372	19	6
	£188,502	0	1
Rental—			
Meters (23,733)	£2,8 7	13	2
Stoves (64,813)	10,370	1	7
Prepayment meters and fittings (80,697)	14,269	0	3
Incandescent mantle maintenance	694	18	8
	28,171	13	8
Residual products—			
Coke, less £4176 10s. 2d. for labour	£35,343	15	6
Breeze, less £928 0s. 11d. for labour	1,652	13	0
Tar	7,912	17	7
Ammoniacal liquor and sulphate of ammonia	11,950	2	5
	56,869	8	6
Miscellaneous receipts—			
Rent receivable	£30	19	6
Transfer fees	47	0	0
	77	19	6
Total receipts	£273,621	1	9

The following are the statements relating to the manufacturing operations of the Company in the half year :—

Statement of Coal and Oil.					
	In Store Dec. 31, 1910.	Received During Half Year.	Carbonized During Half Year.	Used and Sold During Half Year.	In Store June 30, 1911.
	Tons.	Tons.	Tons.	Tons.	Tons.
Coal	22,020	93,281	94,209	716	20,376
Oil—gallons	530,282	1,523,583	1,390,411	..	663,454

Statement of Residual Products.					
Description.	In Store Dec. 31, 1910.	Made During Half Year.	Used During Half Year.	Sold During Half Year.	In Store June 30, 1911.
Coke—tons	4,183	58,881	8,792	52,866	1,405
Breeze—tons	3,066	9,465	..	10,283	2,248
Tar—gallons	516,474	1,111,672	..	1,211,948	416,198
Ammoniacal liquor—butts of 108 gallons	9,234	34,218	38,749	..	4,703
Sulphate of ammonia—tons	50	1,230	..	1,250	30

Statement of Gas Made, Sold, &c.				
Quantity Made.	QUANTITY SOLD.		Quantity Accounted for.	Number of Public Lights.
	Public Lights and under Contracts (estimated).	Private Lights, per Meter.		
Thousands.	Thousands.	Thousands.	Thousands.	
1,764,178	36,579	1,606,260	1,669,301	3894

The remaining statement is the balance-sheet, which gives the value of the stores in hand at the close of the half year as follows: Coal, oil, &c., £20,007; coke and breeze, £1144; tar, ammoniacal liquor, sulphate of ammonia, &c., £6584; sundry stores, £30,923—total, £58,658. The figures this time last year were: Coal, oil, &c., £20,521; coke and breeze, £1665; tar, ammoniacal liquor, sulphate of ammonia, &c., £7505; sundry stores, £32,866—total, £62,557. A sum of £20,370 stands in the balance-sheet as employees' bonus and savings, compared with £16,073 at the end of June, 1910.

BROMLEY AND CRAYS GAS COMPANY.

An Appreciation of the Late Secretary.

The Half-Yearly General Meeting of this Company was held last Thursday—Mr. ALEXANDER DICKSON (the Chairman) presiding.

The accounts presented showed that the revenue in the six months ended June 30 was £43,502, and the expenditure £32,772; leaving £10,730 to go to the profit and loss account. The balance applicable for distribution was £12,117; and the Directors recommended the declaration of dividends, under the sliding-scale, at the rates of 6, 4½, and 5½ per cent. per annum on the "A," "B," and "C" stocks respectively, subject to income-tax. The payment of these would absorb £9261, and leave £2856 to be carried forward. The working statements show that, under the supervision of Mr. W. Woodward, the Company's Chief Engineer, 14,826 tons of coal were carbonized in the half year in the production of 218,264,000 cubic feet of gas, of which 201,952,000 cubic feet were sold; and that the residual products were: Coke, 8895 tons; breeze, 89 tons; tar, 174,022 gallons; sulphate of ammonia, 143 tons. The Directors reported that the business of the Company continued to show satisfactory progress.

The CHAIRMAN, in moving the adoption of the report, said he took it that its brevity would be entirely satisfactory to the shareholders. The Directors had nothing sensational to report. The accounts showed both advantages and disadvantages; and when the figures were adjusted, the disadvantage was about £190. Of the increased expenditure, £800 arose from the higher price of coal. There had disappeared from the accounts the remainder of the sum which was last year standing as an undischarged liability in connection with the account for the substitution of plant at Bromley for the works of the amalgamated Company; so that they were quite clear of further liability in this respect. The business of the Company had been most satisfactorily strengthened by amalgamation. Referring to the late Secretary (Mr. H. W. Amos), the Chairman said that the shareholders had, no doubt, all heard of his death since the issue of the report. Mr. Amos entered the Company's service 48 years ago, and his qualities secured for him first the appointment to the post of collector, and subsequently to that of Accountant and Secretary; and the last office he held for some twenty years. His work was always done to the best of his ability, and with that integrity of purpose which testified to a high life and long and honourable record. He would always be remembered as one of the Company's most faithful and loyal officers. The Directors expressed their sympathy with Mrs. Amos and family.

The DEPUTY-CHAIRMAN (Colonel Bertram H. Latter) seconded the motion; and it was carried.

The dividends recommended having been declared, The CHAIRMAN moved the following resolution: "That the Bromley and Crays Gas Company, in general meeting assembled, hereby records its sense of the loss which the Company has sustained in the sudden death of its Secretary, Mr. H. W. Amos, and its appreciation of his services, which, in different capacities, extended over a period of 48 years; and that a copy of the foregoing resolution be forwarded to Mrs. Amos, with an expression of sincere sympathy with herself and family."

Two of the shareholders having joined with the Chairman in his tribute of praise to the late Secretary, the resolution was agreed to.

The CHAIRMAN said the Directors had been much touched by the suddenness with which the death of Mr. Amos had come about; and they had resolved to recommend that a sum of one hundred guineas should be paid to Mrs. Amos. He therefore proposed that this amount should be voted to the widow of the late Secretary, in view of the very sudden termination of his career.

The proposition was agreed to.

The CHAIRMAN, in responding to a vote of thanks accorded to him, said the Directors invariably saw eye to eye in matters affecting the progress of the Company, which was, of course, added to by the officers and staff carrying out the policy and directions of the Board. It was always a pleasure on such occasions to acknowledge the work of the Chief Engineer (Mr. Woodward), for his painstaking efforts in connection with all that conducted to the advantage of the Company, and those who assisted him; also that of the Chief Clerk (Mr. Wicks) and others in the Secretary's office. They much appreciated their services.

Halifax and the Bailiffe Bridge Gas Supply.—At the meeting of the Halifax Town Council last Wednesday, the Gas Committee reported the receipt of a letter from the Clerk to the Hipperholme District Council, stating that his Council were prepared to acquire the undertaking of the Bailiffe Bridge Gas Company, Limited, and to supply gas. He asked whether it might be understood that the Corporation would not dissent to a Provisional Order, if applied for, empowering the Council to work the undertaking, and also inquiring on what terms the Corporation would be prepared to sell to the Council gas in bulk for distribution at Bailiffe Bridge. After hearing the Town Clerk's report upon the whole question, the Committee resolved that he should reply "that the Committee cannot recommend the Corporation to give an undertaking not to oppose an application made by the Council for a Provisional Order, as suggested; and that, so far as regards the portion of the area now being supplied by the Bailiffe Bridge Gas Company which is in the Halifax area of supply, the Committee would, if necessity arose, themselves supply such portion if the Bailiffe Bridge Gas Company ceased to supply there."

WELSBACH LIGHT COMPANY, LIMITED.

Statutory Meeting.

There was not a very numerous gathering at the statutory meeting of the Welsbach Light Company, Limited (which was held at Winchester House, E.C., last Tuesday); but nevertheless the proceedings were of quite a lively character, owing to the attitude of one or two shareholders.

The Secretary (Mr. S. J. Endersby) read the notice convening the meeting and the certificate of Messrs Deloitte, Plender, Griffiths, and Co., the Auditors. It was set forth in the statutory report that the total number of shares allotted was 262,000, of which 162,000 were allotted as fully paid up. The total amount of cash received by the Company in respect of the shares issued wholly for cash is £100,000. The preliminary expenses are estimated at £7000. The following is the constitution of the new Board: Herr Felix Kallmann, of Berlin (Chairman), Sir Edwin Grant-Burls, Kt., C.S.I. (Vice-Chairman), Mr. C. M. Crompton-Roberts, Herr R. Feuer, of Berlin, Mr. L. Fletcher, Mr. E. Lovinson, and Major G. O. S. Pringle.

The meeting was presided over by Sir Edwin Grant-Burls, who pointed out that this was not an ordinary annual meeting of the Company. There was no Directors' report, no balance-sheet, and no resolution to put. It was merely a meeting required by Statute to be held for certain limited purposes, and within a limited period from the date at which the Company were entitled to commence business. The statutory report, which was in the hands of the shareholders, contained all the information required by Parliament to be submitted to them.

At this point, several shareholders exclaimed "No, no;" and Mr. Green, interrupting, said that he and others were going to ask the Board of Trade to hold an inquiry into the conduct of this business. They had no fault to find with the gentleman now presiding; but they did contend that Major Pringle, Mr. Crompton-Roberts, and Mr. Fletcher had no right to sit on the Board—they did not represent the shareholders. It was proposed to ask the Board of Trade to hold an inquiry from the very beginning. They said the United States Debenture Corporation had no earthly right to nominate two Directors.

Remarking that this had nothing whatever to do with the business before the meeting, the Chairman continued his speech. He said the shareholders were aware that the Company had been formed as the result of an agreement entered into on Jan. 30 last between the Deutsche Gasglühlicht Aktiengesellschaft (Auergesellschaft)—or the German Company—and the old Welsbach Incandescent Gaslight Company, Limited, which subsequently went into liquidation. Under the agreement, the German Company undertook to form a new Company with a capital of £265,000 in £1 shares, and to procure the new Company to enter into an agreement for the purchase of all the assets of the old Company. The purchase price was to be £100,000 in cash, £240,000 in debenture stock of the new Company, and £100,000 in fully-paid shares. The new Company were also to undertake other responsibilities, with which he need not trouble the shareholders. The transaction foreshadowed by this preliminary agreement was, after lengthy discussion and due consideration of the many points involved, and of the documents necessary to carry the matter out, both in Berlin and London, duly proceeded with. The Memorandum and Articles of Association of the new Company having been eventually agreed and approved by all parties, registration of the Company took place on May 6 last; and on May 15, the definite sale agreement between the old Company and their Liquidator, the German Company, and the new Company was entered into. In accordance with their obligations, the German Company subscribed in cash for 100,000 shares of the new Company, so as to provide the cash portion of the purchase consideration for distribution among the preference shareholders of the old Company. A debenture stock trust deed, dated May 31, had been entered into to secure the £240,000 worth of debenture stock; the parties to this deed being the new Company, the German Company (as guarantors), and the United States Debenture Corporation, Limited (as Trustees). Then 35,000 fully-paid shares were allotted to the German Company or their nominees, in consideration of the guaranteeing of the payment of principal and interest of the debenture stock and provision of sinking fund; and 30,000 fully-paid shares were allotted to them, or their nominees, in consideration of subscribing at par 100,000 shares of £1 each. The question of the liquidation of the old Company had really nothing to do with this meeting; but as the point had been more or less indirectly raised, and as the shareholders might be anxious to know the apparent reason for the delay in the completion of the matter (for which the present Directors were not in any way responsible, as they had nothing whatever to do with the liquidation of the old Company), he might say that the mass of detail to be got through had been enormous, and that the Liquidator and the clerical staff at the Company's offices had for many weeks past been working until late at night. With regard to the constitution of the Board, he did not know the past history; but two of the Directors were, in pursuance of the agreements, nominated by the Trustees of the debenture holders. They were Major Pringle and Mr. Crompton-Roberts. Some of the Board—like himself—were associated with the conduct of the business for the first time. On the other hand, continuity was assured from the fact that some of the members of the Board had been previously connected with the business. "But at any rate," he concluded, amid disturbance, "whether with or without continuity, you may rely upon the present Board to do their best in your interests to carry this business to a big success."

Mr. Green then heatedly returned to his objection to the Directors he had already named. Mr. Fletcher, in reply, said that he, Major Pringle, and Mr. Crompton Roberts joined the Board only after the Advisory Committee had gone through the past affairs of the Company, in the hope that it might be possible to pull the Company together; and since then practically the whole of the actual capital had been repaid in dividends, and the Company had been sold for a figure in excess of its value at the time he joined the Company. He did not at all want to take the job on; but the German Company had insisted upon him entering into an agreement with the new Com-

pany. He had a duty to the shareholders; and he would carry it out. Colonel Ranken then took up the opposition, on similar lines to Mr. Green, and moved a resolution to the effect that the shareholders refuse to confirm the appointment of the three Directors named; but the Chairman ruled this out of order.

The proceedings, which had lasted upwards of half-an-hour, terminated with a vote of thanks to the Chairman.

NEWPORT (MON.) GAS COMPANY.

The Half-Yearly General Meeting of this Company was held last Tuesday—Dr. H. M. BREWER (the Chairman) presiding.

The SECRETARY (Mr. T. H. Hazell) having read the notice convening the meeting, the report of the Directors, with the accounts for the six months ended the 30th of June, was presented. The accounts showed a sum of £10,718 available for distribution; and the Directors recommended the payment of the statutory dividends.

The CHAIRMAN, in moving the adoption of the report, referred to the recent reduction of 2d. per 1000 cubic feet in the price of gas, and said there had been a satisfactory increase in the sales during the half year. The Board had given effect to the long-standing desire to reduce the price; and their action had been justified. If the increase in business continued satisfactory, he hoped the time would come when a further reduction might be considered possible. The abnormal summer weather had increased the Company's business to the extent of 9 million cubic feet of gas in the half year; being an increase of 5 per cent. upon the corresponding period of 1910. New mains had been added to the Company's system to the extent of 1½ miles; and some 200 stoves had been fixed in consumers' houses. The profit for the half year showed a slight improvement on 1910; and the Directors recommended the usual statutory dividend.

Mr. G. GEEN seconded the motion.

Dr. GARROD THOMAS inquired as to how the warm weather increased the consumption of gas.

The CHAIRMAN replied that people cooked by gas instead of by coal.

The report was adopted.

The dividend recommended having being declared, and the retiring Directors and Auditor re-elected, a vote of thanks was accorded to the Chairman, Directors, and officers.

The CHAIRMAN, in acknowledging the vote, assured the meeting that in the general all-round work of the Company he tried his utmost to ensure success.

The SECRETARY, in reply, said it was satisfactory that the Company they served was administered by a most efficient Board of Directors. The staff zealously endeavoured to discharge their duties. The Company was a prosperous one, and, though it met with considerable competition, it never went back. There had always been progress, and last year's business was not the least progressive of their many years of prosperity.

The ENGINEER (Mr. T. Canning) likewise expressed his acknowledgments. He said he had tried his utmost to promote the interests of the Company, and his staff rendered very loyal service. They were engaged on improvements which would bring the undertaking up to date. It was no use attempting to carry on any concern with commercial success unless it was up to date from an engineering point of view. When the works were completed, they would be an advantage not only to the shareholders but to the consumers as well.

TESTING METERS IN MANCHESTER.

Proposal to Put the Electricity Department on the Same Footing as the Gas Department.

At the Quarterly Meeting of the Manchester City Justices on Monday last week, the Gas-Meter Testing Committee presented a report on the suggestion made at the previous meeting that the testing of electricity meters should be under the control of the Gas-Meter Testing Department. The recommendation in the report was to the effect that the testing of electricity meters should be carried out by a Committee independent of the Gas-Testing Committee and the Corporation.

The Chairman of the Gas-Testing Committee (Mr. N. Bradley) said the object of the recommendation was to bring the sellers of electricity under the same conditions as the sellers of gas, so that purchasers of electricity might have the same opportunity of seeing that they had fair measure. He went on to explain that the Sale of Gas Act, 1859, provided that in all boroughs in which the Town Council was the manufacturer and seller of gas the Justices of such boroughs should have the power of carrying into effect provisions for the testing and stamping of gas-meters; and these powers were exercised by the Justices of the City of Manchester through the Justices' Committee. The Manchester City Council were manufacturers and sellers not only of gas but also of electricity; and the Committee felt that what was done in the public interest for the control of gas-meters should also be done in the case of those used for the supply of electricity. In the absence of statutory powers, however, the work of testing these meters could only be transferred to an independent authority by consent of the Corporation.

The Chairman of the Electricity Committee (Mr. G. Howarth) suggested that the Justices should appoint a small Committee to meet a few members of the Electricity Committee, who would be prepared to put the whole facts before them. At present there was no borough or city in the kingdom where there was a separate plant for the testing of electricity-meters; and he reminded the meeting that the Justices had no power to enforce what they proposed.

After some discussion, it was decided to "receive" the report, and to appoint three Justices to meet a similar number of members of the Electricity Committee to consider the question.

DARLINGTON CORPORATION GAS UNDERTAKING.

Annual Accounts.

We have received from the Gas Engineer and Manager of the Darlington Corporation (Mr. Frank P. Tarratt) the accounts of the Gas Department for the twelve months ended the 31st of March, as prepared by the Borough Accountant (Mr. J. W. Armitage). They show that the sale of 349,992,226 cubic feet of gas produced £36,562; that residuals brought in £15,261; and that the total revenue was £54,649. The expenditure on the manufacture of gas was £20,127; on purification, &c., £760; wages came to £4256; repairs cost £4884; distribution, £6369; rates and taxes, £2264; management, £1595; and sundry items brought up the total to £41,469. The balance carried to the profit and loss account was £13,180; and with the amount brought forward, there was produced a total of £18,212. This has been disposed of as follows: Liquidation of loans, £4346; interest on loans, £2527; transferred to district fund in aid of rates, £5500; carried to balance-sheet, £5838. The net profit is £6305; and Mr. Tarratt's working statement shows that this sum is equal to 3s. 2.759d. per ton of coal carbonized, 3.781d. per 1000 cubic feet of gas made, and 4.324d. per 1000 cubic feet sold. The quantity of coal carbonized was 39,043 tons; the make of gas 400,257,000 cubic feet, or 10,251 cubic feet per ton. The residuals produced were: Coke and breeze, 19,678 tons 16 cwt.; tar, 351,260 gallons; ammoniacal liquor, 1,221,400 gallons—yielding respectively 11s. 1d., 21s., and 9s. 1d. per ton. The capital invested in works and plant amounts to £186,253; being at the rate of £4 15s. 5d. per ton of coal carbonized, and 10s. 8d. per 1000 cubic feet of gas sold. The gross profit is 7.076 per cent. upon the total capital employed.

HALIFAX CORPORATION GAS UNDERTAKING.

The Past Year's Working.

The accounts of the gas undertaking of the Halifax Corporation for the past financial year show that the sale of 786,982,800 cubic feet of gas produced a revenue of £82,239; but a sum of £349 was paid to the Sowerby Bridge Urban District Council for 3,180,900 cubic feet supplied to Luddenden—bringing down the total to £81,890. The deduction of discounts further reduced this to £78,964. Meter-rents produced £2352; the sale of residual products, £28,742; and other items made up a total of £111,661. The principal items of expenditure in the past year were: Manufacture and purification of gas, £40,061; maintenance of works, £7862; distribution of gas, £4795; and management, &c., £5153—other items making up a total of £68,384, and leaving a gross profit of £43,277 to go to the net revenue account, compared with £41,369 for the year 1909-10. After meeting interest and sinking fund charges and paying income-tax, there was left a balance of £15,968, compared with £14,222 before. Adding the amount brought forward, £12,977, a total of £28,945 was produced. Out of this was paid to the borough fund account in aid of the rates for the year 1910-11, £7315; to the district fund account, £3657; placed to the reserve fund, £3616; and transferred to the working balance account, £4000; making a total of £18,589, and leaving a balance of £10,356. The amount added to the reserve fund brings it (with £934 interest on investments) up to £31,321.

The accounts relating to the working during the past year show that, under the supervision of the Gas Engineer and Manager (Mr. John Wilkinson), 70,966 tons of coal were employed in the manufacture of 840,618,000 cubic feet of gas, of which 783,941,600 cubic feet were sold and 8,802,300 cubic feet used on the works. The leakage was 47,240,100 cubic feet, or 5.6 per cent. The residuals were 32,335 tons of coke made for sale, 4568 tons of tar, and 839 tons of sulphate of ammonia. The cost of gas at the works was 13.24d. per 1000 cubic feet sold; and the expenses of distribution, &c. (less meter-rents), came to 5.37d.; making a total of 18.61d. The total receipts for gas worked out to 24.17d. per 1000 cubic feet; showing a difference of 5.56d. The balance of profit was 4.89d.; and the accident insurance fund and the cyanide plant account for the rest.

GAS UNDERTAKINGS IN THE POTTERIES.

Reductions in Price.

The report of the Gas Committee of the Stoke-upon-Trent County Borough Council which was submitted at the last meeting of the Council contained recommendations to reduce the price of gas by 2d. per 1000 cubic feet for ordinary purposes in the Burslem and Fenton areas, and by 3d. per 1000 cubic feet for ordinary and power purposes in the Longton area, from the 30th of September next.

Mr. MITCHELL, the Chairman of the Gas Committee, in moving the adoption of the report, said the Committee had hoped that the balance-sheet of the four works would have been in the hands of the members at this meeting; but the delay was due to the Auditors not having completed the accounts. The amended proof had been adopted by the Committee; and upon the profit shown they recommended the reductions in price set forth. The net profits for the year were: Burslem, £4839; Stoke, £1359; Fenton, £1674; Longton, £3573. He thought these figures were satisfactory. It had been decided to let the price of gas in Stoke remain at 2s. 1d., owing to the circumstances of the Stoke undertaking. But with regard to the three other undertakings, the Committee, in consultation with the Managers, had decided to reduce; and, further, all charges for mains and services, meters, cookers, and extension of plant and apparatus, which could reasonably be charged to capital, must be met and paid for out of revenue. The Committee, upon the advice of the Managers, were sanguine that, with the prospect of good markets for residuals and

favourable contracts for coal, they could safely recommend the reduction to 1s. 10d. The proposals had been carefully considered, and the total amount of saving to the gas consumers and public lighting authorities would in the three areas be: Burslem, £4002; Fenton, £1130; Longton, £3358—total, £8490. In Longton, the reduction of 3d. per 1000 cubic feet to all ordinary customers would amount to £1729; and the effect of putting the prepayment consumers on the same terms as the ordinary ones (as arranged by the Council) would be a reduction of £1021. If the Hanley prices for public lighting were adopted, the loss would be £608. So that the total estimated reduction in the case of Longton was £3358. In the case of Burslem, the reduction of 2d. on gas sold was £3319; the estimated reduction in the cost of public lighting by the adoption of Hanley prices was £235; and the abolition of meter-rents was £448. So that there was a total reduction in Burslem of £4002. The reductions in Fenton amounted to £1130—£730 for ordinary consumers and £400 for public lighting. The Managers estimated that, allowing for the reductions, the profits next year would be: Burslem, £838; Fenton, £237; Longton, £215. The increases in the quantity of gas sold in the past as compared with the previous year were: Burslem, 25 millions; Stoke, 6½ millions; Fenton, 8½ millions; and Longton, upwards of 10½ millions. In conclusion, he said he thought the time had come when the Council might move in the direction of securing a reduction in the price of gas sold by the British Gas Company in the Hanley and Tunstall areas.

Mr. BROOKHOUSE seconded the motion.

After some discussion, a Committee was appointed to approach the British Company, with the view of obtaining a reduction in price in Hanley and Tunstall.

GAS AND WATER FINANCE AT STOCKPORT.

The annual abstract of accounts for the borough of Stockport, presented at last Wednesday's meeting of the Town Council, showed that the total income for the year in the Gas Department was £122,111, and the expenditure upon revenue account £76,178; leaving a gross profit of £45,933, which had been appropriated as follows: Depreciation, £12,254; interest on capital, £7487; reserve fund, £6842; local rates, 1911-12, £19,350. Out of the reserve fund, £11,016 had been expended during the year; leaving the balance to the credit of this account £5171. The capital expenditure was £11,096; making the total outlay on the gas undertaking £470,055. The deposit account showed £1924 to the credit of gas deposits; £1000 for tar deposits; £184 for fittings deposits; and £414 for accrued bank interest.

The Chairman of the Finance Committee (Mr. Henry Bell) explained that the income from the Gas Department was up by nearly £6300—showing an increase of 5½ per cent. on the previous year. Their expenditure had increased by only 2 per cent. The Gas Committee had put £6842 to the reserve, which was £3800 more than last year; but they had done a good deal of new work, and paid for it out of revenue. This represented £11,000; and the balance now standing in the reserve fund was £5171.

Referring to the Water Department, Mr. Bell said the income for the past financial year was £57,066—an increase of £2075 on the previous twelve months. The expenditure on revenue account was £59,406, or an increase of £1224, of which no less than £706 was due to higher rates. The expenditure which they were committed to in carrying out the important works at Kinder had resulted in an increase of £121,236 on the mortgage debt on the water-works.

IMPROVED PUBLIC LIGHTING IN KENSINGTON.

At the last meeting of the Kensington Borough Council, the Sub-Committee appointed for effecting an improvement in the public lighting of the borough reported that they had inspected a number of "Kensington" pattern lanterns which had been converted for the use of one and two inverted burners respectively. As regards the lamps converted for one burner, they were of opinion that the system would prove in every way satisfactory when correct adjustment of the burners had been made, and the lamps were kept in proper condition; and they had given special directions to the Lighting Engineer on these two points. With regard to the seventy "Kensington" pattern lamps converted for the use of two inverted burners, which had been fixed in Cromwell Road, they considered the results most satisfactory. Under these circumstances, they had decided to give an order to Messrs. D. Anderson and Co. for the conversion of a further 1000 lamps for use with one inverted burner, and for a further 200 "Kensington" pattern lamps for use with two burners. The Sub-Committee also reported with reference to the description of the three-light lamps to be provided in certain streets, that they had inspected lamps of the arc pattern which had been fixed by Messrs. D. Anderson and Co., Messrs. Falk, Stadelmann, and Co., and Messrs. W. Sugg and Co.; and looking to the satisfactory results obtained from these lamps, they were of opinion that similar ones should be provided in those streets in which the Council had decided that three-light lamps should be fixed. The lamps required to complete the lighting of Earl's Court Road are to be obtained from Messrs. Falk, Stadelmann, and Co.; and those for lighting Church Street from Messrs. W. Sugg and Co.

The Whittlesey Gas and Coke Company, Limited (with offices at High Causeway, Whittlesey, near Peterborough), was registered on the 25th ult., with a capital of £2500 in £10 shares.

In connection with the memorable Sidney Street siege, claims to the amount of £2193 were made by parties who had sustained damage; and they were settled for £533. The only claimant to receive payment in full was the Commercial Gas Company, who lost meters, stoves, and gas to the amount of £13 8s. 2d.; and this sum has been paid them.

LIGHTING OF LEAVESDEN ASYLUM.

Inverted Incandescents Replace Flat-Flame Burners.

At a recent meeting of the Metropolitan Asylums Board, the Asylums Committee reported that on the 20th of May the Managers accepted the offer of the Watford Gas Company to supply gas to the Leavesden Asylum, on the terms and conditions set forth in a report by the Engineer-in-Chief. The Clerk of the Board now informed the Committee that he had settled the terms of the agreement between the Managers and the Company, but that there was one point, relative to the candle power of the gas to be supplied, in which the agreement differed from the conditions approved by the Board. In the Engineer-in-Chief's report, 15-candle power was mentioned; whereas the agreement specified that the gas to be supplied should, as regards illuminating power and purity, be subject to the provisions of the Watford Gas Act, 1906, under section 36 of which the prescribed number of candles was to be 13. The Clerk of the Board, however, had been informed that the Gas Company supply 15-candle gas, but that they cannot give any guarantee that the gas shall be of this power when it reaches Leavesden; and he did not see how the Managers could press for more than the Company's Act requires. The Assistant-Engineer saw no objection to the variation being agreed to; and in this the Committee concurred.

The Hospitals Committee reported that the replacement, in a small portion of the Southern (Upper) Hospital, of flat-flame gas-burners (by which the institution was lighted throughout) by inverted incandescent gas-burners having given satisfactory results, they proposed that the whole of the Upper Hospital should be fitted with modern burners, especially as it was estimated that considerable economy would accompany the improvement in the lighting which the suggested change would effect. The Engineer-in-Chief considered there would be a saving of approximately £200 per annum if the number of blocks occupied during the twelve months after the installation were the same as during the year 1910, or about £270 per annum if the hospital were fully occupied. He estimated the expense of the provision of the new burners at approximately £425, including the cost of adjustable pendants (with shades) for lamps in the patients' blocks over the tables at which the nurses sit at night; and he stated that the new burners could be fixed by the hospital staff. There would be 1520 of the existing burners replaced by 1146 others. The Committee recommended: "That the replacement, at an estimated cost of £425, at the Southern (Upper) Hospital, as and when required, of the existing gas-burners by inverted incandescent burners, as advised by the Engineer-in-Chief be sanctioned; and that the Works Committee be instructed to arrange for the execution of the necessary work by the hospital staff, under the supervision of the Assistant-Engineer." The recommendation was adopted.

RAINSTORMS AND TARRED ROADS.

Colonel R. E. Crompton, the Consulting Engineer to the Road Board, sent a letter on this subject to "The Times" the day after the great storm on the 28th ult.; and it appeared in the Engineering Supplement last Wednesday. In it, he made the following remarks.

As one of those responsible for advising the street authorities of London to tar and render dustless their macadam roads, I was naturally much interested to see how far the extensive tarring in Kensington which has been carried out during the present summer has affected the discharge of storm water into the sewers. The storm of yesterday was a true cyclonic electrical disturbance. Its cyclonic nature caused the downpour to be so concentrated that it resembled a waterspout, the centre of which moved rapidly over the area. . . . A large number of gullies were so blocked that the water rose to a high level, basements were flooded, and much damage was done. This was notably the case opposite the Palace Hotel, where the rush from the roadway in Kensington Palace Gardens resembled a Scotch stream in spate.

As soon as the rain slackened, I went round and inspected all the roads which had been tarred on Campden Hill, Phillimore Gardens, and in the Earl's Court and Queen's Gate districts. In every case, even where there were trees, I found the gullies free and clear of grit and no accumulations of water. But in all cases where the roads were left untarred, the gullies had been blocked, and there were accumulations of grit and mud on the road, which were soon churned up and carried afar by the traffic.

The great advantage that tarring has for road authorities in reducing the scour from such storms and the necessary repairs of roads following them was already well known to me; but, as an advocate of the advantages of surface tarring for the macadam roads of London, I was gratified to find that the waterproofing of the streets by tarring greatly assists the scavenging power of the thunderstorms which follow long periods of drought, and at the same time minimizes the erosive and damaging effects on the roadways and the consequent blocking of gullies and flooding of basements.

If His Majesty's Office of Works had seen their way to tar the surface of the road in Kensington Palace Gardens in a similar manner to Queen's Gate, it would have saved the Kensington and Westminster authorities, and the unfortunate owners who had their basements flooded, much discomfort and heavy cost.

Beverley Gas and Water Profits.—The Beverley Corporation Gas Department, for the year ending March 31, shows a gross profit of £5080, and a net profit, after payment of interest, &c., of £3389. There is a gross profit from the Water Department of £1913, and a net profit of £943. These gratifying results, it is pointed out, reflect much credit both on the Gas and Water Committee and the Manager (Mr. F. W. Oldfield). The Committee have decided to give in aid of the rates a sum of £1000 from the gas profits, in addition to the annual contribution of £684 for the drainage loan—making a total of £1684 for the year.

NOTES FROM SCOTLAND.

From Our Own Correspondent.

Saturday.

I fully expected that the gas accounts of the Corporation of Glasgow would have been available for publication this week, as they have been prepared and have been issued to members of the Corporation. There is a very strict rule, however, in the Corporation service, that until a document has been approved by the Town Council it is "private and confidential, and for the use of members only." The gas accounts were on the *agenda* of the meeting on Thursday; and I attended in order to see them adopted. The meeting, unfortunately, was the first which had been held after the holidays; and there was an accumulation of business which threw the item I was interested in down to No. 21 on the list. The Corporation succeeded in disposing of 18 of the items, which fell short of the Gas Committee's report and accounts. As may be expected, so large an undertaking as the Glasgow Corporation Gas Department has many eyes upon it; and information which there is every reason to believe is accurate, though incomplete, has been published in the local Press. It would be a pity to publish what has already appeared, and afterwards to print the full account which we are in the habit of giving in the "JOURNAL." However, it may be stated briefly that the gross revenue for the year amounted to £896,046, and the gross expenditure to £683,482. Depreciation written off capital assets amounted to £66,047, raising the expenditure to £749,529, and leaving a gross balance of £146,517. After payment of annuities, interest, and sinking fund, there remains a sum of £9961, which has been transferred to the credit of the reserve fund.

The Gas Committee recommend that the price of gas for domestic lighting, for quantities of less than 500,000 cubic feet, remain at 2s. per 1000 cubic feet, but that quantities beyond this amount and up to 2 million cubic feet be reduced from 2s. to 1s. 11d.; from 2 to 6 millions to be reduced to 1s. 10d.; from 6 to 10 millions, to 1s. 9d.; and for quantities above 10 million cubic feet, from 1s. 9d. to 1s. 8d. For power and manufacturing purposes, the proposal is to supply gas up to 20,000 cubic feet at the present rate of 2s.; up to 5 million cubic feet, that the rate be reduced from 1s. 8d. to 1s. 6d.; and up to 6 million cubic feet, from 1s. 6d. to 1s. 4d. per 1000 cubic feet. For hotels, clubs, and institutions, other than for lighting purposes, it is recommended that, for quantities above a certain amount, there should be a reduction of 2d. per 1000 cubic feet. It is recommended that the charge for gas supplied through prepayment meters be reduced from 2s. 7d. to 2s. 6d. per 1000 cubic feet; and that for public lamps the charge for gas be reduced from 1s. 8d. to 1s. 6d. per 1000 cubic feet. These proposals, with the Gas Committee's report and the accounts, will all come before the Council at their next meeting. Probably the reason why the Council did not overtake the whole of the business was that attention was engaged with a proposal of the Finance Committee to appropriate out of a surplus of £55,000 which had accrued upon the tramways account, to the amount of £40,000 in relief of the rates, and to the amount of over £11,000 in improving slum areas. Last year the Corporation made their first venture in the direction of aiding the rates from the profits of commercial undertakings, by voting the sum of £15,000 from the tramway profits. There was a fierce and long discussion upon the proposal of the Finance Committee, in the course of which it was pointed out that the Corporation until last year were clean in the matter of aiding the rates, and that then Parliament took away from the Gas Committee the power to make contributions from their revenues towards municipal purposes. This brought out the somewhat curious explanation that the Gas Committee did at one time make such contributions, but ceased making them, and for twenty years did not do so. The further explanations were given that the power to make such contributions was taken away with the consent of the Gas Committee; and that it was done because the power had been so long unused that there was evidently no necessity for it. The Council were informed that the proposed contribution of £40,000 would mean a reduction in the rates of 2d. per pound. The Council decided not to make the appropriation which was recommended, but to set apart the whole of the tramway surplus as a fund to be employed in the improvement of the poorer districts of the city.

This week we in Scotland have been having demonstrations by Mr. Soyer of his method of cooking food in paper bags. Arranged by the proprietors of the "People's Journal," these demonstrations were given in Edinburgh, Dundee, Aberdeen, Glasgow, and Rothesay, with a return visit to Edinburgh in the beginning of next week, on account of the success of the venture. The cooking was done by means of gas-stoves, which in some (if not all) of the instances were supplied and fitted up free of charge by the local gas authority, who also supplied gas gratis. I attended one of the demonstrations, for the purpose of ascertaining the quantity of gas consumed. When I arrived, fifteen minutes before the demonstration began, the three stoves to be used were already under heat, and so I cannot give the total quantity of gas consumed from start to finish. But from the time I read the meter—fifteen minutes before cooking began till the end of the demonstration, a period of an hour-and-a-half—it indicated that the consumption of gas was almost exactly 100 cubic feet. This was as near as could be a gas consumption to the total amount of 3d. The distinguished *chef*, in the course of the demonstration, cooked as many as 18 dishes, beginning with a joint of 5 lbs. weight, and concluding with baked and stewed fruits. The demonstration fully bears out the claim that the cooking of food in paper bags is economical so far as the consumption of gas is concerned. It may be proper to explain, as accounting for the small consumption of gas, that during the process of cooking the taps are turned down to the extent of one-half.

Sheriff-Substitute Moffatt on Monday gave his decision upon the relevancy of the complaint brought by the Corporation of Falkirk against Bailie Russell, one of their number, of having used for lighting within his premises gas supplied to him at a cheaper rate for power purposes, contrary to section 38 of the Gas-Works Clauses Act, 1847. The Sheriff-Substitute is of opinion that the complaint is relevant; and he has repelled the objections that were stated at a previous diet of the Court. Bailie Russell thereafter pleaded not guilty, and the case was adjourned to Oct. 26 for trial.

The Gas Manager at Kirkcudbright submitted the other day to the

Town Council his estimates of revenue and expenditure for the current year. These showed an income from the sale of gas of £1113, and from residual products of £237—a total of £1350. The expenditure was stated at £1001, which left a balance of £349. From this there was deducted interest on loans, amounting to £136; sinking fund charges, amounting to £165; and other items of expenditure, amounting to £16—which left a net balance of £32. The Manager recommended a reduction in the price of gas for lighting purposes to the extent of 5d. per 1000 cubic feet. This was agreed to. On a proposal that 2s. 6d. per week be added to the wages of the stoker, the Council differed in opinion; and the resolution arrived at was that the stoker receive an increase of 2s. a week, with a bonus of 6d. if he produces on an average 9500 cubic feet of gas per ton of coal carbonized.

The annual meeting of the Banff Gaslight Company was held on Wednesday. The report of the Directors was adopted; and a dividend of 5 per cent. was declared.

The parliamentary inquiry into the application by the Corporation of Falkirk for an extension of the burgh boundaries, which was begun last week, was concluded on Wednesday. During the whole time of the inquiry, the Parliamentary Commissioners were occupied in hearing evidence in support of the application. Among the witnesses examined was Mr. W. Wilson, the Gas Engineer to the Corporation, who considered that the area proposed to be taken in, being mostly supplied already by the burgh, ought to be brought within the boundaries. The Commissioners, without calling for evidence on the part of the objectors (of whom there were about twenty), intimated that they found the preamble of the Bill not proved. In their opinion, the position of the burgh and of the adjoining districts was such that in the near future some extension of the boundaries would probably be necessary; but at the present moment they had no doubt the application was premature. In consequence of the failure of the application, the agreement which was intimated last week as having been come to between the promoters and the Polmont District Gas Company, whereby the Company were to receive £6000 for their interest in the village of Laurieston, falls.

CURRENT SALES OF GAS PRODUCTS.

[For Table of "Tar Products Prices," see p. 378.]

Sulphate of Ammonia.

LIVERPOOL, Aug. 4.

With the turn of the month the tone of the market has become quieter, the most pressing requirements having evidently been satisfied. This being the period of smaller production, available supplies are limited, and there has not been any anxiety shown to force sales. Prices have therefore been fully sustained, and the closing quotations are £13 17s. 6d. to £13 18s. 9d. per ton f.o.b. Hull, £13 18s. 9d. to £14 per ton f.o.b. Liverpool, and £14 1s. 3d. to £14 2s. 6d. per ton f.o.b. Leith. Little actual business has transpired in the forward

position, but manufacturers maintain a very firm attitude, and it is reported that £14 2s. 6d. per ton has been paid in Scotland for October-March delivery in equal monthly quantities.

Nitrate of Soda.

The market in this article is unchanged, and holders of spot parcels continue to quote 10s. per cwt. for ordinary and 10s. 3d. for refined quality.

LONDON, Aug. 4.

Tar Products.

There is little alteration in the markets for tar products; but prices remain very firm. In pitch there is no alteration in price; but high figures are asked in nearly every quarter. Benzols are quiet, but steady. In regard to solvent naphtha, it is difficult to do business in this article at the present moment. Heavy naphthas are firm. Creosote is in good demand. Crude carbolic is very firm, and high prices are reported to have been paid for next year's delivery.

The average values during the week were: Tar, 20s. to 24s., *ex* works. Pitch, London, 39s. to 40s.; east coast, 39s. to 40s.; west coast, Manchester, 38s. to 38s. 6d., Liverpool, 39s. to 40s., Clyde, 39s. to 40s. Benzol, 90 per cent., casks included, London, 9½d. to 10d.; North, 9d. to 9½d.; 50-90 per cent., casks included, London, 8¾d. to 9¼d.; North, 9d. to 9½d. Toluol, casks included, London, 9¾d. to 10d.; North, 9¼d. to 9½d. Crude naphtha, in bulk, London, 4d. to 4¼d., North, 3¾d. to 3½d.; solvent naphtha, casks included, London, 11d. to 11¾d., North, 10d. to 10½d.; heavy naphtha, casks included, London, 11½d. to 1s. 0½d., North, 10d. to 10½d. Creosote, in bulk, London, 2¾d. to 2½d.; North, 2d. to 2½d. Heavy oils, in bulk, 2¾d. Carbolic acid, 60 per cent., casks included, east coast, 2s. to 2s. 1d.; west coast, 1s. 11d. to 2s. Naphthalene, £4 10s. to £8 10s.; salts, 40s. to 42s. 6d., bags included. Anthracene, "A" quality, 1½d. per unit, packages included and delivered.

Sulphate of Ammonia.

The inquiry is still very good, and further business has been reported for both this and next year's delivery at improved prices. For the prompt position, the value remains about the same. Actual Beckton is nominally quoted £13 12s. 6d., although it is believed that this make has changed hands at a higher figure. Outside London makes are quoted £13 10s. to £13 12s. 6d., Hull £13 17s. 6d., Liverpool £13 17s. 6d. to £13 18s. 9d., Leith £14, and Middlesbrough £13 17s. 6d. to £13 18s. 9d. For forward delivery, a premium of 2s. 6d. to 3s. 6d. per ton is asked at nearly all ports.

An emphatic objection to the electric light comes from Dublin, where an old man named Brown has been sentenced to two months' imprisonment on a charge of breaking electric fittings in the workhouse. He stated that he objected to the electric light because the inmates of the workhouse could not light their pipes or warm themselves with it.



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COAL TRADE REPORTS.

Northern Coal Trade.

There is a heavier demand for coal in the North, now that the shipments are freed from labour troubles; and there is a desire to accumulate stock. In the steam coal trade, the exports are full, and best Northumbrians are quoted at from about 11s. 6d. per ton f.o.b., second-class steams are from 9s. 6d., and steam smalls are in better request at 5s. to 6s. Production is full; and it is well taken up. In the gas coal trade, there is now an increased demand, both for local use and for shipment; and the prices are very firm, especially for best kinds. Second-class gas coals are about 9s. 6d. per ton f.o.b., best Durhams are from 10s. 6d. to 10s. 7½d., and "Wear specials" from 10s. 10d. to 11s. A sale is reported of a quantity of best Durham for shipment to Genoa this autumn at about 17s. 3d. per ton, delivered at that port—a price a little below that now quoted for occasional cargoes. One or two small contracts are also in the market; but with delivery fairly forward, the tendency is to ask higher prices, because of the expected addition to the cost of production through the legislation that is now in progress. The coke market is brisker. Good gas coke is quoted at from 14s. to 14s. 9d. per ton f.o.b. in the Tyne. The output of gas coke is increasing slowly; but the demand takes it up.

Scotch Coal Trade.

The improvement in the coal market noticed last week has been fully maintained. The demand for shipping is considerably better, and prices are reported to have been advanced 3d. and 6d. per ton. Small stuffs are still in poor demand. The prices quoted are: Ell 9s. to 10s. 3d. per ton f.o.b. Glasgow, splint 9s. 6d. to 10s., and steam 9s. to 9s. 3d. The shipments for the week amounted to 255,130 tons—an increase upon the previous week of 33,238 tons, but a decrease upon the corresponding week of 17,334 tons. For the year to date, the total shipments have been 9,120,607 tons—an increase upon the corresponding period of 84,096 tons.

Malton Gas Company.

The half-yearly meeting of the Malton Gas Company was held last Wednesday—Mr. Hugh W. Pearson (the Chairman) presiding. In moving the adoption of the report and accounts, he said there was a net profit of £1448 on the six months' working; and as the usual dividend of 6 per cent. required £1440, there was a small margin. They had, however, a floating balance of between £1600 and £1700 of past profits which they were entitled to use to equalize dividends; and they also had a reserve of £7122. These two figures made up what was practically a reserve of upwards of £8700, or more than one-third of the paid-up capital. The financial position of the Company, therefore, was undoubtedly a strong one. With the income-tax at 1s. 2d. in the pound, when they paid their dividend tax free it was equal to £12 14s. per cent. per annum. Referring to the Company's

assessment appeal early in the year, as reported in the "JOURNAL" at the time, the Chairman remarked that though the Company had completely succeeded, the appeal had cost them £140. But the saving in rates which they would have had to pay, had they submitted to the higher assessment, was at least £80 a year, and with the increased rates at Malton and Norton was probably nearer £100 per annum saved. Consequently, they had already, in the year-and-a-half that had passed since it was sought to raise the assessment, more than recouped themselves the £140. He was sorry he could not say so much for the ratepayers, as the cost to them by what he could only regard as the obstinacy and wrong-headedness of the Assessment Committee, was practically £1000. It was a much-needed lesson to them, as he found from experience that it was next to impossible for any ratepayers—especially an industrial concern like the Company—to get fairly good treatment. The report was adopted, and a dividend of 6 per cent. for the half year, free of income-tax, declared.

Felixstowe Water Purchase Question.—The Felixstowe and Walton Urban District Council have passed a resolution in favour of the purchase of the undertaking of the local Water Company; and they have resolved that their Parliamentary Agents shall take all the necessary steps in connection with the promotion of a Bill for the purpose.

Reduced Price at Runcorn.—At the half-yearly general meeting of the Runcorn Gas Company, the Chairman (Mr. Frederick Rigby) congratulated the shareholders on the successful report submitted, and announced a reduction in the price of gas of 2d. per 1000 cubic feet, from July, and a further reduction of 2s. 6d. per lamp on the lamps of the town.

Gas v. Electricity at Dawlish.—A test of the use of gas and electricity for public lighting is to be carried out at Dawlish. The District Council decided last Wednesday to accept an offer by the Electric Light Company to erect and maintain six lamps in the Strand for twelve months; the Council to pay 3d. per unit for the current. The Gas Company will at the same time put up six lamps of the same power in another street, and will maintain them for the same period, charging for the gas 2s. per 1000 cubic feet.

Voelker Lighting Corporation, Limited.—The annual meeting of the shareholders was held at the works at Wandsworth last Friday, when the report and balance-sheet, which were referred to in the "JOURNAL" last week (p. 313), were duly adopted. This action by the shareholders was not surprising, as the report all round was of so favourable a character. A vote of thanks was unanimously passed to the Directors and the heads of departments, for the satisfactory manner in which the business continues to be conducted. It is generally admitted that competition in the gas-mantle industry is of the keenest; and it may therefore be assumed that the good results obtained by the Voelker Corporation are mainly due to excellence of manufacture, which, it is pleasing to note, is wholly British.

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Lighting the South Pontoon of Woolwich Ferry.

At the meeting of the London County Council last Tuesday, the Highways Committee reported having been in negotiation with the South Metropolitan Gas Company with regard to the improvement of the lighting on the south pontoon of Woolwich Ferry. The Company stated that they were prepared to instal new high-pressure incandescent gas-lamps in substitution for all the existing lamps on the ferry for the sum of £77 4s. 8d., and allow £6 for the old lamps; also to alter the hanging of the lamps on the bridge approaches with a view to making them as effective as the lamps similarly placed on the north pontoon. The Committee stated that the total expenditure involved by the acceptance of the Company's offer amounted to £107 4s. 8d. (less £6 for the old lamps); but as the alterations would have the effect of considerably improving the lighting, as well as of materially reducing the consumption of gas and the annual maintenance charge in respect of the lamps, they recommended that the Company's offer should be accepted. This was agreed to.

Grantham Gas Company.

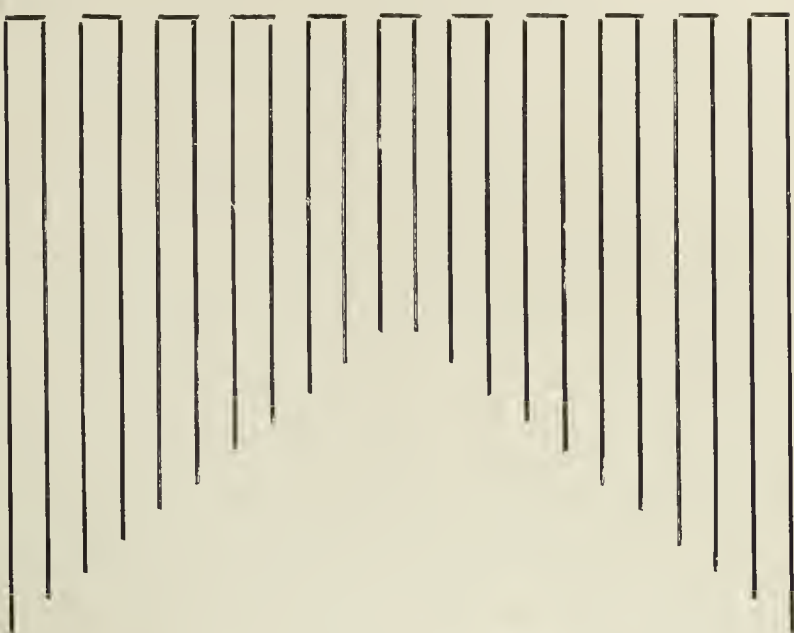
At the ordinary half-yearly general meeting of this Company held last week, the Directors reported that they were again able to present a very satisfactory balance-sheet; showing a sum of £3834 to the credit of the profit and loss account. Out of this, they recommended that £2000 should be applied in payment of the maximum dividend of 5 per cent. per annum on the consolidated stock, and that the balance should be carried forward. The Directors thought the time had arrived when a further reduction might be made in the price of gas; and they therefore proposed that to all consumers it should be reduced from Sept. 30 next by 2d. per 1000 cubic feet—viz., from 2s. 11d. to 2s. 9d. They also reported that the co-partnership scheme had been working smoothly and successfully, and that, in consequence of the reduction in the price of gas in 1909, the bonus paid was at the increased rate of 5 per cent. This had been much appreciated by the employees, who would next year be entitled to a still further increased benefit by reason of the reduction in price of gas, as now proposed. The Chairman (Mr. J. G. Thompson), in moving the adoption of the report, said the accounts were the most satisfactory ever presented in the history of the Company. For this they were indebted to the Manager (Mr. R. G. Shadbolt), the employees and the consumers. The employees were partners in the concern. Three years ago they had a bonus of 3½ per cent.; last year, through the reduction in the price of gas, it was increased to 5 per cent.; and now, on account of the further reduction, it would again go up. The report was adopted.

Fire at the Acton Compressing Station.—A slight fire occurred last Friday week at the Acton compressing station of the Brentford Gas Company, due to the failure of a valve on the high-pressure main to shut tight, causing an escape during a small repair to the compressor. There was no explosion; but the engine man was burnt about the face and arms. The Acton compressor station is one of the largest in the kingdom; and supplies gas to 3 miles of high-pressure mains. There are 604 lamps fed from this plant; and the supply to them was not interfered with. The damage done was at once repaired.

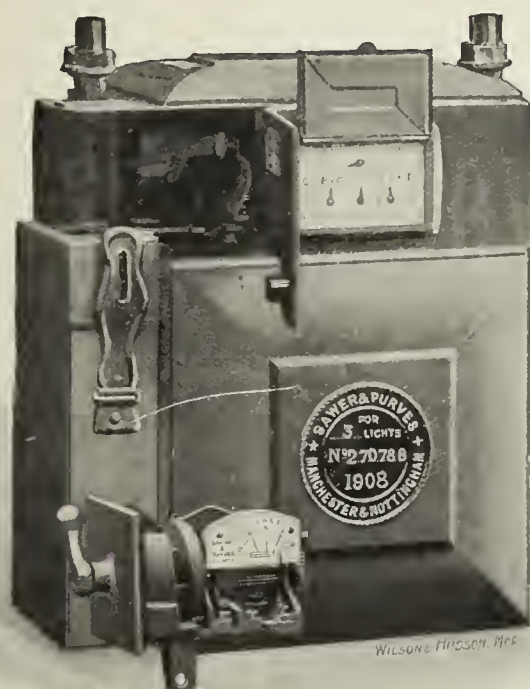
Gas-Cooker Tenders at Warrington.—A discussion on tenders followed upon the recommendation of the Warrington Corporation Gas Committee, at the meeting of the Town Council last Wednesday, respecting the acceptance of a tender from an outside Company for 100 gas-cookers. Alderman Pierpoint, the Chairman of the Committee, explained that there were two important local firms of gas-stove makers, and it was with great regret that the Committee had had to pass them by, and give the order to others; but the difference in price was 10 per cent. Mr. Jenkins moved an amendment to refer the matter back for further consideration, on the ground that the local concerns mentioned paid a large amount in rates, and ought to have a preference. There was a good deal of local feeling that this tender should have been allowed to go out of the town. After some discussion, however, the amendment was withdrawn, and the Committee's action approved.

Question as to Depth of Mains at Bakewell.—At the Town Hall, Bakewell, on Monday last week, two of the Justices of the Peace (Messrs. G. J. Marples and B. Morton) sat as Arbitrators to decide a case between the Bakewell Urban District Council and the Derbyshire County Council. The District Council, for whom the Clerk (Mr. V. R. Cockerton) appeared, are laying mains from the gas-works to the villages of Ashford and Longstone. They are being laid at a depth of from 2 ft. 1 in. to 2 ft. 4 in.; and the County Council (for whom Mr. G. G. Bailey, one of the Council's officers, appeared) contended that on the main roads the pipes should be laid at a depth of 3 feet. In the absence of an undertaking on the part of the District Council to enter into an agreement which would protect the County Council in case of damage to the pipes through heavy traffic, the District Council declining to give such an undertaking, the Court found that the mains were being laid at an ample depth.

Fatal Accident at the Halifax Gas-Works.—An inquest has been held at Halifax relative to the death of John Cardwell, who for over thirty years had been employed at the Corporation gas-works. It was stated that Cardwell had charge of the coke-conveyor; and that last Thursday week he was on the night shift. Shortly after 12 o'clock, he was found lying insensible on the floor, having apparently fallen from the gangway alongside the conveyor, a distance of 9 feet. No one saw him fall, as the rest of the men were in the cabin. Three ribs were fractured, and had perforated the lungs; and the right side of the head was severely lacerated, the ear being torn off. He died at the infirmary on the following Monday. A verdict of "Accidental death" was returned; and the jury expressed the opinion that a rail should be fixed at the side of the gangway. Mr. J. Wilkinson, the Manager of the gas-works, said the Corporation would provide a rail as suggested. On behalf of the Corporation, Mr. Morton expressed regret at the accident, and sympathy with the widow and family. He mentioned that this was the first fatal accident at the gas-works for forty years.



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Shortage of Water in Paris.—Writing last Tuesday, the Paris Correspondent of the "Daily Mail" said: "The shortage of drinking water in Paris gives rise to anxiety. A conference took place to-day between the Prefect of the Seine (M. Delanney), the Seine Engineers, and Dr. Roux, Director of the Pasteur Institute, at which plans were discussed for making the Seine water drinkable. Experiments will be made immediately. Of the six large reservoirs which supply Paris with water, one at Montsouris is now dry, while another is only a quarter full. The St. Cloud reservoir contains only 75,000 cubic metres as compared with 300,000 cubic metres under normal conditions. The authorities still hope to save the situation by hastening the completion of the new reservoir at St. Maur, which is capable of holding 300,000 cubic metres of sterilized water. Meanwhile, the pressure is exceedingly low, and people occupying lofty flats have to fetch their water in jugs from the street mains." It is proposed to utilize the water of the River Marne, after filtration and chemical treatment.

The Recent Kirkcaldy Gas Arbitration.—The following appeared in the "Glasgow Herald" last Tuesday: "The claims of the Kirkcaldy Gaslight Company against the Corporation for their skilled witnesses' fees in connection with the recent arbitration proceedings were before the Auditor of the Court of Session on Friday, and the finding, which has just been received in Kirkcaldy, shows that the Gas Company claimed fees for seven skilled witnesses, the sum claimed being £3446 6s. 7d., and the Court struck off £2532 13s. 4d.; leaving a sum of £913 15s. 3d. to be paid by the Corporation. The details were as follows: Mr. Cash claimed £548 3s. 6d., allowed £386 8s. 6d.; Mr. A. M'Pherson claimed £686 4s. 4d., allowed £63; Mr. H. Woodall claimed £639 12s. 9d., allowed £283 9s. 9d.; Mr. E. H. Stevenson claimed £699 0s. 7d., allowed £31 10s.; Mr. H. O'Connor claimed £203 8s. 8d., allowed £5 5s.; Mr. Marwick claimed £531 1s. 9d., allowed £52 10s.; Mr. Morland claimed £138 17s., allowed £91 12s."

Southampton Water Supply.—At the last meeting of the Southampton Town Council, a motion by Mr. Kimber, submitted at the previous meeting, that the Council should immediately consult an independent geological expert to advise whether or not an additional supply of pure water could be obtained at Otterbourne or its immediate vicinity, and that the Parliamentary and Water (Joint) Committee should select and confer with the expert, was again under consideration. The mover urged that the present was a very appropriate time to adopt the course proposed, as there had been a period of almost unprecedented drought. Alderman Dunsford moved an amendment to the effect that power be given to the Committee to consult "all necessary experts," though he thought that their present one (Mr. William Whitaker) was second to none. The Mayor (Alderman E. Bance) appealed to the members to adopt the amendment. He said though there was still a full and good supply of water, they must not jump to the conclusion that they had everything they wanted. No one was more thankful than he that they had a good supply; but they must look forward to future requirements. After discussion of a rather heated nature, the amendment was carried by a large majority.

The Richmond Gas Stove and Meter Company, Limited, have secured a contract to supply the Corporation of Stockport with 1000 grillers.

The firm of Bale and Church, of 5, Crooked Lane, E.C., was, on July 31, registered as a limited liability company, with a capital of £1000 in £1 shares.

A new automatic water supply, from the River Wandle to the works of the Columbia Phonograph Company, Limited, at Bendon Valley, Wandsworth, was put into operation towards the end of June, and has, we learn, proved entirely satisfactory under the particularly trying atmospheric conditions which have since existed. After filtration, the water runs by gravitation to a well in the works, and is then lifted by a direct-acting pump, circulated round the casings of a large number of hot presses, and delivered into a cooling-tank, whence it is returned to the river without loss. The supply is automatically controlled by the requirements. The new plant has effected an immediate economy in the working expenses equivalent to a saving of from £400 to £500 a year. The works were designed by Messrs. Henry Adams and Son, and were carried out by direct labour under their supervision.

Messrs. W. Underwood and Co., of Dukinfield, have secured a £70,000 contract for the construction of extensive water-works at Mountain Ash, South Wales.

Municipal employees of Manchester and Salford, including those in the gas and water departments, have adopted a resolution that after the 31st inst. they will refuse to work with non-Unionists. It is stated that 90 per cent. of the workers are members of the Municipal Employees' Association.

The Worthing Town Council are seeking power to borrow £4950 for extending the electricity undertaking. Comparisons have, however, been made which show that, while the electricity is costing £3874, an equal light could be obtained by gas for £1547 which is equal to a saving to the ratepayers of 3d. in the pound.

Though the Portsmouth Corporation are conducting an electricity undertaking at the public expense, the continued faith in the Portsea Island Gas Company is evidenced by the fact that last Wednesday the Company's £50 shares realized the following prices: "A" shares (13 per cent.), £142 to £144; "B" shares (12 per cent.), £135; "C" shares (10 per cent.), £126.

An excellent exhibition of appliances for gas lighting, heating, and cooking, arranged by the Directors of the Yorktown and Blackwater Gas Company, has just been held at the St. George's Hall, Camberley; and in connection therewith Miss Illie Miles gave each afternoon and evening interesting lectures on the advantages of gas compared with ordinary fires for culinary purposes. Specially attractive were the demonstrations with the new paper-bag cooker, for which Miss Miles said gas-stoves were particularly suitable. There were crowded attendances at all the lectures. Messrs. Arden Hill and Co. showed all their latest appliances for gas heating, lighting, and cooking; and Miss Miles pointed out that the terms on which they could be obtained were now such as should induce all householders to use gas-stoves.

APPLICATIONS FOR LETTERS PATENT.

- 16,880.—WILSON, A. B., "Compressing apparatus." July 24.
- 16,887.—HORSTMANN, S. A., A., & G. O. H., EDGAR, W. T., and HORSTMANN, E. H., "Pressure-controlled distance lighting and extinguishing apparatus for gas." July 24.
- 16,899.—ROBERTS, E., "Liquid for the treatment of coal, coke, or any other fuel." July 24.
- 16,916.—POTTERTON, T., "Gas-ovens." July 24.
- 16,920.—HAM, C. G., "Reducing-valves." July 24.
- 16,931.—BURKE, C. R., "Producing light hydrocarbons." July 24.
- 16,939.—REISS, C., "Incandescent gas-lamps." July 24.
- 17,032.—DAVIS, H. N., and TWIGG, W. R., "Gas-fires." July 25.
- 17,044.—SHOTTER, G. F., "Measurement of the level and flow of liquids." July 25.
- 17,055.—KÖRNER, E., "Controlling the lighting of gas from a distance." July 25.
- 17,096.—SEYD, F. O., "Gas advertising apparatus." July 26.
- 17,157.—GIROD, F., and GRAFLICH VON LANDSBERG-VELEN & GEMEN'SCHE CHEMISCHE FABRIK, BERG-UND HUTTENWERKE G. M. B. H., "Manufacturing light coloured sulphuric acid, free from arsenic and iron, by the lead chamber method." July 26.
- 17,158.—GIROD, F., and GRAFLICH VON LANDSBERG-VELEN & GEMEN'SCHE CHEMISCHE FABRIK, BERG-UND HUTTENWERKE G. M. B. H., "Concentrating sulphuric acid." July 26.
- 17,214.—ANDERSON, D., "Controlling cocks and switches." July 27.
- 17,220.—STEPHENSON, J., "Generation of water gas." July 27.
- 17,257.—WAGNER, F., "Lighting and extinguishing gas-lamps by variations in pressure." July 28.
- 17,297.—SPIRIDONOFF, B. DE, "Cocks or valves." July 28.
- 17,298.—ANDERSON, D., "Incandescent gas-lamps." July 28.
- 17,318.—FLETCHER, RUSSELL, AND CO., LTD., and FLETCHER, T. W., "Blow-pipes." July 29.
- 17,319.—FLETCHER, RUSSELL, AND CO., LTD., and FLETCHER, T. W., "Gas-stoves." July 29.
- 17,320.—FLETCHER, RUSSELL, AND CO., LTD., and FLETCHER, T. W., "Blow-pipes." July 29.
- 17,368.—KOLLER, K., "Gas-producers." July 29.

TAR PRODUCTS PRICES.

Representative manufacturers give the following as fair current values for the week ending Aug. 5. Prices are net, and they include the usual packages and delivery f.o.b., f.a.s., or f.o.r., as customary.

Article.	Basis.	London.	North-East Coast.	East Coast, Yorks.	West Coast.		Glasgow.
					Liverpool.	Manchester.	
Tar, crude	per ton	28/- 30/-	20/- 25/-	20/6 24/6	21/- 22/6	20/3 22/9	—
Pitch	"	40/-	39/-	40/-	40/-	39/-	—
Benzol, 90%	per gallon	—	-9½	-9	-9½	-9½	—
Benzol, 50-90%	"	—	-10	-9½	-8½	-8½	—
Toluol, 90%	"	—	-10	-10	-10	-10	—
Crude naphtha, 30%	"	—	-4½	-4	-3½	-3½	—
Light oil, 50%	"	—	-3½	-3½ -1/4	-3½ -1/3½	-3½	—
Solvent naphtha, 90-160	"	—	-10	-10	-10	-10	—
Heavy naphtha, 90-190	"	—	-11	-11½	-11½	-11½	—
Creosote in bulk	"	-2½	-2	-2	-2½	-2½	—
Heavy oils	"	-3	-2½ -2½	-2½	-2½	-2½	—
Carbolic acid, 60's	"	—	2/-	2/1	1/11	1/11	—
Naphthalene, crude drained salts	per ton	—	43/9	41/3	47/6	47/6 50/-	—
" pressed	"	—	60/-	63/-	60/-	60/- 72/6	—
" whizzed	"	—	—	—	60/- 72/6	60/- 75/-	—
Anthracene	per unit	-1/2	-1½	-1½	-1½	-1½	—

WANTED, FOR SALE, CONTRACTS, &c., ADVERTISEMENTS IN THIS WEEK'S "JOURNAL."

Appointments Vacant.

TEACHER OF GAS-FITTING. Wales and Monmouthshire Institution of Gas Engineers and Managers. FOREMAN (LANTERNS AND GOVERNORS). Sutherland Meter Company, Birmingham.

Plant, &c. (Second-Hand), for Sale.

CONDENSER. Sutton Gas Company. METERS. No. 5421. PURIFIERS, COLUMNS, &c. Oxford Gas Company. LAMPS, GLASSWARE, WATER-METERS, VALVES, &c. Gas and Water Appliances, Limited (in Liquidation), 96, Middlesex Street, E. PIPES, MOUTHPIECES, &c. J. Adams and Sons, Newcastle-on-Tyne.

Patents, Licences, &c.

ACETYLENE LAMPS AND GENERATORS, &c. Haseltine, Lake, and Co., Southampton Buildings, W.C.

Manufacturers Wants.

HIGH-PRESSURE GAS LIGHTING, &c. No. 4536. PREPAYMENT PADLOCKS. 5437.

Meetings.

BRIGHTON AND HOVE GAS COMPANY. London Office. Aug. 25. Two o'clock. ENFIELD GAS COMPANY. Offices. Aug. 29. 5.30 o'clock. HORNSEY GAS COMPANY. London Office. Aug. 18. 3.30 o'clock. NORTH MIDDLESEX GAS COMPANY. London Office. Aug. 21. 2.30 o'clock. RIDDINGS DISTRICT GAS COMPANY. London Office. Aug. 29. 3.30 o'clock. SOUTHGATE GAS COMPANY. London Office. Aug. 24.

TENDERS FOR

Coal.

DRONFIELD GASLIGHT AND COKE COMPANY. Tenders by Aug. 19. BROADSTAIRS GAS COMPANY. Tenders by Sept. 5.

Condensers.

SMETHWICK GAS DEPARTMENT. Tenders by Aug. 11.

Oxide of Iron.

SALFORD GAS DEPARTMENT.

Pipes, &c.

HEYWOOD GAS DEPARTMENT. Tenders by Aug. 12. GLASTONBURY GAS COMMITTEE. Tenders by Aug. 17.

Sulphuric Acid.

HEYWOOD GAS DEPARTMENT. Tenders by Aug. 12.

Tinned Ware.

HEYWOOD GAS DEPARTMENT. Tenders by Aug. 12.

NOTICES TO CORRESPONDENTS, ADVERTISERS, AND SUBSCRIBERS.

No notice can be taken of anonymous communications. Whatever is intended for insertion in the "JOURNAL" must be authenticated by the name and address of the writer; not necessarily for publication, but as a proof of good faith.

COPY FOR ADVERTISEMENTS for the "JOURNAL" should be received at the Office NOT LATER than TWELVE O'CLOCK NOON ON MONDAY, to ensure insertion in the following day's issue.

Orders for Alterations in, or stoppages of, PERMANENT ADVERTISEMENTS should be received by the FIRST POST on SATURDAY.

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Particulars may be obtained from the undersigned.

Tenders to be sent in to Mr. Alderman Morland, Chairman of the Gas Committee, endorsed "Tender for Pipes," not later than Aug. 17, 1911.

The Committee do not bind themselves to accept the lowest or any Tender.

D. E. GARLICK,

Manager.

COUNTY BOROUGH OF SALFORD.

(GAS DEPARTMENT.)

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Full Particulars may be obtained from Mr. WILLIAM W. WOODWARD, Engineer, Gas Offices, Bloom Street, SALFORD.

BOROUGH OF HEYWOOD.

THE Gas Committee invite Tenders for the Supply of TUBES and FITTINGS, SULPHURIC ACID, and TINNED WARE.

Specification and Form of Tender may be obtained upon Application to Mr. W. Whatmough, Gas Manager. Sealed and endorsed Tenders to be sent to me not later than Saturday, Aug. 12, 1911.

By order,

GEO. G. BOUCHIER,

Town Clerk.

Municipal Buildings, Heywood,
July 20, 1911.

COUNTY BOROUGH OF SMETHWICK.

(GAS DEPARTMENT.)

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Sealed Tenders, endorsed "Tender for Condensers," addressed to the Chairman of the Gas Committee, to be Delivered to the undersigned not later than Ten a.m. on Friday, the 11th of August next.

The Committee do not bind themselves to accept the lowest or any Tender.

By order

W. J. STUROS,

Secretary.

Gas Department, Council House,
Smethwick, July 26, 1911.

DRONFIELD GASLIGHT AND COKE COMPANY.

THE Directors of the above Company invite TENDERS for 700 Tons of Washed PEANUTS and 400 Tons of Best Screened GAS COAL to be spread over the Ten Months ending June 30, 1912, the same to be Delivered at such times and in such Quantities as required.

Tenders to be endorsed "Tender for Gas Coal," and sent to the undersigned on or before Saturday, the 19th inst.

Aug. 2, 1911.

HAROLD WHITE,

Secretary.

BROADSTAIRS GAS COMPANY.

THE Directors of the above Company invite TENDERS for the Supply of about 7000 Tons of best Durham or Yorkshire GAS COALS, to be Delivered between the 1st of October, 1911, and the 30th of September, 1912, either at Broadstairs Railway Station or Broadstairs Harbour.

Sealed Tenders, endorsed "Gas Coal," addressed to the Chairman of the Company, Gas Offices, Broadstairs, to be sent in not later than Tuesday, Sept. 5, 1911.

The Directors do not bind themselves to accept the lowest or any Tender.

Further Particulars and Form of Tender may be obtained from

F. HIGGINSON,
Engineer, Manager, and Secretary.
Gas Offices, Broadstairs,
Aug. 2, 1911.

SALES BY AUCTION OF GAS AND WATER STOCKS AND SHARES.

MESSRS. A. & W. RICHARDS beg to notify that their SALES BY AUCTION OF NEW CAPITAL ISSUED UNDER PARLIAMENTARY POWERS, and of STOCKS and SHARES belonging to EXECUTORS and other PRIVATE OWNERS in LONDON, SUBURBAN, and PROVINCIAL GAS and WATER COMPANIES, take place PERIODICALLY at the Mart, TOKENHOUSE YARD, E.C.

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7188 of 1901, for "IMPROVEMENTS IN OR RELATING TO ACETYLENE GAS LAMPS OR GENERATORS;" No. 11,612 of 1902, for "ACETYLENE GAS-LAMP FOR TABLE USE;" No. 23,629 of 1903, for "IMPROVEMENTS IN ACETYLENE GAS GENERATORS;" and No. 10,185 of 1905, for "IMPROVEMENTS IN ACETYLENE GAS GENERATORS," are desirous of entering into Arrangements, by way of LICENCE and otherwise, on reasonable Terms, for the purpose of EXPLOITING the same and ensuring their full Development and Practical Working in this Country.

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BRIGHTON AND HOVE GENERAL GAS COMPANY.

NOTICE is Hereby Given, that the ORDINARY HALF-YEARLY GENERAL MEETING of the Proprietors will be held at the Company's Offices, No. 5, Great Winchester Street, Old Broad Street, in the City of London, on Friday, Aug. 25, 1911, at Two o'clock p.m., precisely, to receive the Report of the Directors and the Accounts of the Company for the Half Year ended the 30th of June, 1911; to declare Dividends; and for other purposes.

The TRANSFER BOOKS of the Company WILL BE CLOSED from the 12th to the 25th of August, both days inclusive.

ERNEST L. BURTON,
Secretary.

5, Great Winchester Street,
Old Broad Street, London, E.C.,
Aug. 3, 1911.

HORNSEY GAS COMPANY.

NOTICE is Hereby Given, that the ORDINARY HALF-YEARLY GENERAL MEETING of the Proprietors of this Company will be held at the Offices of the Company, No. 63, Chancery Lane, in the County of London, on Friday, the 18th day of August, 1911, at Half-Past Three o'clock in the Afternoon precisely, to receive the Report of the Directors and the Accounts for the Half Year ended the 30th of June last; to declare Dividends; and to transact the Business of an Ordinary General Meeting.

The TRANSFER BOOKS WILL BE CLOSED from the 4th to the 18th of August, 1911, both days inclusive.

By order of the Board,
WILLIAM E. ROBERTS,
Secretary.

Offices: 63, Chancery Lane,
London, W.C., Aug. 1, 1911.

NORTH MIDDLESEX GAS COMPANY.

NOTICE is Hereby Given, that the ORDINARY HALF-YEARLY GENERAL MEETING of the Company will be held at the Company's Offices, No. 5, Great Winchester Street, Old Broad Street, in the City of London, on Monday, the 21st day of August inst., at Half-past Two o'clock p.m., to receive the Report of the Directors and the Accounts of the Company for the Half Year ended the 30th of June, 1911; to declare Dividends; and for other purposes.

The TRANSFER BOOKS of the Company WILL BE CLOSED from the 8th to the 21st of August, both days inclusive.

ERNEST L. BURTON,
Secretary.

5, Great Winchester Street,
Old Broad Street, London, E.C.,
Aug. 7, 1911.

ENFIELD GAS COMPANY.

NOTICE is Hereby Given, that the HALF-YEARLY ORDINARY GENERAL MEETING of the Proprietors of this Company will be held at the Offices of the Company, Sydney Road, Enfield, on Tuesday, the 29th day of August current, at 5.30 o'clock in the Afternoon precisely, to receive the report of the Directors and the accounts of the Company for the Half Year ended the 30th of June last; to declare a Dividend; and to Transact the General Business of the Company.

The TRANSFER BOOKS WILL BE CLOSED from the 16th to the 29th of August, both inclusive.

By order,
CHAS. W. OFFORD,
General Manager and Secretary.

Enfield, Aug. 3, 1911.

SOUTHGATE AND DISTRICT GAS COMPANY.

NOTICE is Hereby Given, that the ORDINARY HALF-YEARLY GENERAL MEETING of the Company will be held at the Company's Offices, No. 5, Great Winchester Street, Old Broad Street, in the City of London, on Thursday, the 24th day of August inst., at 3.45 o'clock p.m. precisely, to receive the Report of the Directors and the Accounts of the Company for the Half Year ended the 30th of June, 1911; to declare Dividends; and for other purposes.

The TRANSFER BOOKS of the Company WILL BE CLOSED from the 11th to the 24th of August, both days inclusive.

ERNEST L. BURTON,
Secretary.

5, Great Winchester Street,
Old Broad Street, London, E.C.,
Aug. 7, 1911.

RIDDINGS DISTRICT GAS COMPANY.

NOTICE is Hereby Given, that the ORDINARY HALF-YEARLY MEETING of the Shareholders of the above Company will be held at the Offices of the Company, Nos. 6 & 7, Queen Street, Cheapside, in the City of London, on Tuesday, the 29th day of August, 1911, at Half-Past Three o'clock in the Afternoon, to receive the Report of the Directors and the Accounts for the Half Year ended the 30th day of June last; to declare a Dividend; and to Transact the General Business of the Company.

The TRANSFER BOOKS WILL BE CLOSED from the 16th to the 29th inst., both inclusive.

By order of the Board,
ERNEST W. DREW,
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Cheapside, London, Aug. 4, 1911.

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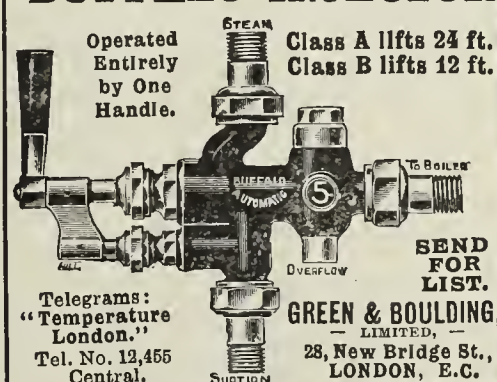
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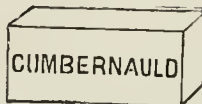
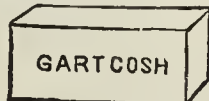
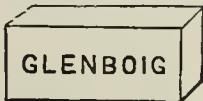
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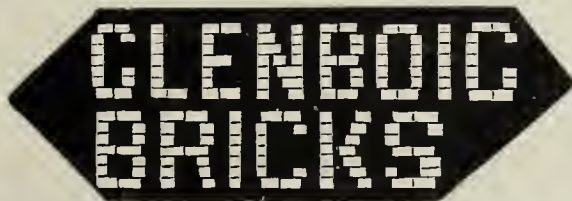
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Undenoted we give a Table of Analysis and Physical Characteristics of a sample of Glenboig Fire-Clay by J. T. Norman, London; and, in submitting a report from a responsible and reliable public analyst, we would here draw attention to the unreliable character of some recently published analyses where a manufacturer selects not only his own samples, but also those of his competitor, and has them treated by a private analyst. SUCH STATEMENTS ARE ALTOGETHER UNTRUSTWORTHY.

ANALYSIS OF GLENBOIG FIRE-CLAY.

By JOHN T. NORMAN, Esq., F.C.S., &c., The City Central Laboratory, LONDON.

THE GLENBOIG UNION FIRE-CLAY CO., LTD., GLENBOIG, SCOTLAND.

23, LEADENHALL STREET,
LONDON, E.C., September 21st, 1909.

DEAR SIRS,

I have completed the investigation of the samples of Clay received from you on the 10th inst., and now beg to report the results.

CHEMICAL ANALYSIS.

	Raw.	Fired.
Silica, free	3.03	3.49
Silica, combined	43.20	49.77
Alumina	36.55	42.10
Ferric oxide	1.80	2.08
Titanic oxide	1.30	1.50
Lime	trace	trace
Magnesia	trace	trace
Alkaline oxides	trace	trace
Sulphates as trioxides	0.92	1.06
Loss on Ignition	13.20	—
	100.00	100.00

PHYSICAL RESULTS.

Density	2.65
Volume weight	1.90
Porosity	15.4 %
Linear shrinkage at 100° C.	3.70 %
" " " 1050° C.	4.76 %
" " " Total	8.46 %
Volume shrinkage at 100° C.	10.7 %
" " " 1050° C.	12.6 %
" " " Total	23.3 %
Plasticity	20.0 %
Fire Stability	1850° C. equiv. 3362° F.

(SEGER CONE 36.) (New Scale CONE 38.)
(Signed) J. T. NORMAN.

This Clay is remarkable for its high percentage of Alumina and for the almost complete absence of ingredients tending to lower the refractory properties; its fire-stability is extremely high. For some years past I have been urging clients who are working the Clays of the Coal Measures to search for such a material, but you are the first to discover a supply. The possession of this Clay places you in a unique position amongst the manufacturers of refractory goods throughout the world, and I have no doubt will, if duly exploited, enable you to drive out of the market the large quantities of foreign fire-bricks which are being poured into this country for use in the construction of bye-product ovens and for other purposes. —I am, yours faithfully,

JOHN T. NORMAN.



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LE GRAND & SUTCLIFF,

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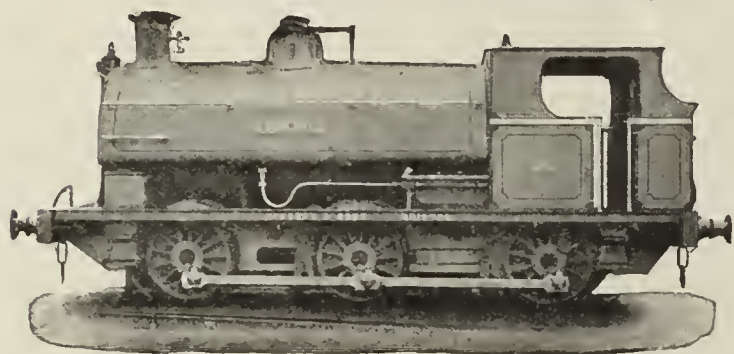
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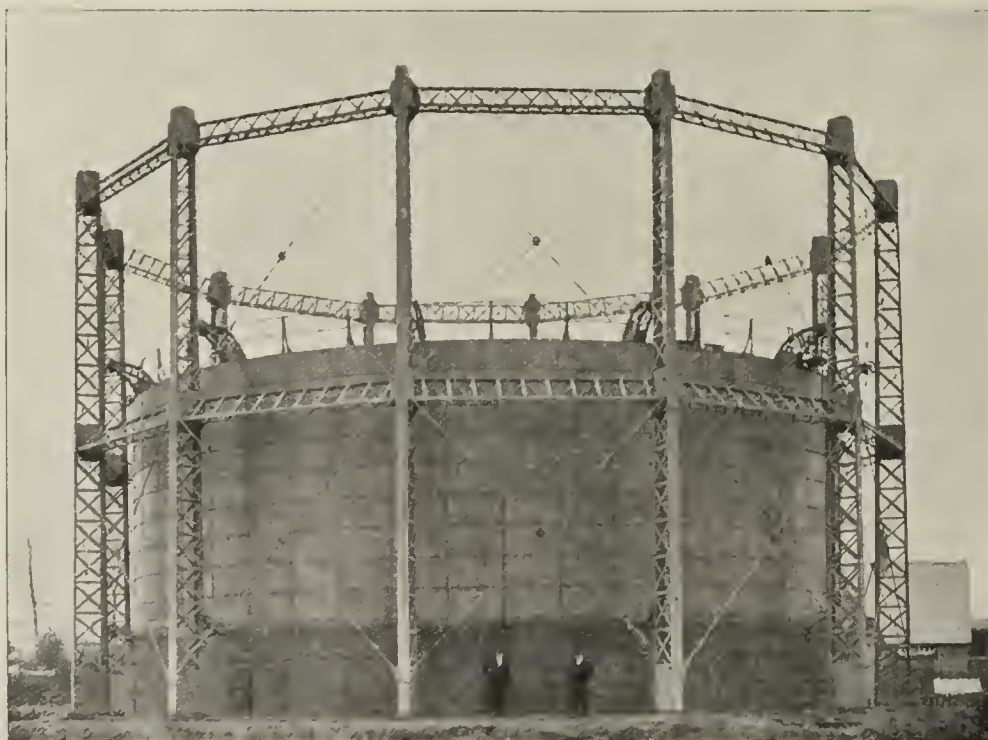
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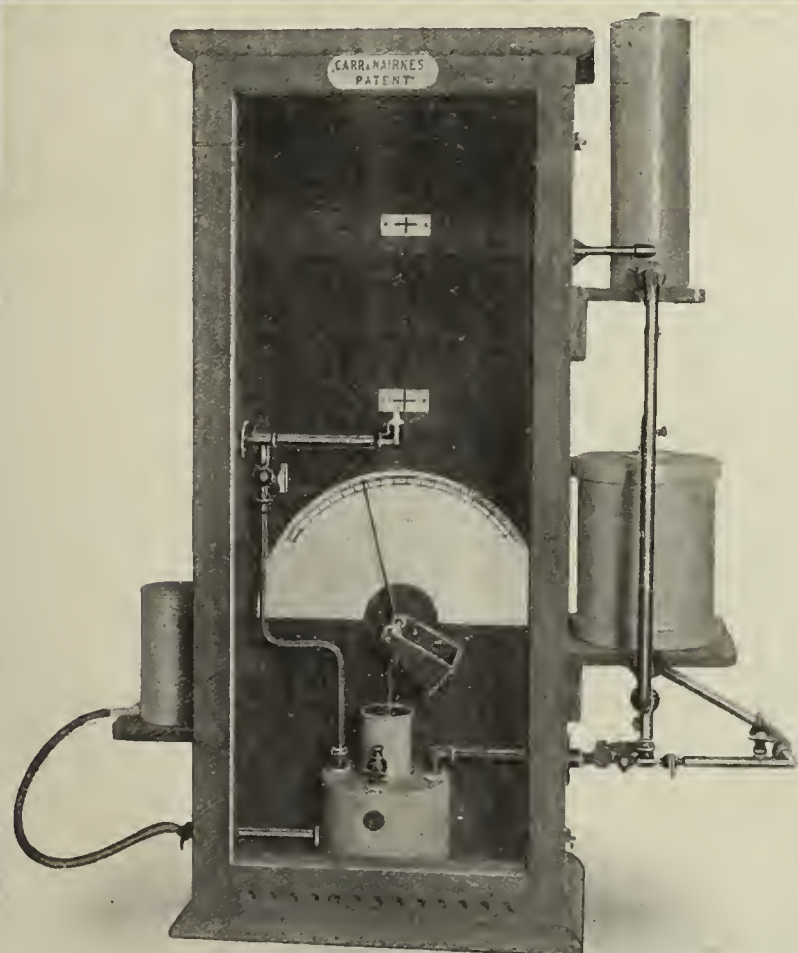


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Every Skein of equal weight and length.
The Lead Wool Joint is built up evenly all the way through.
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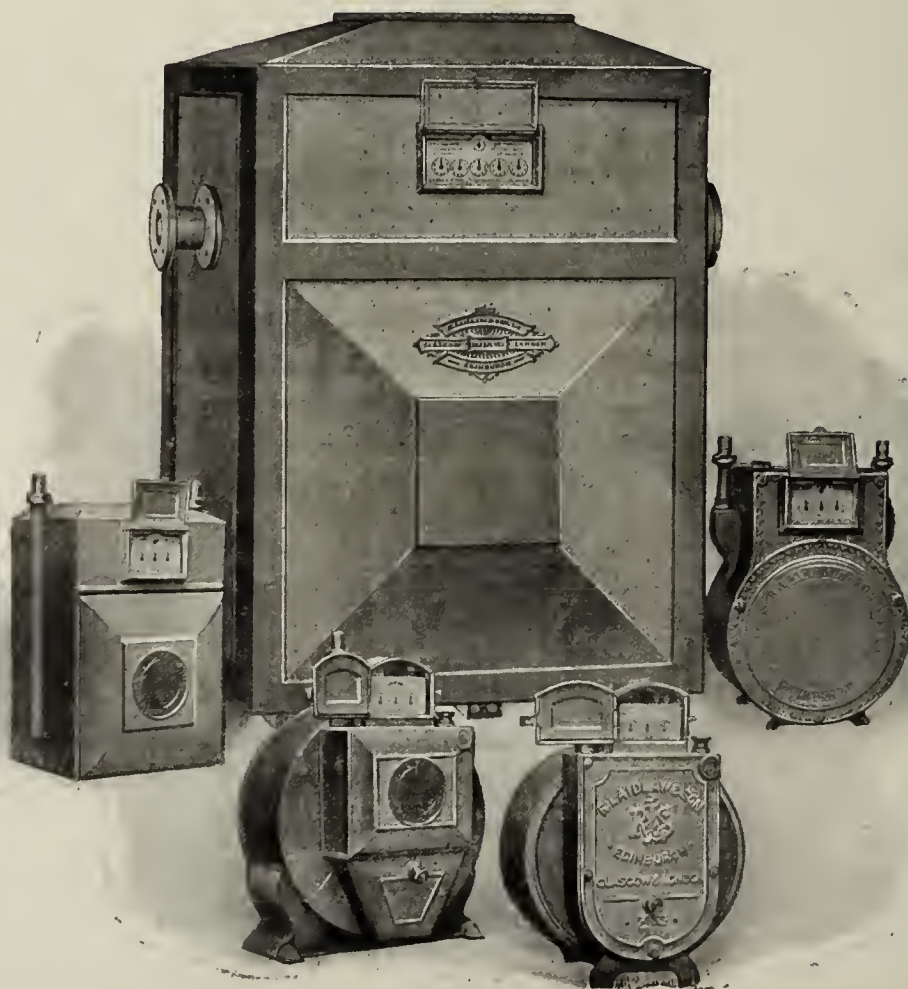
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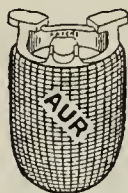
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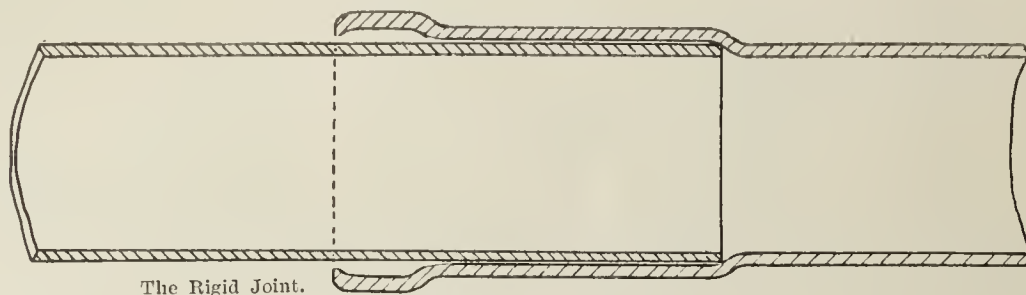
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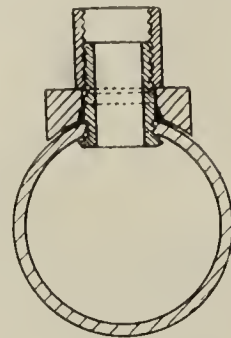
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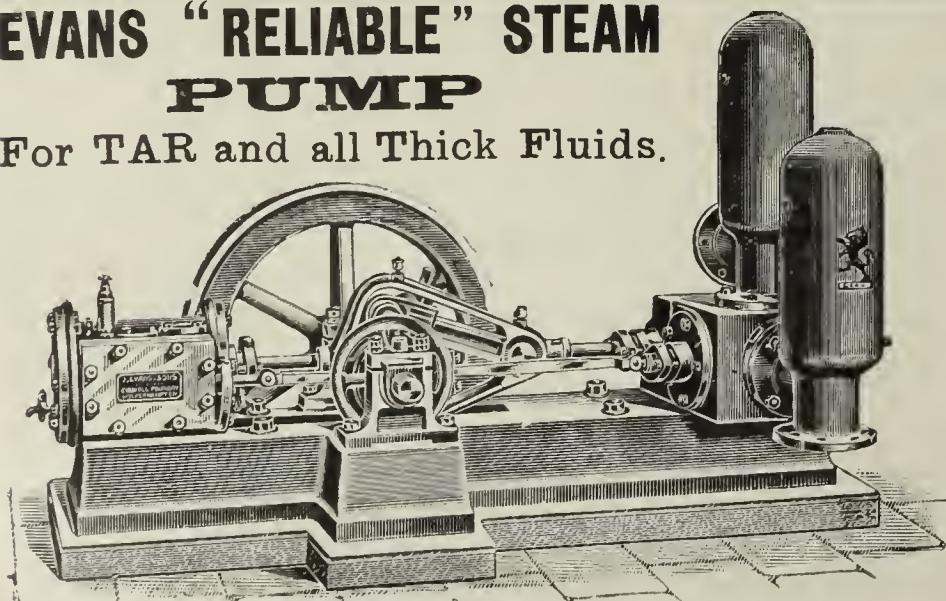
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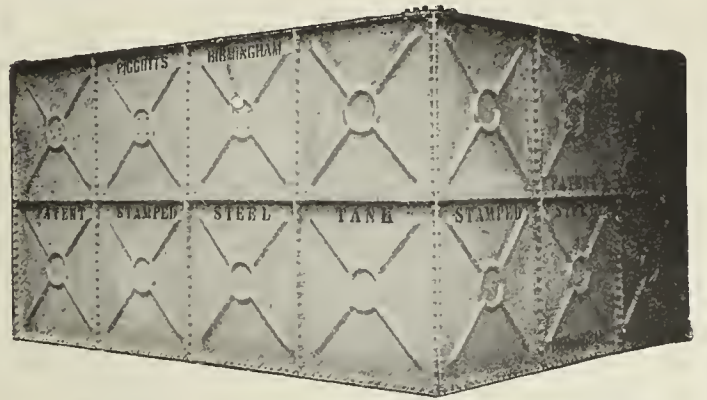
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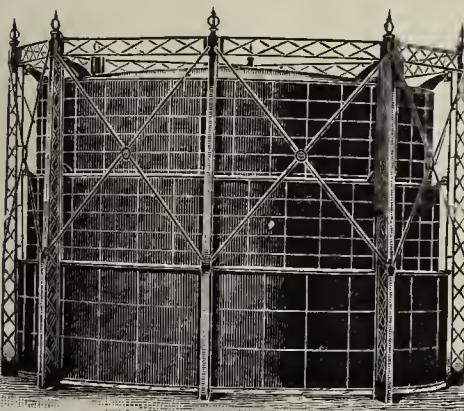
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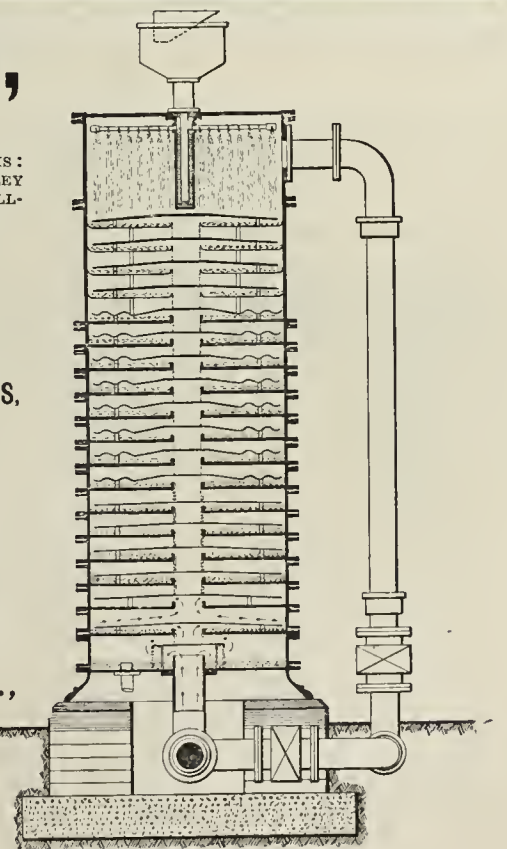
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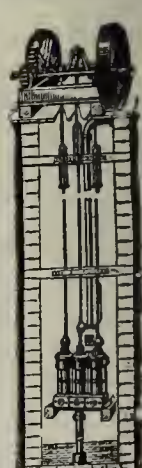
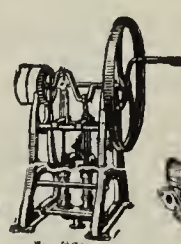
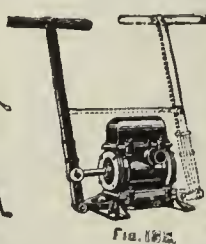
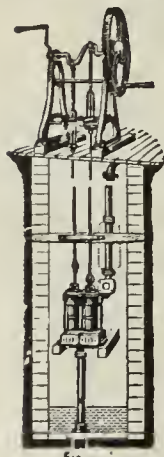
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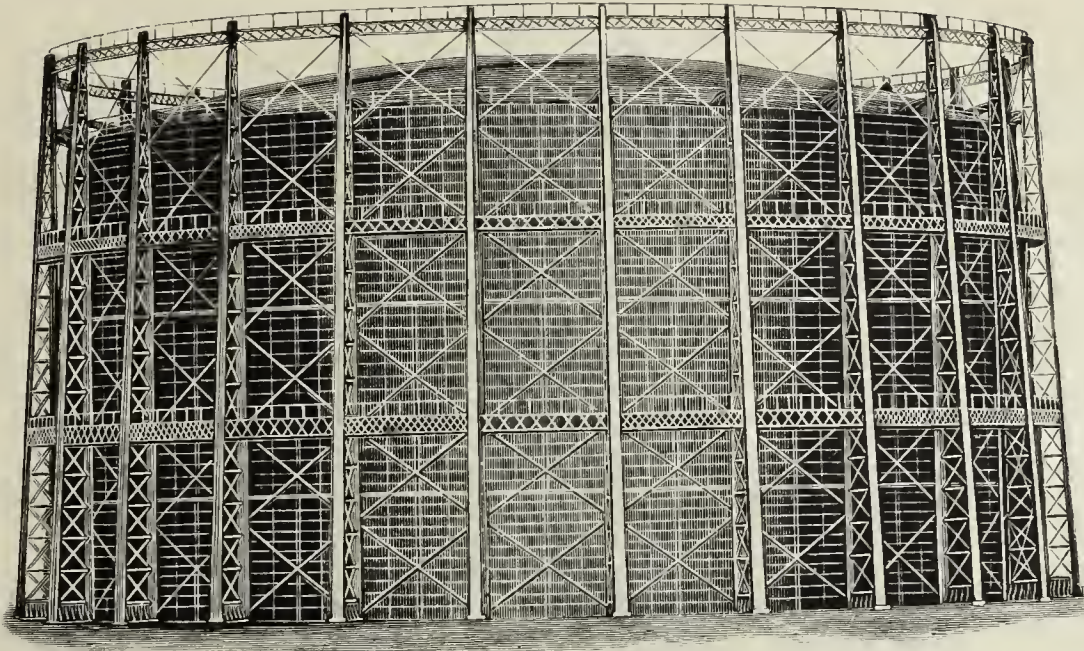
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Wish to draw Engineers' attention to the following:

ROTARY WASHER SCRUBBER, CANVAS SCREENS for TOWER SCRUBBERS.

Patent No. 4613, 1910.

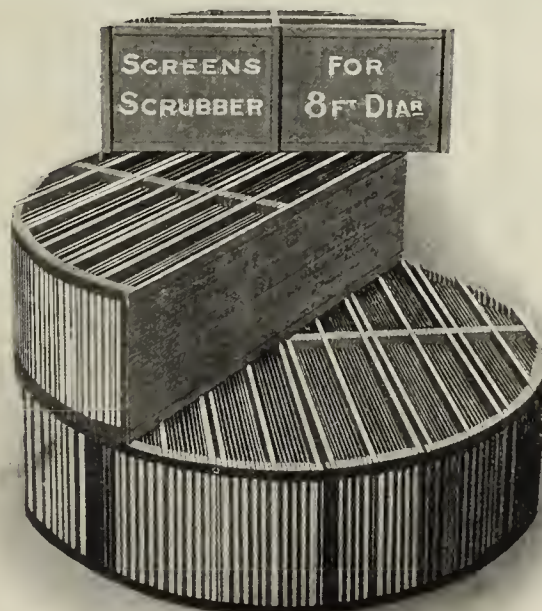
The Important Features of their NEW WASHER-
SCRUBBER are the Washing Bundles are constructed of
NON-METALLIC and NON-CORROSIVE
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EXTERNAL and ACCESSIBLE Liquor Overflows.
GREAT REDUCTION OF BACK PRESSURE.

**SAFEGUARD AGAINST CORROSION
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in an INCREASE OF CAPACITY.

Washer-Scrubbers upon this system can be seen
working and Inspected upon Application.

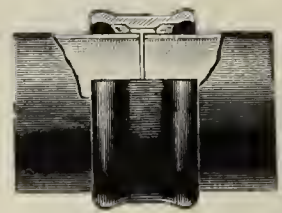


Engineers requiring ADDITIONAL SCRUBBING AREA
can INCREASE their EXISTING Apparatus
50 per cent.
by substituting CANVAS SCREENS for wood or any other
type of filling.



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Joints for Wrought Steel Mains made by lead and yarn are specially applicable where buried in the ground; if coated with Dr. Angus Smith's solution (a protective) they resist the detrimental action of ground charged with salts and acids; if wrapped with Hessian cloth, and again recoated, they are eminently satisfactory.



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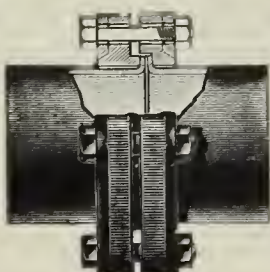
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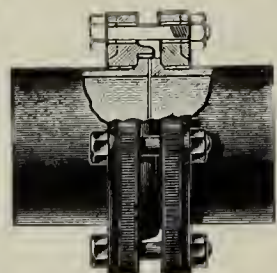
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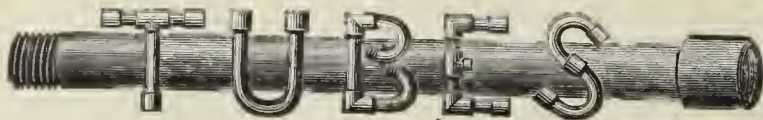
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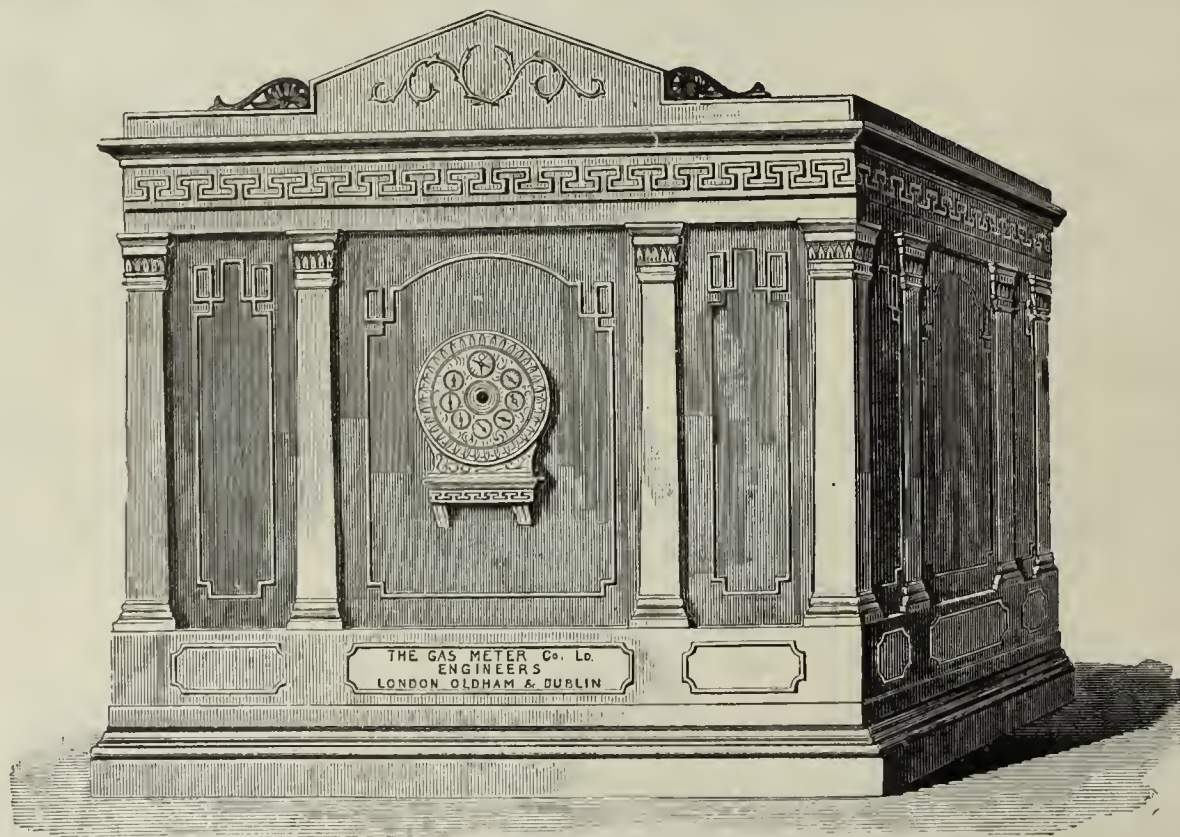
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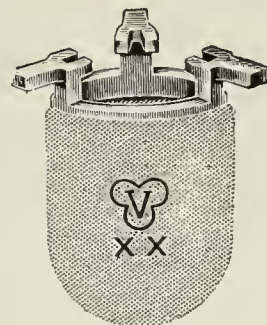


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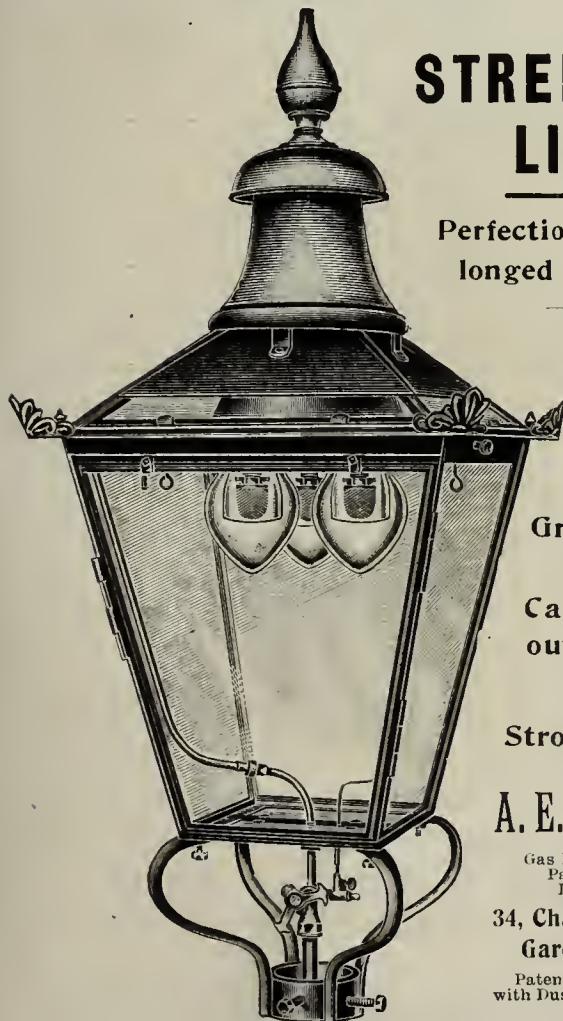
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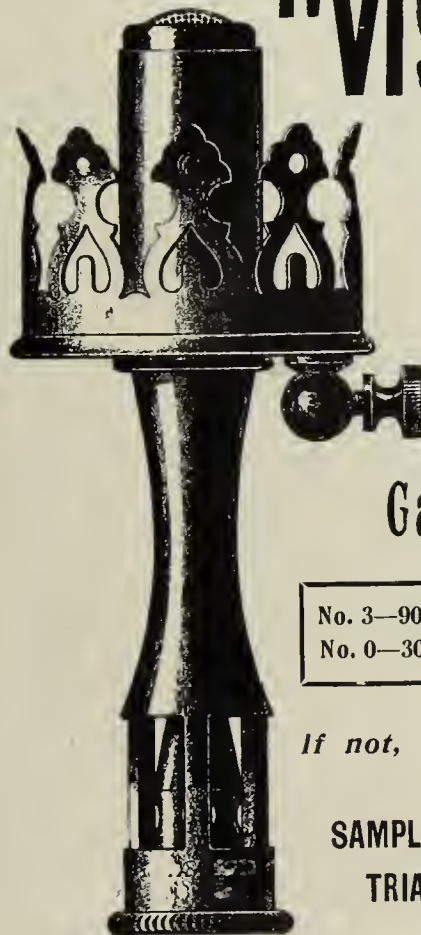
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Barrow (2) . . . 500,000	Deventer . . . 150,000	Liverpool (3) . . . 750,000	Southampton (2) . . . 500,000
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Belfast (2) . . . 4,500,000	Dublin . . . 2,000,000	Lübeck . . . 400,000	Southgate (2) . . . 500,000
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Charlottenburg . . . 2,500,000	Dundee . . . 1,500,000	Maidenhead . . . 225,000	South Shields . . . 650,000
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Bruges . . . 200,000	Göteborg . . . 300,000	Oberhausen . . . 175,000	Tottenham (4) . . . 1,000,000
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EDITORIAL NOTES—GAS, &c.

Among the Causes of Progress and Prosperity. Labour Questions.

ALBEIT the thermometer was standing at 96.7° at two o'clock on Wednesday afternoon, or $1\frac{1}{2}^{\circ}$ higher than the previous record of July 16, 1900, a goodly number of enthusiastic proprietors in the South Metropolitan Gas Company assembled to hear the address of the Chairman (Mr. Charles Carpenter) on the affairs of the half year; and they were rewarded with something more than that. As a matter of fact, the Chairman touched very lightly on the experiences and results of the half year; but, in a succinctly framed statement, he presented to the proprietors an account of certain of the causes that are contributing to the present flourishing condition of the gas industry—touching at the same time on certain matters that are of political moment to the industry just now, in regard to both technical and administrative procedure.

Despite increased labour charges and additional costs of raw material, the Company's financial position (as we fully showed a fortnight since) is stronger than it has ever been; and a reduction of price from 2s. 2d. is, it is believed, within measurable distance. The Chairman indicated that the extraordinarily good position was due to technical rather than to commercial reasons. This has to be admitted; but the work of the commercial side must not, through inadequate recognition, be depreciated, when we consider the maintenance of gas consumption under the prevailing conditions of recent years, the increases in consumption of more recent times, and the not-to-be despised help the secondary products markets have offered in largely reducing the net cost of coal. The Chairman evinced a decided inclination in his speech to bestow praise on the technical side of the business. We are with him up to the point at which a just allocation of praise should be made to the commercial side. The inclination was further marked in the words he used in proposing a vote of thanks to the staff and workmen generally. He referred to the business as having a technical foundation. That is true. But to give the commercial superstructure its due: It and not the technical foundation creates the demand that gives the technical part of the undertaking its opportunities to show what it can do.

In the advancement of the technical causes that have redounded so vastly to the material advantage of the industry, the South Metropolitan Company have taken (the gas industry has recognized this in several ways) a prominent and historical part. There can be no question about it that, had it not been for the strenuous fight that the Company—under the leadership of Sir George Livesey, with Mr. Carpenter as his lieutenant—successfully waged for freedom, the gas industry would not have been so unfettered as it is to-day in extensively applying the fresh scientific knowledge that has accrued under the ruling conditions. The effects to-day are greater than were foreseen a few years ago. The relief that has been afforded by the Carpenter (or "Metropolitan" No. 2) burner has been immeasurable in the gain it has permitted in this way. A lower illuminating standard for gas tested by the old standard burners would never have allowed gas men to have gone to the same lengths in the application of modern knowledge in carbonization as has been the case through the No. 2 burner. Nothing more is claimed for the burner than that it has been one of the valuable means to a substantially productive end, as seen by accounts received from all parts of the country—accounts bettered through the increased yield of gas per ton of coal, the greater number of pounds of sulphate of ammonia now recovered per ton of coal, the improved coke and tar, and the lower carbonizing costs per unit of gas produced, a part of which (small it may be) may be ascribed to the lessened trouble occasioned by stopped ascension-pipes. The trouble from

naphthalene deposits, too, has sensibly diminished in many works. The South Metropolitan Company did much of the pioneer work that has enabled this to be accomplished; and the gas industry does not forget its debt.

While the Chairman gave much and due praise to the technical side of the business in its contribution to progress and prosperity, the power exercised by the efficiency and the economic advances made in the means of applying gas—credits on the commercial side—were also pointed out. There is high-pressure gas lighting. Shopkeepers in the Company's area have taken this up with much avidity; and the displacement of solid fuel by gaseous is going on apace. The electrical competitors are feeling the former; traders in solid fuel the latter, as a recent editorial reference to a circular by a certain firm of coal dealers indicated (see *ante*, p. 92). The conditions cannot be avoided. In certain directions gas has suffered from the progress made in what competitors have had to offer; the competitors have to suffer from any superior position in any direction in which the gas industry finds itself through its advances. Submission to progress is an inexorable law. But, on the balance, the gas industry is in a stronger position than ever to-day; and the consumers are far and away the greatest gainers in it all—much more through the operation of the sliding-scale than through the competitive forces.

Looking round from his exceptionally well-placed standpoint, Mr. Carpenter sees only one real cause for anxiety. That is the coal market; and he deplores, for the sake generally of industry and the welfare of the country, that some fresh method is not devised as the basis for miners' wages. That is a consummation most devoutly desired in many places. But the widespread unrest of labour is a cause for anxiety. Not far from the doors of the place of meeting is the River Thames; and the trouble with dockers, lightermen, porters, carters, and so forth, has been the central factor in the production of a paralyzing of trade (fortunately it has ended—at any rate, for a time) that must, in some shape or form, and in a greater or less degree, make an impression on the fortunes of industry and commerce throughout the country. Within our own industry, we have heard lately of stoppages of coal deliveries; in certain quarters, a distance from London, there has been an unsuccessful attempt to get certain of the gas workers to join forces with the malcontents out on strike in the localities in mind; and, at the meeting of the South Metropolitan Company, a large dealer in coke told how the deliveries of that commodity in certain parts of London had been prevented by interference on the part of the strikers with his carters. Certain gas-works, too, were for some days without incoming trucks, and therefore without empties for the transport of secondary products. These, however, are only temporary disturbances, the effects of which it is hoped to commence to wipe out directly—peace having been restored.

Another point affecting labour—and an interesting point it is—has reference to the National Insurance Bill at present before Parliament. The Company have had the longest experience of all gas undertakings with co-partnership and with the jury system in respect of accidents; and these have done more than all the machinery statutorily devised and formulated in the Factory Acts to prevent accidents. The Company have also had decades of experience with their sick fund; and this does more for the men, at less expense, than is planned by the new measure that is being piloted through Parliament by the Chancellor of the Exchequer. The attitude of the Company and their men towards this measure has been explained in previous articles. But the Chairman points to a possible effect of all this legislative suppression of voluntary effort, and the setting-up of compulsory and less economic and beneficial enactment. It is that the burden of it all will lead to what has been the effect in Germany, which country the Chancellor confesses has been taken as his exemplar in this national insurance business. Mr. Carpenter states how in a tour of inspection of German gas-works, he was surprised at the extent to which labour-saving plant has been adopted in certain works there;

and he learned that labour difficulties and compulsory burdens attaching to labour were at the root of—were the main persuasive forces in—the reduction of manual labour to the minimum. This is an effect that has not been well considered by our own Legislature in association with the growing burdens of socialistic birth that it is sought to attach to industry; and it is an effect that touches the more acute question of unemployment. But the prayer of the Board of the South Metropolitan Company is—the efforts of the men are directed to the consummation of the prayer—that they may be defended from the necessity, through the expanding interference of the Legislature between the employers and employed, of having recourse to any labour-saving plant other than is compulsory, for economic reasons, under the advances of technical discovery. It was a good address, full of thought-awakening point, that the proprietors heard from their Chairman last Wednesday.

Gas Affairs in East London.

EAST London, which the Chairman of the Commercial Gas Company (Mr. W. G. Bradshaw) is fond of referring to as an excellent index to trade conditions, has shared with the other Metropolitan districts in yielding a good increase in gas consumption during the past half year—so much so, indeed, that the additional receipts represented by the extra consumption, with the accretion in gas-rentals, has already wiped out more than half of the sum represented by the reduction of 2d. a few months since. It is remarkable how the elements of expansion in the gas industry have been of late years revealing and developing themselves. Price is an important factor in expansion and in meeting competition in the heating and power fields. But the merits of the means of applying and utilizing gas to-day are also of great potential value. These merits are being realized more and more in East London as elsewhere. The future even in this section of London in which is resident the poorest part of London's millions is, in consequence of this and other causes, bright for the gas industry. The price of gas is at 2s. 4d. for ordinary purposes, and lower still for power. The workers of the Company have raised the make of gas per ton of coal carbonized to 12,455 cubic feet; and the residual products are in the topmost positions of the Company's working records, both in respect to their quality and quantity. The current coal contracts are back to the prices of 1909; but a slightly higher figure will have to be paid for oil at the end of the year.

Another advantage in respect of the cost of gas is the lower charge for carbonizing wages. Ten years ago the item averaged 3½d. per 1000 cubic feet; while now the figure is 1½d. This is an extraordinary change for a single decade. But we hazard the opinion (without reference to the accounts) that the Company are paying more in wages to-day than they were ten years ago. The workers must not run away with any notion that because the average of the carbonizing wages per 1000 cubic feet is lower that the Company are not such large employers as formerly. It is contrariwise; and the mentioned reduction of the average is largely due to the increased production of gas per ton of coal carbonized, and the improved means of handling materials. Workers are aware that economy in production enables the charging of lower prices for gas, and lower prices for gas create demands for it, and larger demands mean additional employment. The workers who assist in the production of economy in this way are helping to create employment.

The Chairman gave the fullest credit to the Engineer and General Manager (Mr. Stanley H. Jones) for his part in bringing about the present excellent position in the Company's affairs; and he did not omit to mention how much is also due to the Station Engineers and Managers at Poplar and Wapping—Mr. Williams and Mr. Gill. We should like to see this innovation of personal recognition of station managers adopted with a little more freedom in connection with the large gas undertakings. They and their individual efforts are, in a measure, very much concealed by the circumstances of their position—much more so than is the case with the manager of a works in a provincial town of far lower status in magnitude than the stations of the larger undertakings. Nevertheless, the station manager of the larger concern has to go to and come from the meetings of proprietors, and be content with the fact that his individuality and efforts are all engulfed in the terms "officers" and "staff" appearing in the vote of thanks with which the proceedings of meetings invariably conclude.

Test Burner and Illuminating Power in Canada.

WE heartily congratulate the Canadian Gas Association on having been instrumental in bringing about an important departure in connection with gas testing in the Dominion. Through their investigations and their conferences with Government officials, by one move the whole of the old gas-testing burners are to be swept from the testing-stations of Canada; and as soon as the necessary number of No. 2 burners can be transmitted from England, they will be set up, and future testings made by them. How differently and how swiftly this change has been effected in Canada, compared with the piecemeal and drearily slow and expensive method of effecting the adoption of an approved new standard in this country! Canada has displayed a vast amount of commonsense in this matter. The next move is to reduce the standard of illuminating power to a common basis; and it appears that the steps to be taken will follow a similar course, with a (so to speak) nationalization of the standard. There is clearly a lesson here for the mother country; but what agonized screams there would be about "parliamentary bargains" and so forth if a similar industrial reform were ventured upon here. The question of a 14-candle power standard is being considered; and the Canadian Association are bent upon convincing the Government that a reduction of the illuminating power of gas to a minimum equivalent to 450 B.Th.U. net would be to the interest of consumers and undertakings alike.

Meeting of the Irish Association.

IT is a pity that greater personal interest cannot be stirred up among the members of the Irish Association. To say the least, the disposition to leave things to the few willing workers is a trait that it would be better were once for all blotted out, and replaced by an internal activity that would mark the organization out as being far from the least healthy of all District Gas Associations. Ireland cannot afford to be without its Gas Association; and yet apathy may reduce it to such a condition that it might as well be reckoned as among the moribund. We earnestly add our appeal to that of the President (Mr. J. Paterson, of Queens-town) to the gas managers of Ireland to each do his part in infusing more life into the organization by personal interest and real help. Further than this, we will not touch on the domestic side of the proceedings of last Tuesday's meeting, as we are satisfied that, if the gas managers of Ireland will only put forward their energies to this end, they can make their Association one whose proceedings will command the admiration and respect of the foremost in the professional ranks.

There is no part of the United Kingdom that has offered so extended a scope as Ireland, in the face of almost heart-breaking and merciless difficulties, for the exhibition of grit and perseverance on the part of gas managers; and the President of the Gas Institution (Mr. R. G. Shadbolt), who is a frequent visitor at these annual gatherings of the gas managers of Ireland, can attest this. Under their circumstances, some of them have done extraordinary things in pulling their undertakings from the quagmires of depression and immobility into which they had fallen, and setting them on a foundation as sound as is to be found in many a place of superior opportunity and potentiality. The history of the Queenstown gas supply as traced in the President's address reads almost like a romance. A blacker or more dismal condition of things could not have existed than when an Electricity Company started operations there, and when business fell and dividends followed suit. What succeeded Mr. Paterson's entry upon the task of righting things is the best indication that good generalship was required to deal with the conditions of the day. The task that lay before him was a heavy one; the results are the best possible evidence of the fact that the position was rightly measured, and the means of rehabilitation and advancement the correct ones. The tabular statements accompanying the address are sufficient for us. The Electricity Supply Company cannot, we imagine, have made any great headway, with such a tale of gas progress in seven or eight years. Lower prices for gas, increase of the total gas and stove rental, net profits considerably greater, and dividends brought up to their maximum. Economical, judicious, and energetic management is at the seat of all this. Using approximately the same quantity of coal as seven or eight years back, about 5 million cubic feet more gas is made from it; the increased production per ton being about 2000 cubic feet, with an average

last year of 11,370 cubic feet. The quantities of residuals produced for sale have all gone up. When in a place such as Queenstown, a make is found of 21.1 lbs. of sulphate of ammonia per ton of coal carbonized, we enter the fact up as good working. There are, in short, many gas undertakings better circumstanced than Queenstown showing less efficiency in the working records.

We are pleased to see the recognition by the President that the vertical retort system can be readily adapted to the purposes of small gas-works. There was a disposition at one time to believe that this could not be done, or perhaps we ought to say economically done. But the excellent results obtained from limited trial installations are sufficient to negative the idea. The recent torrid conditions remind that the vertical systems do much to remove men from working under conditions which, the last few days, could only have been borne by those indurated ones whose lives have been largely spent in the retort-house. With vertical retorts, the President remarks, "there is an entire absence of those laborious and purgatorial conditions usually associated with the operations of drawing and charging retorts." We agree, after eliminating the "purgatorial" part of this expression of opinion; but between the President and ourselves in that connection, there is only a question of connotation.

The technical proceedings at the meeting had their foundation in two papers—one being by Mr. A. Percy Hoskins on "Purification by Lime and Oxide;" and the other by Mr. C. F. Hurst on the "Uses of Coal Gas Appliances for Industrial Purposes." In reading these papers, it must be remembered that the members of the Association are not all in charge of works that are capable of being conducted on the same plane of efficiency as, nor with the opportunities that are vouchsafed to the managers of, works in most areas in other parts of the United Kingdom. Mr. Hoskins, for instance, in his paper acknowledges that what he had to put before the members was an oft-told tale. But it is not a tale that has been often told before the members of the Irish Association; and therefore the message may have an effect in producing in some quarters greater efficiency in purification. There is nothing in the paper to criticize, but only to endorse. The first part, as to the actions and reactions that occur in lime and oxide purifiers, will be passed over by many engineers as elementary, and savouring somewhat of the text-book. But those who read to learn must not stop short at any part of the paper until the end is reached, as, in effect, the preservation of sequence in explanation brings to the front of the communication those methods that are not economical and efficient, while leaving to nearly the end the most approved, and therefore most economical and efficient practice of the times. For the majority of our technical readers when this is so, nothing more need be added. Incidentally, Mr. Hoskins confirms, from the experience gained at Belfast, the point made by Mr. H. Townsend in our "Correspondence" columns in the "JOURNAL" for July 11, that "when a box to be discharged is made the fourth in the series for a few hours before being taken off, neither heating nor nuisance of any kind is produced when the box is emptied."

The importance of the subject of Mr. Hurst's paper not only to the gas industry but to manufacturers cannot be over-rated. With the author, we agree that there is an extensive, and as yet largely uncultivated, field for the use of gas in industrial operations in many localities favoured with factories needing heat that can be regulated at will to requirement, that will not be wasteful through stand-by losses, and that will, through its ready applicability and efficiency, increase and improve production. It is the misfortune of some gas-supply areas that they are not richly blessed with such industries; and we are afraid that, in this particular line of business, the majority of the gas undertakings of Ireland have but a poor outlook. However, there are huge tracts of Great Britain where the contrary exists; and there are districts that hitherto have not been highly industrial where the provision of cheap gas for manufacturing and power purposes is among the inducements to manufacturers to establish themselves there. But this industrial heating business is not going to be gained without hard and persevering work on the part of gas suppliers. Among the most difficult of the barriers to be removed are those constructed by custom and tradition. Mr. Hurst points out the trouble experienced with workmen who disapprove of new inventions that economically increase the output of works. But such workmen cannot be allowed to stand in the way of

progress. If their influence is sufficient to overthrow for a time in some instances the adoption of new processes, the success of the latter in other places will prove a counter-active force. One manufacturer cannot allow another to obtain commercial mastery through improved methods, while he, through his men's *penchant* for the antiquated, is left struggling in the rear. Right, like truth, must prevail; and labour, strong as it is, cannot prevent advances in economic conditions. Mr. Hurst sets out the advantages and disadvantages of various means of applying gas for industrial use with, considering all things, a considerable amount of disinterestedness. There will, however, be those who, according to their experience, will discriminate differently the ranges of usefulness to which the author allocates the various types of plant and the methods of achieving the ends in view.

Footing the Bill—£5308 !

The promotion of another Joint Standard Burner Bill, to which reference was made in our issue for the 4th ult., should be a comparatively cheap means of placing in the hands of those companies who avail themselves of the opportunity, the burner now approved by Parliament and the Board of Trade—the "Metropolitan" No. 2—for gas-testing purposes. Local authorities are not likely to be led again, as they were led last year, despite all the warnings in our columns and the parliamentary history of this matter, to enter upon a fatuous expedition against a condition that has been so definitely settled by the Legislature. The local authorities who combined to assail the joint measures last year, at (principally) the instigation of Liverpool, had a salutary lesson administered to them that will make other authorities look twice, and well, before they are induced to take part in a similar quixotic proceeding. The Parliamentary Agents for the organized opposition of last session have had the unpleasant duty imposed upon them of informing those authorities who took part in it that the certificate of the Taxing Officer of the costs of their ineffective hostility shows a total sum of £5308 1s. 5d. This is the price that has to be paid for the stupid procedure that resulted abortively for all the opponents; and it does not include the whole of the money spent. The Liverpool Corporation made an agreement with the Gas Company just at the twelfth hour; but that was outside the parliamentary proceedings—the Committees of both Houses having passed the Gas Companies' promotions without imposing any conditions. The local authorities who had been induced to take part in the opposition were naturally not over-pleased with the result of their joint endeavours; and the reminder, of their utter and inglorious rout all along the parliamentary line, that they have just received from their Agents in this matter, is not to them an agreeable one. The share in the costs of the Hastings Corporation, for instance, is £225 11s. 9d.; and apart from the joint expedition to Westminster, they spent £198 4s. 3d. We make out that the total of their costs came to £423 16s. Experience is an excellent teacher.

A Gas Arbitration Award.

From the lengthy report of the evidence and speeches in the Swinton and Mexborough gas arbitration which was given in the "JOURNAL" some few weeks ago, it will have been gathered that there were several factors which tended to complicate the work of the Arbitrators and Umpire in arriving at the fair and proper value to be paid by the Gas Board for the undertaking of the Company that they had secured authority to purchase. For one thing, there was a gasholder which had to some extent subsided, and as to the ultimate safety of which there was much argument; and then there was a question as to the correctness of the stock-taking with respect to the quantity of tar and liquor. As the basis of the purchase, the Company suggested a multiplier of 28½ years; while, on the other hand, the Board's witnesses regarded 20 years as a fair figure to adopt. The final sum arrived at by the Company was £56,900; and that of the Board was apparently about £24,500, and the expenses of re-investment. The award has now been handed to the parties; and it is reported that the amount to be paid for the undertaking is £60,370, which includes the mortgage debt and the other liabilities mentioned in section 27 of the Gas Board's Act. This section, which was stated by Counsel during the arbitration to be not an ordinary one, is to the effect that "all debentures, mortgages, obligations, debts, and

liabilities of the Company other than on revenue account existing at the date of transfer shall be paid and satisfied by the Board, but subject as between the Board and the Company to sub-section 2 of this section, and to the section of this Act the marginal note whereof is 'Maintenance until Transfer.' " Sub-section 2 reads: "Not less than fourteen days before the commencement of any arbitration for determining the purchase price for the undertaking of the Company, the Company shall furnish to the Board a statement of all such debentures, mortgages, obligations, debts, and liabilities of the Company then outstanding, so far as the same can be ascertained. And all obligations, debts, and liabilities (if any) of the Company incurred before the date of the award which are not included in such statement or in any amendment thereof notified to the Arbitrators or Umpire before the date of the award, shall as between the Board and the Company be paid by the Company."

Lime and Sulphur Purification.

Certain companies, among them the South Metropolitan Company, have, as readers are aware, reverted, or rather partially reverted, to lime for the reduction of the sulphur compounds in the gas where, through the character of the coal used or other conditions, the sulphur content is found in excess of an admissible quantity. Through this, more money was expended by the South Metropolitan Company on purification last half year than in the corresponding half of 1910; but this reversion to the use of lime in boxes after the old fashion, it is understood from Mr. Carpenter's speech at the proprietors' meeting last Wednesday, is only a temporary expedient pending the results of research. He whets the appetite for further information. The Company expect to have at work shortly a large-scale plant in which will be embodied the latest knowledge of one aspect of the purification question. Does this mean coal-liming, under the system practised at Cheltenham, whereby the lime is made to adhere to and coat the coal by being applied in the form of dust by the aid of steam, or is it quite another system? The last heard of the Cheltenham experiences was that they were exceeding expectations, and that there were advantages attaching to the system in excess of the one that originally led to its application.

Fertility of the Industry.

One of the companies that vividly portrays the fertility of the gas industry is the Tottenham and Edmonton; and there is consequently rarely a meeting the proceedings at which do not supply matter that is of universal interest. We take two or three points as examples from the address of the Chairman (Mr. Corbet Woodall) to the proprietors at their meeting the other day. The Company progress with big strides, despite the competition of electricity. There was a time when the Chairman told the local authorities that, if they wanted electricity, the Company were prepared to apply for powers to render the service. But the local authorities would have none of it. The Company and their Engineer (Mr. A. E. Broadberry) are, however, resourceful; and those who are supplying electricity in the area are being made somewhat poignantly aware of the fact. The system of high-pressure gas lighting has obtained so much favour among the shopkeepers in other parts of the district that the main streets of Tottenham itself must of necessity be threaded with high-pressure mains, in order to meet the requirements. If, however, electricity must be had, then the Company show the large users how the energy can be obtained, by gas-driven generating plant, at a cheaper rate than it can be furnished to them through long lengths of cable. This is a subject that is referred to in our "Electricity Supply Memoranda" this week; and the Tottenham Company stand as an instance of those gas undertakings who are at work in checkmating attacks on the gas industry by showing how to economically produce the competitors' own commodity. The competitors have a right to work for business; gas undertakings have a right to defend theirs—even to the extent of having their gas used as an agent in developing current. But reverting to the laying of high-pressure mains, the Chairman spoke as to the possible coming of a new lamp for low-pressure service by which high-power effects will be secured on the lines of those produced by high-pressure service. Nevertheless, the lamp obviously is not an actuality at present; seeing that the Company are busy laying high-pressure mains in the streets of Tottenham for the

supply of high-power lights—the same as they have successfully done in other areas. One other matter. The Company are now supplying gas at the lowest price, excepting Wandsworth, of any Suburban Company; and the Chairman foreshadows another penny off next Christmas—the contracts for coal being on somewhat better terms than last year's. The demand for gas in the area goes on expanding in luxuriant fashion; and the last penny reduction has already been swallowed up and lost in the increase of business.

Companies and National Insurance.

Until one makes a close study of the matter, it is difficult to realize the magnitude of the interference with superior existing conditions that is proposed by the National Insurance Bill—not only in the case of gas companies, but other large enterprises. The subject was further treated upon by the Chairman of the South Metropolitan Gas Company (Mr. Charles Carpenter) at the meeting of the proprietors last Wednesday; and he produced a fresh point for the consideration of workmen. If the Chancellor of the Exchequer goes to Germany for his schemes, it is quite within the bounds of propriety to go to Germany to unearth all the effects. That is a matter, however, that is treated upon elsewhere. But in conjunction with our immediate interest in the matter, the meetings of the railway companies the last week or two have shown how hard in this connection State interference between them and their men will press on both. The railway men, like many gas companies' men, have recognized that they are not going to be so well off under the scheme as constructed in the rough in the Bill as they are under the present arrangements, and that the scheme in its working is going to be less economical. The men would therefore prefer to be left as they are. An effect suggested in the case of the railways is that the Bill will interfere with the relations at present existing between the companies and their employees. Voluntary funds of the kind are a means of bringing them together; while the stiff and formal provision under compulsory legislation will change all that. The Great Western Company calculate that the Bill will add about £60,000 a year to their costs, the London and North-Western Company between £60,000 and £70,000, and the Great Northern Company somewhere about £30,000.

A Sign of the Times.

There was good reason for a remark made a few days ago, to the effect that "labour movements at present were so numerous that presently they would not know how many such movements there were." The author of the statement was a worthy Councillor who was presiding over a large meeting of Manchester municipal employees—a gathering which was arranged for the purpose of arriving at a common understanding that after Aug. 31 they should cease to work with non-Unionists. By means of a resolution, this "common understanding" was come to; and the Manchester municipal employees, like their *confrères* at Salford, have determined that after the end of this month they will not work with those who are not members of a Union. Labour generally is truly just now on the look-out for scalps; and some of the men who are in the employ of local authorities are evidently desirous of joining in the hunt. The real objective of the Manchester meeting was frankly explained by the Councillor already referred to—namely, that the workers must be in a position, not only to ask for improvement in their conditions, but to demand it. For the successful carrying out of a fighting policy, solidarity on the part of the men is, of course, necessary; and usually we see this solidarity secured by (more or less) peaceful persuasion. But, from all accounts, municipal conditions of service frequently embrace decided advantages to the employees; and it occurs to one that in the event of a strike this fact would be not unlikely to prove a weakness to the men's side. In the case of public authorities or of private undertakings, each rise in wages secured by the men renders their "job" more attractive, and increases the likelihood of some one else coming forward to take it should the one-time holder throw it up in consequence of a Labour dispute. From this point of view, with each improvement of conditions the "solidarity" of the men should be rather harder than easier to maintain. This is merely a thought arising out of the Manchester meeting; and doubtless the Labour leaders there fully recognize the difficulty they might experience during a strike—if the Unionist pickets were kept strictly within the law—in preventing other men

coming forward to fill the vacated positions. If the Manchester speakers are to be credited, there is no such thing to-day as peace between Capital and Labour, and arbitration is not wanted; but their right to pose as authorities on Labour subjects may be questioned, in view of the statement of one of them that "the sympathy of the public would never fill the stomachs of their wives and children." In a dispute, public opinion is surely the strongest ally that the workers can have; and a person who dismisses it as being of little account has possibly not studied very closely the matter with which he essays to deal.

Temporary Borrowings.

Much work has been done in the cause of the municipalities by Mr. J. Harwood-Banner, M.P., particularly in connection with the Association of Municipal Corporations, in whose affairs he has for a long time now taken a leading part. He has lately presented a Bill to Parliament (supported by Mr. G. R. Thorne, Mr. Middlebrook, Mr. Hamar Greenwood, Lord Alexander Thynne, and Sir William Bull), for the purpose of enabling municipal corporations to make temporary borrowings from their bankers pending the receipt of rates and other income. The measure is promoted by the Association of Municipal Corporations; and it is pointed out that a similar power to that asked for has been of general application in Scotland since the passing of the Burgh Police (Scotland) Act, 1903. The Bill is commendably short. It contains only three sections; and of these one consists solely of a definition, and another of a short title. The remaining section sets forth that the council of a borough, for the purpose of defraying any current expenses that may be incurred by them in the execution of any Act or Provisional Order confirmed by Act of Parliament between the commencement of any financial year and the receipt by them of the proceeds of the rate or income out of which they are authorized to defray such expenses, may borrow by way of temporary loan from any person, or by way of overdraft from any bank, on the credit of such rate or income, such sums as they may from time to time require, and as may be specified in the resolution of the council authorizing such borrowing; and any sum so borrowed shall be a charge upon such rate or upon the undertaking from which such income is derived, as the case may be. Any sum so borrowed, together with the interest thereon, shall, in the case of any sum borrowed on the credit of a rate, be repaid out of such rate within the financial year during which the same was borrowed; and in any other case it shall be repaid out of the income on the credit of which the sum was borrowed within three months after the expiration of such financial year. Instead of borrowing in the way named, the council may take the money from any reserve or sinking fund which they possess; but if this is done, the money is to be repaid into the fund from which it was taken, within the time already mentioned, just as if it had been borrowed, and the fund is to be credited with such fair rate of interest as the council may resolve upon. This interest, it may be remarked, is not to be less than 3 per cent. per annum.

Municipal Finesse.

The possession of the electricity undertaking by the Hastings Corporation has had a marvellous effect in sharpening the wits of certain members; and the additional keenness is not always used to the benefit of the ratepayers, but rather to that, in real or fictitious manner, of the electricity undertaking. This white elephant has been a costly appendage to the municipal property; and all too long the expense of its maintenance has been largely drawn from the pockets of the ratepayers, and not from those who think fit to make use of such services as it is able to render. It is bad enough that many thousands of pounds should have been taken directly from the ratepayers towards its keep, and other lump-sums indirectly through the public lighting. But the latest artifice, in contributing to its support, is somewhat remarkable; and it amounts, from our way of looking at things, to an exercise of sharp practice. The estimate for the current district rate provided the sum of £1900 for defraying the computed deficiency on the working of the electricity undertaking in respect of the year ending March last. The actual deficiency, however, which it was necessary to meet was "only" £1677 ("only" is the word of the Public Lighting Committee, not ours), so that there is a balance between provision and requirement of £223. Is this going to be handed back in some shape or form to the ratepayers?

Not a bit of it. There is the greedy electricity undertaking—not satisfied with a maintenance order on the ratepayers for a sum of £1677—willing and anxious to have the sum spent for its benefit. It has therefore been agreed to lay out the £223 in converting to electricity about sixty more gas-lamps. This is a new way of robbing the ratepayers; and a fresh lesson from Hastings in municipal management through the back door. The overlapping of the administration of local affairs through members of the Corporation Electricity Committee being on other public bodies has supplied former lessons, some of which have been dealt with in our pages.

Beet Sugar Industry.

We know what a big claim beet culture has had in Germany on sulphate of ammonia; and therefore we cannot help watching with interest the efforts that are being made to establish the cultivation of beet and the sugar industry in this country. We just learn that there has been registered by license of the Board of Trade, as a Company not existing to make a profit, the Incorporated Beet Sugar Pioneer Association. The object of the organization is the furtherance of the cultivation of sugar beet in England, with the view to the introduction of the industry to the United Kingdom. The President is Mr. R. P. Houston M.P.; and a number of influential gentlemen have consented to act as Vice-Presidents. A strong Council has also been formed. At a recent meeting of the latter at the House of Commons, it was stated that encouraging reports have been received as to the progress of the movement throughout the country. We hope those encouraging reports will continue—at all events, the Association may take it that they have the gas industry's best wishes for an abundant success.

Those Ill-Natured Newspaper Reporters!

The fat will be in the fire again. Several of the daily papers last week had the temerity to report that the fire at the Carlton Hotel, Pall Mall—through which one man lost his life, and much damage to valuable property was occasioned—was apparently due to the fusing of an electric wire in a lift-shaft at the rear of the hotel. These papers will have our electrical contemporaries bringing all their combined weight upon them; and probably the watchful and courageous Mr. Renwick, in the name of the Electricity Publicity Committee, will make a little remonstrance. For has it not been written, according to the old-fashioned formula of the London Fire Brigade, that the "supposed cause of fire is unknown?" We should like the new Chief of the London Fire Brigade to revise this ancient form (which appears more frequently than ever) of stating that the cause is unknown to the brigade. If the cause is unknown, then the use of the word "supposed" is superfluous. But the "supposed cause" of the Carlton Hotel fire being "unknown," does not exonerate electricity. The Directors of the Carlton Hotel appear to be fairly well satisfied as to the cause of the fire; for the day succeeding it they issued a statement which commenced: "The fire which occurred in the Carlton Hotel, in the Haymarket, yesterday evening is believed by the management to have originated owing to a short-circuit in the service lift." The management of the hotel, and the Board therefore support those newspaper reporters who, with a persistence or malignity that the electrical press cannot understand, will ascribe fires to electric wire fusions. But on this occasion we shall be inclined to side with the Directors and management of the Carlton Hotel, and therefore with the newspaper reporters. Here is another instance under "London Fires" in a morning contemporary for the 10th inst.: "Exciting scenes occurred just after five o'clock yesterday morning at 4, Soho Street, W., on premises occupied by several firms. A defective electric circuit caused the outbreak." This is really too bad; but we suppose that, in matters of this kind, those on the spot are somewhat better informed than those who were not. At least, we should think so.

The Road Board, with the approval of the Treasury, have made some further advances from the Road Improvement Fund to county councils and other highway authorities. The grants up to June 30 (including those contained in the lists previously published) amounted to £275,390, of which £200,890 was for the improvement of road crusts, including grants towards tar macadam, &c., and surface tarring.

GAS STOCK AND SHARE MARKET.

(For Stock and Share List, see p. 448.)

It was, of course, only to be expected that the Stock Exchange should have had another anxious and agitating week. That is almost getting to be an ordinary recurrent news item. It is true that of the factors for unrest the formidable bogey of Morocco was not in volcanic action last week, but the industrial war raging at home was a matter of the first magnitude, and the Constitutional struggle was epoch-making. The depression of the week was, therefore, at once accounted for. But a brighter spot was visible in the Consols Market, which showed great firmness; the closing quotation being $78\frac{1}{2}$ to $78\frac{1}{2}$. Upon reopening on Tuesday, the markets generally were slow at getting to work, and the tone was variable. Home Government issues were firm. But Rails were much depressed by the continued worsening of the labour outlook, and dealings were for awhile almost arrested. Americans, too, were quite flat; but the Foreign Market was calm and strong. On Wednesday, the general characteristics were unchanged. Gilt-edged showed strength. Consols rose a small fraction; but strike developments thrust Rails down. Americans continued weak; and Foreign were firm. On Thursday, business remained at low pressure and without any heart in it. Even Consols were feeling not quite so stiff. Rails could find little to cheer them in the chances of Government intervention in the strike trouble; but they clutched at the straw. Americans were crushed by the Official crop report. On Friday, the long lane of depression found its turning at last, and everyone was looking more cheerful. Government issues were in request, Consols jumped up $\frac{3}{4}$, Rails recovered on better prospects of industrial peace, and Americans took a more hopeful view of their own troubles. This upward turn did not last through Saturday; but Consols were steady. In the Money Market, there was little movement, and that was variable. Business in the Gas Market was quite on a holiday scale, but was fairly distributed through the list. Changes of quotation were rare, but prices were very firm. In Gaslight and Coke issues, the ordinary was very moderately dealt in. But nothing changed hands below 108, and 108 $\frac{1}{2}$ was marked more than once—a rise of $\frac{1}{2}$. In South Metropolitan, there were a few transactions ranging from 119 $\frac{1}{2}$ to 120, and the debenture realized 79 $\frac{1}{2}$ and 80 $\frac{3}{4}$. In Commercial, there was one deal in the $\frac{1}{2}$ per cent. at 116, and two in the $\frac{3}{4}$ per cent. at 108 $\frac{1}{2}$ free and 109 $\frac{1}{2}$. Among the Suburban and Provincial group, Alliance and Dublin were marked at 81 $\frac{1}{2}$, Brentford new at 205, British at 45, ditto debenture at 95 $\frac{1}{2}$, Bromley "B" at 87 $\frac{1}{2}$ free, and (on the local Exchange) Liverpool "B" at 164 $\frac{1}{2}$. In the Continental companies, Imperial was only dealt in two or three times, marking 181 to 182 $\frac{1}{2}$; ditto debenture made 92 $\frac{1}{2}$; Union, 90 and 90 $\frac{1}{2}$; ditto preference, 135 $\frac{1}{2}$; and European, 19 $\frac{1}{2}$ to 19 $\frac{3}{4}$. Among undertakings of the remoter world, Bombay realized 6 $\frac{5}{8}$, Cape Town and District 2, Monte Video 12 $\frac{3}{4}$, Primitiva 7 $\frac{7}{8}$, ditto preference 5 $\frac{1}{2}$ and 5 $\frac{3}{4}$, ditto debenture 97 $\frac{1}{4}$ and 97 $\frac{3}{4}$, and San Paulo 21 $\frac{3}{4}$ and 22.

ELECTRICITY SUPPLY MEMORANDA.

Gas and Diesel Engines for Generating Electricity—Testing of Electricity Meters—Litigation in the Air—"Free" Wiring Condemned—Electricity in Mines—Cooking Phenomena.

THE other week we touched upon the subject of the growth of the use of private electricity generating plants incorporating gas-engines as the motive power—many large consumers of electricity for lighting and other purposes showing day by day that they can, by such plants, generate and supply themselves with current at a lower price than ordinary electricity purveyors. With gas-engines and generation on the spot, the South Suburban Gas Company have proved to the Festival of Empire Committee that they can furnish themselves with electricity at a lower rate than the local electricity suppliers. There are many other instances of town-gas driven generating plants. There is the municipal one at Newcastle (Staffs.), and numerous private ones. There are also the gas-driven generating plants on gas-works for the provision of energy for the operation of retort-house machinery; energy being derived by them at a lower cost than the electricity authorities can supply at. With all this before us, it seems strange that the Farnham Gas and Electricity Company should be advertising for two high-speed Diesel oil-engines for driving their electricity generating station. They ought, it seems to us, to set a good example by patronizing their own gas for power purposes. At the rate at which gas undertakings are obtaining powers to supply both gas and electricity—if not in their central districts, in the outer areas—and are doing business in the provision of driving plant for private electricity installations, we shall soon be requiring advising experts with experience in both gas and electricity work. This recommendation by electrical engineers of the Diesel engine for electricity generating purposes is spreading. At Egham, there is a proposal to erect a generating station on land adjoining the gas-works; and there, again, two Diesel oil-engines are proposed. Objection was raised to the use of the engines at a Board of Trade inquiry held lately by Mr. A. P. Trotter; it being seriously imagined by occupiers in the

vicinity that there would be a nuisance. It supplied the opportunity for giving an excellent character to the Diesel engine in this respect. Mr. Dykes (of Messrs. Handcock and Dykes) stated that similar engines were installed in Messrs. Peter Robinson's premises in Oxford Street, just under the show-rooms, in which they could not be heard. Having visited the premises, the Inspector confirmed the statement. Now if, in a big drapery establishment of this kind, in the very heart of the fashionable shopping quarter of London, a private electric plant can be used in this way without trouble, then such plants can be employed practically anywhere. This points to another thing. If Messrs. Peter Robinson find it preferable and more economical to have their own electricity generating plant than to patronize the local vendors of electricity, the same will apply to other large users of electricity thereabouts. If all these large users followed the example of the firm named, what a big slice would be cut out of the business of the ordinary suppliers of electrical energy! There is clearly work here for gas undertakings (other than municipal ones with municipal electricity departments in opposition) in showing some of these large users of electricity for lighting how they can save money by using gas-engines coupled-up to a dynamo.

Electricity meters are at the present time an awful worry to suppliers of electricity. Their initial cost is great; the expense of maintenance is great; and their lives are so condensed that the Local Government Board recommend that they be purchased out of revenue, or, if loans are granted for them in special circumstances, then the Board are only prepared to allow a comparatively small number of years as the term within which the loan should be repaid. But these aspects of the meter question are of no concern to the consumer. It is not his business that such appliances are costly and organically very delicate; it is his business to be assured that the meter is a fair arbiter between him and those from whom he purchases current. There is a growing feeling of uncertainty about the electricity meter on the part of consumers. They know that in most cases these meters are not sealed and certified by an independent authority, as in the case of gas-meters. They are also learning that there is no compulsion on the part of electricity suppliers to have meters tested, sealed, and stamped; and some of them want to know the reason why. There is experience enough now as to the testing of such meters by an independent authority; the London County Council having for some time past undertaken the work. There ought not, having regard to the time electricity meters have been in use and the experience, to be any great difficulty about making independent testing and sealing a compulsory matter. The City Justices of Manchester, who are the city gas-meter testing authority, are of opinion that the verification and sealing of electricity meters should also be under their charge; but the Corporation Electricity Department (who have a testing department of their own) do not appear enamoured of the proposal. Hence a deadlock. Unless the Manchester Corporation will voluntarily place the work in the hands of the Justices, the latter, without statutory authority, are impotent in the matter. But the same power that placed the testing and sealing of gas-meters under the charge of the Justices can do the same in the case of electricity meters.

A correspondent in the "Engineering Supplement" of "The Times" has called attention to the considerable amount of unrest there is in the electrical industry at the present time in regard to metallic filament lamps. The cloud of litigation is above the industry; and it is a wonder that the cloud has not burst before this, seeing the number of tungsten lamps that have come upon the market under various denominations. That things have been allowed to go so far without calling upon the Courts to settle respective titles, and to say whether or not this or that is an infringement, is singular. There have already been one or two skirmishes; but the main question has yet to be settled. The industry, says the writer whose article reminds of what threatens, cannot pursue its normal course of development until the patent situation is cleared up. The situation, however, is complicated on account of the manner in which the various patents have been concentrated in a few hands, and also by agreements which are understood to have been made by some of the larger concerns, by virtue of which they are supporting one another against all outsiders. Nevertheless competition from abroad, and the establishment of new concerns to manufacture lamps, have proceeded. The uncertainty grows; and most manufacturers have now to give the distributing houses guarantees against the consequences of infringement. The Courts alone can clear away doubt; but it is recognized that, if a patent monopoly is established, the public safeguard of open competition falls to the ground.

There is a somewhat historical similarity between the metallic filament lamp and the incandescent gas mantle. Both originated abroad; and firms largely interested in gas had a hand in the pioneer work. The Osmium lamp was invented by Welsbach; but it has been superseded. Just and Hanaman's British patents, and those of the Deutsche Gasglühlicht Gesellschaft of Berlin, were acquired by the General Electric Company in this country; and through a subsidiary Company—the Osram Lamp Company, Limited—manufacturing works at Hammersmith were then established. Dr. Kuzel's patents for making filaments from a paste containing tungsten in the colloidal condition were acquired by the Berlin gas firm of Pintsch; and lamps are made according to the process at Brimsdown. We will not go through the whole history of metallic filament lamp development. But a good many other people are interested in lamps for which various physical and constructional differences are claimed; so that, if war is per-

sisted in, we have here the making of a *cause célèbre* for the lighting world—technical and commercial. An incidental interesting point is found in the returns relating to the manufacture of electric lamps in Germany. In the six months ending March last, that country manufactured 13,900,000 carbon filament lamps, and 17,000,000 metallic filament lamps.

We have kept at hand for notice an article that recently appeared in the "Electrical Review" by Mr. H. E. Goody, bearing the title of "Some Objections to 'Free' Wiring." There are many objections to "free" wiring where the electricity suppliers are local authorities; but there are no objections that gas suppliers can reasonably offer when the electricity vendors are private companies. Interest in the matter for the gas supplier then ends at the pabulum for reflection that is supplied regarding the unbusiness-like qualities of some people who fancy they are endowed with an extraordinary amount of commercial acumen. This article by Mr. Goody is practical and frank. He points out what most of us know (though not a few electrical engineers who are hyper-sensitive over the matter of an error of judgment will not acknowledge it), that there is a good stock of experience now of supply authorities who have burnt their fingers over the free-wiring business, and are silently cutting their losses by declining to connect more consumers on the same terms, and, as those already on the system drop out, by ruling out the connections. Others who have entered into the business continue in the vain hope of recovering the capital they have generously spent in wiring the houses of people who obviously must be in the category of customer that is least likely to make such a system of business pay. "Free" wiring may produce a temporary spurt in the number of connections; but what is the good of this if there is no profit hanging to the business? We have Mr. Goody also candidly saying (and his remark is of value beyond the intention), "an electric light installation has too short a life for a company to be content merely to earn interest of (say) 6 or 7 per cent. on their capital outlay." Further, "for the system to have the slenderest chance of financial success, it is necessary that each installation should be completely paid for in, at the most, four years," in which time the most expensive portions of the installation will probably require renewal.

There is pleasure in meeting an electrician like Mr. Goody who refuses to mince matters. He next proceeds to give an illustration. A council spent from £5 10s. to £6 upon each free-wiring installation; the consumers being charged 6d. per unit, instead of the ordinary price of 4½d. per unit. The average consumption in a winter quarter was 2 units per week (we have no doubt for an indifferent amount of illumination). The 1s. revenue gave 3d. per week above the ordinary consumer of 2 units a week. In the summer, the consumption was still lower. So that in a year each consumer only paid 8s. above the ordinary consumer to meet capital repayment, interest, repairs, and lamp renewals. Leaving out all expense other than repayment, the 8s. per annum would only succeed in clearing off the bare original cost in about fourteen years! This does not make any allowance for the contingency of the consumer transferring his residence. Mr. Goody does not see any analogy whatever between a free electric wiring installation, and what gas suppliers are able to do. We are not astonished he does not, because there is not the faintest trace of an analogy existing. Then, under the circumstances, he finds that this free-wiring system and the extra charge per unit does not work out equitably. The large consumer pays more than the smaller one; and he is, in comparison, heavily penalized for being the better consumer of the two. Mr. Goody ends up the case against free wiring with the pious hope that it "will come to an early and merciful end."

Our electrical contemporaries are very wroth with the way things are going in connection with the use of electricity in mines. We are not concerned in the matter beyond the point that it is folly for the defenders of electricity to endeavour to paint its innocence in immaculate white. What electricity will do out of the mine, it will do in the mine. Fires have been caused by electricity in much less dangerous places than mines—in places where no gas could be found. We also remember the fatal explosion in the purifier-house at the Dublin Gas-Works, which was proved to have been caused by an electric wire from which the insulation was partly worn away. The matter that so annoys our contemporaries is that the coal miners of the country are antagonistic to the use of electricity; and the coal miners express themselves as genuinely in fear of it. Whether the economy of mechanical coal-cutters worked by electrical energy has anything to do with their "fear" is not a matter that appears to have been discussed. However, at the head and front of their objection, they place the danger of electricity; and at the Miners' International Congress at Westminster lately, a resolution was passed calling upon the Government to expedite legislation making for the greater safety of workers in mines, and the use of electricity was condemned in no measured terms. The Government are doing something to control, but not to prohibit, the use of electricity in coal mines. Clause 60 (as it originally stood) of the Coal Mines Bill—now under consideration by Standing Committee "B" of the House of Commons—prohibited the use of electricity in any part of a mine where, on account of the risk of explosion of gas or coal dust, the use of electricity would be dangerous to life; and it also provided for the use of electricity being subject to general regulations under the Act. When this clause was under consideration by the Committee, amendments were proposed; and one suggested by Sir A. Markham was ultimately carried. It provides for the discon-

tinuance of the use of electricity in any part of a mine where the amount of inflammable gas in the air currents exceeds ½ per cent. The amendment further provides for testing, and supervision by a competent person. The electrical papers put all the agitation down to ignorance, prejudice, foolishness, and so forth. Our contemporaries may say what they please in this way, but it will not alter facts. The confidence of the miner in this matter has to be gained not by belittling his intelligence, and that of those who speak for him, but by satisfying him (if it be possible) that electricity is something incapable of harm. We recognize the difficulty of doing this, as well as the greater case of casting ridicule, of handling platitudes, and of making use of transparent pretence. However, the amending clause stands as part of the Bill.

We were interested a few weeks ago in certain phenomena that the Berry Construction Company assert attach to the use of electricity for cooking. There is some peculiarity about the heat of electricity, we understand from these people, that results, by its employment in cooking, in a saving of pounds of meat in the course of a week, and pounds in money in the course of a year. And we also understand from them that there is something altogether different about the heat of gas, which causes it, no matter how careful one may be, to waste the meat, to shrivel it up, and to do all manner of things that electrical heat is incapable of doing. We asked the Berry Construction Company the wherefore of these strange incomparable doings on the part of the heat of electricity; but never a word in reply. We ask for an explanation again, because we see that the agents of the Company named are stumping the country telling the people as to the wonderful doings of "Tricity" cookers. We likewise see that the "Electrician" mentions that at Preston it was stated that a 10-lb. joint can be cooked for 2½d. (time, please, and price per unit?), and that "the loss of 1½ lbs. of meat, which would take place by any other method, is avoided." As the Berry Company appear to be coy, perhaps the "Electrician" will explain the difference between gas and electrical heat, so as to try to arrive at the truth of the matter. To save the "Electrician" trouble, it will find what we previously had to say on the subject in our issue for July 25. We have a fancy for a little discussion over this matter.

Presentation to Alderman Hart.

Alderman Henry Hart, the Chairman of the Canterbury Gas and Water Company, completed on the 2nd inst. half-a-century of service as a municipal councillor; and at the meeting of the Council on the morning of that day, the Mayor (Alderman F. Bennett-Goldney) offered him the congratulations of his colleagues, and expressed the hope that he might be spared to have a jubilee for his sixtieth year, and later still. Alderman Hart, in acknowledgment, said he had tried, during his membership of the Council, to do his best to serve the citizens in the duties which had devolved upon him; and he hoped to be able to continue to do so. At the close of the proceedings, he invited the members to partake of refreshments in the Mayor's Parlour. In the afternoon, he was presented, at the house of the Town Clerk (Mr. Henry Fielding), with a handsome inlaid writing-table, by the officials of the city. It bore the following inscription: "1861—1911. To Alderman Henry Hart, J.P., on the completion of his fiftieth year of faithful and unbroken membership of the Canterbury Town Council, from the officials of the City, as an appreciation of his invariable consideration, kindness, and courtesy to all. Canterbury, 2nd August, 1911." The Town Clerk, in making the presentation, referred to the affection and esteem in which Alderman Hart was held by all the members of the Council, the officials, and the citizens generally, for whose welfare he had given the best years of his life. In acknowledging the gift, Alderman Hart said he had been greatly aided in his work by the officials. He expressed the real devotion he had for them and for the work of the City, and said it was his greatest wish ever to retain the goodwill of his neighbours.

Pipe Subways in London.—According to the annual report of the Engineer for the City of London (Mr. Frank Sumner, M.Inst.C.E.), the portions of which relating to lighting were given in the "JOURNAL" a fortnight ago, the total length of subways in the city is 1 mile 947 yards. In them, there are about 2 miles 693 yards of gas-mains and 1 mile 693 yards of water-mains. During the year, the number of admissions given to parties having mains in the subways was 336; among them being 90 to the Gaslight and Coke Company and eight to the Metropolitan Water Board. In addition, 306 admissions were given to the Gas Company for the daily examination of their mains.

Canadian Gas Association.—The accounts of this Association presented at the last annual meeting show that the receipts in the twelve months ended the 31st of May, with the amount brought forward, amounted to \$2001, and the expenditure to \$1343; leaving a balance of \$658 in hand. The officers for the current year are: President, Mr. Arthur Hewitt (Toronto); First Vice-President, Mr. E. J. Philip (Berlin); Second Vice-President, Mr. A. W. Moore (Woodstock); Secretary-Treasurer, Mr. John Keillor (Hamilton); Executive Committee, Messrs. J. S. Norris (Montreal), R. A. Wallace (Quebec), A. A. Dion (Ottawa), J. M. H. Young (London), and P. S. Coate (Chatham). It was thought that Mr. Hewitt, the retiring President, should be re-elected; and next year's meeting will, in all probability, be held in Toronto.

AN APPRECIATION OF M. JOSEPH DE BROUWER.

THE distinguished gas engineer, M. Joseph de Brouwer, was made the recipient of the honour of being nominated an Honorary Member of the Association of Gas Engineers of Holland at the recent meeting of the Association at Leeuwarden. The distinction was conferred upon him in consideration of his services to the gas industry in various directions, and in particular of his achievements in superseding manual labour in the retort-house by mechanical power.

M. de Brouwer, we learn from "Het Gas," was born at Bruges on Nov. 2, 1843, and graduated as Doctor of Laws at the University of Louvain in August, 1865. He was duly called to the Bar; but circumstances soon drew him towards gas manufacture. The gas-works at Bois-le-Duc, Tirlemont, Bruges, and Courtray had been founded by his father, whose early death led to the son being called upon to take an active part in their management. Throwing himself into this sphere of activities with the greatest zeal, the young Doctor of Laws quickly became metamorphosed into a technical gas man whose right to the title of gas engineer no one would now deny. In 1904, the Société Technique de l'Industrie du Gaz en France conferred upon him its highest distinction—its gold medal—an honour he shares with M. Coze, Baron Auer von Welsbach, and (since 1908) M. Sainte-Claire Deville. He was for many years a member of the Council of the Belgian Gas Association, and has occupied its presidential chair.

The name of De Brouwer first acquired world-wide renown through his conveying trough; and, later, his charging machine and push-discharger enhanced his reputation. In the early days of his connection with the gas industry, he aimed at improving the construction of retort-settings and diminishing manual labour in the retort-house. In the nineties, he made extensive investigations in intensified gas lighting—using gas under high pressure in special services. At Ghent, before 1900, he put in three large installations on this system, which are still in use. He at the time took out a patent for strengthening high-pressure gas-mantles by means of platinum gauze. In 1905, he was instrumental in founding a Central Société for the exploitation of the gas and electricity industries in different districts. With his eldest son (M. Jean de Brouwer) as Manager, this undertaking rapidly developed under his general managership; and during six years seven gas-works, supplying sixty towns and villages, have been amalgamated in it. Their high-pressure mains extend through the North of Belgium, from Limburg to Dunkirk, with a total length of 342 miles. M. de Brouwer's services have been recognized by the State by the conferring upon him of the Officer's Cross of the Order of Leopold, and the Civic Cross of the First Class.

The congratulatory notice in "Het Gas" concludes with hearty wishes, in which we associate ourselves, for the continued welfare of M. de Brouwer, his family, and his undertakings.

Obituary.

We regret to announce the death, on Monday last week, at Heckington, Lincolnshire, while on holiday, of Mr. GEORGE RAIT GUYATT, the Secretary of the Ceará Gas Company. This position he had filled since 1899, when he succeeded his father, Mr. Thomas Guyatt, who was elected a member of the Board on the death of Mr. Horatio Brothers. Deceased was in his forty-third year. His father is the Secretary of the Ottoman Gas Company, and his brother (Mr. T. A. Guyatt) the Engineer, Manager, and Secretary of the Ely Gas Company.

Personal.

Mr. GEORGE GREENSLADE, the Engineer of the South Hants Water Company, has, after thirty-two years' service, relinquished this position on account of ill-health; and Mr. D. KITCHINGMAN, the Water Engineer at Poole, has been appointed his successor.

Mr. JAMES HOWARTH, of Poulton-le-Fylde, has been elected a Director of the Whitworth Vale Gas Company to serve for the unexpired term of the late Alderman T. Briggs. Mr. Howarth was formerly Auditor for the Company; and he is succeeded in this position by Mr. W. E. WHITWORTH.

Mr. T. BANBURY BALL has just completed thirty years' service as Gas Engineer and Manager of the Rochdale Corporation. He was appointed in 1881, in succession to Mr. William Romans, who had only held the position for a year; his predecessor being Mr. T. O. Paterson, who left Rochdale to become Gas Engineer to the Birkenhead Corporation. Since Mr. Ball took charge of the Rochdale gas undertaking, it has been greatly developed, and the works practically remodelled under his direction. The latest improvement has been the erection of an installation of Glover-West vertical retorts, now almost ready for use. The Rochdale Gas-Works were purchased from the old Company by the Improvement Commissioners in 1844 for £26,000; and in 1858, two years after the incorporation of the town, they were transferred to the Corporation. At the time of the purchase, the price of gas to consumers in Rochdale—and they were not many—was 7s. per 1000 cubic feet. The Commissioners at once reduced it to 6s.; and it remained at this figure until 1851, when 1s. was taken off. The price is now 2s. 8d.; and the Gas Committee have under consideration the question of a further reduction.

THE ALKALI AND CHLORINE INDUSTRIES.*

THE third volume of the third English edition of Professor George Lunge's monumental treatise on "The Manufacture of Sulphuric Acid and Alkali" deals with: (1) The ammonia-soda process of alkali manufacture; (2) various subsidiary processes of alkali manufacture; (3) the chlorine industry. None of these subjects has any very direct connection with the gas industry, although it is inevitable that two such important branches of applied chemistry as alkali manufacture with its subsidiary processes, and gas manufacture with its resultant bye-products, should come into close touch one with the other at several points. It will, however, suffice in this notice of the new volume of Professor Lunge's work to indicate the scope of its contents, and to point out one or two of the matters dealt with which are of more direct interest to gas chemists and engineers.

The electrolytical methods of producing alkali and chlorine were briefly dealt with in the corresponding volume of the second English edition of Professor Lunge's work; but owing to their extensive development in recent years, they have now been relegated to a new volume, which is being prepared by Professors Askenasy and Haber, and will be issued later as Vol. IV. of the complete treatise. The loss of matter to Vol. III. involved in this removal from it of the description of electrolytical methods is, however, more than compensated for by the more extended descriptions now given of the other processes dealt with in the volume. The first of these—viz., the important ammonia-soda process of manufacturing alkali, is covered in nine chapters extending in all to about 210 pages. The first chapter is historical and general, and the second refers to the ammoniacal solution of salt required for the process. The third chapter deals with the production of carbonic acid for use in the process, and, since this is generally derived from the burning of lime, descriptions are given of the lime-kilns, more or less of a special design, which are used for the purpose. The special feature of these kilns is the provision made in them for the collection and removal of the lime-kiln gases; and the kilns are fired and worked so that as high a proportion as possible of carbonic acid is obtained in the lime-kiln gases. The members of the technical staffs of the gas-works in the country which, owing to local conditions, still burn lime for use as a purifying material in place of oxide, will find a few points of interest in the descriptions of the kilns used for lime burning on alkali works. It would appear that in practice from 12 to 14 parts of coke are charged into the kilns for each 100 parts of limestone. In the description of methods of analyzing lime-kiln gases, mention is made of a "Bunsen burette," where it is evident that the Bunte burette is intended.

There is nothing of special interest to readers of the "JOURNAL" in the fourth and fifth chapters, which refer to the precipitation and preparation of the bicarbonate; but in the sixth chapter, referring to the recovery of the ammonia, there is a brief description of methods for the analysis of gas liquor and sulphate of ammonia. For full details, however, of these methods, the reader may be referred to Professor Lunge's treatise on "Coal Tar and Ammonia." In the eighth chapter, there is a short note on proposals for working the ammonia-soda process in combination with coal-gas manufacture. The chief of these proposals is that embodied in patents taken out by Wallace and Claus in 1877, which involved the purification of coal gas by ammonia alone, and the driving forward of the sulphuretted hydrogen by means of carbonic acid. In the liquor, rich in ammonium carbonate, thus obtained, common salt was to be dissolved, and carbonic acid, produced by decomposing sodium carbonate, was to be passed in in order to cause a precipitate of sodium bicarbonate, which was then collected and heated for the production of carbonic acid for subsequent use. From the solution, containing ammonium salts, the ammonia was liberated by lime for further use in the purification of gas. The process thus saved the carbonic acid and ammonia, which are lost in the ordinary ammonia-soda process; but, as the author points out, the difficulties involved in it have evidently not been surmounted in practice.

The various processes of alkali manufacture described in the five chapters which comprise the second section of the volume do not contain any matter of special interest to gas chemists, nor much that is of immediate practical importance in the alkali industry. This part of the work is mainly a record of proposals, more or less ingenious, which, for one reason or another, have failed to justify adoption on an extended working scale.

The third section of the work refers to the chlorine industry; and in its third chapter—viz., the seventeenth of the volume—it comes into touch with the gas industry through the description of the Weldon process for the utilization of the still liquor. In a brief note on the use of Weldon mud other than for chlorine production, it is mentioned that Hood and Salomon have proposed Weldon mud for purifying coal gas. But the author does not appear to be aware of the fact that the proposal has been carried out on an extensive scale at a number of important gas-works in this country. He speaks of it in the same fashion in which he

* "The Manufacture of Sulphuric Acid and Alkali with the Collateral Branches," a Theoretical and Practical Treatise, by George Lunge, Ph.D., Professor Emeritus of Technical Chemistry in the Federal Polytechnicum, Zürich; Honorary and Foreign Member of the Chemical Society, London, and of the American Chemical Society; Dr. Ing (H.C.) of Karlsruhe, &c. Third Edition. Vol. III., "Ammonia-Soda, Various Processes of Alkali Making and the Chlorine Industry." Gurney and Jackson; London, 1911.

refers to the multitudinous processes connected with the alkali industry for which patents have been taken out, but of which no practical application has ever been made. Whatever may be the merits of Weldon mud as a purifying material as compared with oxide of iron, it has at least had the distinction of being tried on a very extensive practical scale. The author refers to the difficulty of finding uses for the calcium chloride which is produced in such enormous quantities as a bye-product of the Weldon process. The more or less successful attempt on the part of Messrs. Brunner, Mond and Co. to bring this bye-product, either in solution or in a partially dehydrated state into extensive use for mitigating the dust nuisance on untarred macadamized roads, is, however, not mentioned by him. The production of bleaching powder is dealt with in an interesting chapter, which is followed by another one on bleaching liquors and other bleaching compounds. The final chapter is on the manufacture of chlorates. There is nothing in these chapters of direct interest to gas engineers. An appendix to the work gives statistical data on the production of alkali and chlorine products in the chief countries of the world.

The volume as a whole is compiled with Professor Lunge's well-known ability and thoroughness; and the worst fault which can be alleged against it is that he at times fails to discriminate between matter which is of real practical significance and that which is only the product of the imagination of an inventive tyro in the industry. References to many of the patents taken out by inventors of the latter class might well have been excluded from the work. Though the author seems now to be more familiar with the procedure followed in Continental rather than English alkali works, the volume must be indispensable to chemists engaged in the latter.

SLOW v. QUICK CONDENSATION.

It may be remembered that the newly-constituted Special Committees of the Société Technique du Gaz en France submitted reports at the congress held in Marseilles in May last. These bodies had not been in existence sufficiently long to allow of their presenting any noteworthy results of their labours; but they invited members to suggest subjects for study, and promised to deal with them. One of the members—M. André Grebel, whose name has frequently appeared in our columns in connection with his papers read before the Society and his communications to the French Technical Press—has accepted the invitation; and in a recent issue of the "Journal de l'Eclairage au Gaz" he had a long article on the subject of condensation, dealing specially with the views lately enunciated by M. Sainte-Claire Deville, which were embodied in the paper read by M. Laurain at the recent congress [see "JOURNAL" for May 30, p. 602], and those held by the majority of gas managers, himself among the number. It is a question of the rapid cooling of the gas compared with the slow condensation generally in vogue; and M. Grebel thinks it is of sufficient importance to be studied by one of the Committees. It has been before the members more or less since the congress in Paris last year; but M. Laurain's paper has invested it with additional interest. Whether or not M. Grebel's suggestion is acted upon, it may be confidently expected that more will be heard about it at the congress next year. Meanwhile, M. Grebel gives expression to his own views on the matter. These we will endeavour briefly to epitomize.

First of all, he points out that "condensation" belongs to a group of operations formerly referred to under the general expression of "physical purification." The object of the physical and chemical purification of gas is to retain its useful and remove its useless elements, and not solely to reduce to a minimum the quantity of naphthalene present. If this were the only object aimed at, it would appear at first sight to be the right thing to bring the gas leaving the hydraulic main quickly down below the minimum temperature to which it would fall in the pipes and manufacturing and distributing plant. As far back as 1907, and again in 1908, the author asked, in the publication in which the communication now under notice appears, why this system of the sudden cooling of the gas, which has been in use for seventeen or eighteen years in the Municipal gas-works in Brussels, and which the Paris Gas Company have recently adopted, has not been employed in all gas-works. If a solution which appeared to be capable of getting rid entirely of the naphthalene trouble did not receive general support, he thinks there must be good and sufficient reason for not using it in the ordinary conditions of manufacture obtaining in many gas-works.

M. Grebel alludes to the experiments made by M. Sainte-Claire Deville, and points out that they relate to the particular case of the experimental works of the Paris Gas Company at La Villette. It was shown that the loss of benzol in the tar, due to sudden condensation, represented only 2 grammes per cubic metre of gas, or 2 to 3 litres illuminating power (the French standard being 105 litres of gas to give the light of one carcel, or 9.6 candles). But M. Grebel questions whether it is justifiable to regard this as general. In his opinion, the loss is sometimes double or treble. Indeed, at the Gennevilliers works, which were visited by the members of the Société Technique du Gaz last year, the discontinuance of the hot condensers caused a drop of 7 to 8 litres. When the distillation of tar is carried on by managers themselves, the cost of the rectification and purification of the benzols, as

well as the expenses attending supplementary carburation, may be regarded as negligible up to a certain point. It is therefore quite logical that sudden condensation should be adopted in such works as those in Brussels and Paris. In medium-sized works, however, the loss would be appreciable. If only 3 grammes of benzol per cubic metre (35.3 cubic feet) of gas have to be added to compensate for the loss of illuminating power, it would mean, for a make of $3\frac{1}{2}$ million cubic metres, something like 10,000 kilos., or 9 tons 17 cwt., per annum. The cost would be only, roughly, 2500 frs.; but in addition there would be the expenses of carburation. If gazine were employed, which can be easily added in small quantities, the cost would be double. M. Grebel thinks that if the benzol can be left in the gas, and at the same time a large consumption of cold water for cooling avoided, without exceeding the admissible quantity of naphthalene, the question is worth investigation.

M. Grebel's opinion, as expressed at the recent congress of the Société Technique in Marseilles, is that the problem of the removal of the naphthalene will not be solved by the adoption of sudden cooling of the gas. He considers that methodical and liberal washing with tar should be as efficacious hot as cold, even if not more so; and this would be confirmed or otherwise by the suggested experiments. "Capricious" naphthalene, he says, often gives a manager trouble. It is necessary, therefore, to endeavour to produce as little of it as possible in the retorts, and to capture it immediately after it leaves them. But the fact must not be lost sight of that naphthalene will be made so long as gas is produced by the dry distillation of coal. The author concludes, therefore, that it will be well to bear the evil without exaggerating the inconveniences attending it. For the moment, it will suffice, he thinks, to minimize its effects, without ruining ourselves by the adoption of remedies more or less approved and appropriated. In order to deal with it in the surest and most economical way, without bringing upon ourselves other evils, he considers we should first of all learn to understand it better by studying the phenomenon of the dissolution tension of naphthalene vapour in relation to tar.

The late Mr. Gerald T. Watson, who died on the 2nd ult., in his 71st year, left estate of the value of £23,551. Deceased was for some years a Director of the Tottenham and Edmonton Gas Company.

The question of the use of copper water-pipes in private houses was raised by certain speakers at a recent meeting of the Board of Health of the Department of the Seine. A plumber had written to the Prefect to ask if copper piping could be used. The Director of the Municipal Laboratory said that no regulation existed prohibiting such a practice; but he advised the Prefect to consult the Board of Health. M. Armand Gautier was appointed by the Board to study the matter, and he has reported in favour of permitting the practice. Lead, said M. Gautier, was used because it was cheaper and more pliable than copper; but he saw no objection to the use of the latter.

At a recent meeting of the Royal Society, Professor A. H. Gibson dealt with the subject of the resistance that is offered to the flow of water through pipes or passages having divergent boundaries. His contention was that the rate of loss of head in water flowing steadily along various types of expanding tubes was the object of the research. The types selected were circular pipes with uniformly diverging boundaries, rectangular pipes with two sides parallel and the other pair uniformly diverging, trumpet-shaped pipes with the curved boundary made so that the square of the speed fell off uniformly with distance, &c. In this last-named form there was a distinct reduction in the loss of head in a given length, as compared with the loss in uniformly diverging tubes. The divergence which gave the greatest efficiency was from 10° to 16° in the rectangular pipes, and from 7° to 10° in the circular pipes.

On the occasion of the annual meeting of the American Society of Civil Engineers at Chattanooga (Tenn.) last month, the members inspected the water-works plant, which is owned by the American Water-Works and Guarantee Company, where they saw one of the oldest of the pressure type of mechanical filters. Water was originally pumped from the Tennessee River directly into the city mains through the filters. Several years ago, low-lift pumps were installed, a 1,500,000-gallon settling-basin was placed on the hill above the filters, and a clear-water tank built on ground some 40 feet below the filters. Changes were also made in the strainer system. The 26 Jewell filters and 20 National filters are closed steel tanks having a combined filter area of 2500 square feet. The average consumption in Chattanooga and the surrounding suburbs (estimated to have about 72,000 population) is $6\frac{1}{2}$ million gallons in 24 hours. Filtered water from the high-pressure system is used to wash the filters, while the sand is stirred by agitators in those of the Jewell type. Only a reverse current of wash water is available in the remaining filters. Three wooden baffles deflect the raw water from side to side in the settling-basins. Sulphate of alumina, used in quantities varying from 0.6 grain per gallon upwards, is applied directly from one of two solution-tanks into the raw water entering the settling-basin. Samples for chemical and bacteriological analysis are shipped to Birmingham (Ala.), where the Company have a fully equipped laboratory in charge of a trained sanitary engineer.

THE COKE-OVEN GAS PROJECT FOR OSTEND.

IN the "JOURNAL" a short time ago, it was mentioned that the Corporation of Ostend were inviting tenders for the supply of the town with coke-oven gas, works for the production of which were, if thought advisable by the contractor, to be put up on a plot of ground to be placed at his disposal, situated a short distance from the port on the Maritime Canal, and permitting of an easy junction with the Belgian State Railways and with the neighbouring sea-side places. The invitation does not appear to have been promptly responded to, as the time for submitting tenders has been extended till the 5th prox. Curiously enough, one of the papers read at the meeting of the Belgian Gas Association in June last year, the "Transactions" of which, as mentioned elsewhere, have just reached us from the Secretary (Heer van Heede), was on "The Utilization of Coke-Oven Gas for the Lighting of Towns;" the author being M. Charles Regout, the Managing-Director of the Liège Gas Company, in association with his two Engineers, MM. Bertholet and Houtvast, who dealt with the technical details. At the close of the paper, there is reproduced the specification on which the Ostend tenders are to be based; and the following particulars are taken therefrom.

The Municipality reserve the exclusive right to distribute the gas over the entire area under their jurisdiction. The concession will be for 26 years, at the end of which period the Municipality will become proprietors of the works without payment or indemnity to the contractor. The piece of land placed at his disposal for the erection of the works has a frontage of 920 feet and a depth of 1050 feet; and it is situated to the west of the canal from Bruges to Ostend. The gas will have to be supplied to one or more meters to be fixed by the Municipality near the gas-holders; and the price per cubic metre will have to be specified. A table annexed to the specification gives the maximum, minimum, and average daily outputs, and the maximum hourly output, for each month in the past year; and the Municipality will take the minimum daily quantity increased to the extent of 10 per cent. The contractor will have to furnish all the gas that may be required, and make provision for augmentation of consumption during the period of the concession. The present gasholder capacity is 530,000 cubic feet; and it will be increased by the Municipality as required, until it is equal to 65 per cent. of the maximum daily consumption.

The gas is to have a gross calorific power of 550 B.Th.U. per cubic foot, as tested by a Junkers calorimeter, and be perfectly purified. It will be tested by the officers of the Municipality at any point on the distributing plant which they may determine, and as many times a day as they please. The price named in the accepted tender will apply to consumptions not exceeding 200 million cubic feet per annum. Above this quantity discounts will be allowed. Provision is made for the supply of neighbouring communes. The contractor is to place at the disposal of the Municipality a supply of electric current. A penalty at the rate of 1s. 1½d. per 1000 cubic feet will be incurred for deficient supply of gas; and another, calculated in accordance with a formula given, if the calorific power is below the standard. If it drops below 540 B.Th.U. per cubic foot, not only will the penalty be imposed, but the Municipality will not consider themselves liable for payment for any of the gas sent out on the day when the deficiency occurs. The contract may be terminated by the Municipality, without indemnity, if the contractor fails to fulfil the conditions in regard to caution-money; if the supply of gas is suspended for more than 24 consecutive hours, so that the demands of the consumers cannot be met; or if the contractor becomes bankrupt. The supply of gas is to commence, at the latest, sixteen months from the date of the notification of the acceptance of the tender.

AN ABSOLUTE UNIT OF LIGHT.

A NOTE was given in the "JOURNAL" for May 16 last, p. 451, of the contents of a paper by Dr. R. A. Houstoun, of the University of Glasgow, on "The Absolute Measurement of Light: A Proposal for an Ultimate Light Standard," which had been communicated to the Royal Society. The paper has since been printed *in extenso* in the Proceedings of the Society; and in view of the somewhat cognate proposals of Dr. H. Strache, of Vienna, made at the recent Photometric Congress at Zürich (*ante*, p. 358), and of the appointment of a Sub-Committee at the Congress to investigate the subject further, it may be useful to give a fuller abstract of Dr. Houstoun's paper.

The fact that the eye cannot estimate light intensity, but can only tell when the illumination of two adjacent surfaces is equal, makes the measurement of the intensity of a source of light a somewhat unsatisfactory process. The inference that when equal illumination is obtained from (say) a Hefner lamp and a metallic filament lamp, their intensities are inversely as the squares of the distances from the photometer head, is strictly only justified if the colours of the two sources, or the distribution of energy in the spectra of the two sources, is exactly the same. Abney has

shown that the relative luminosity of the different colours of a spectrum varies with its intensity. Thus the result of a photometric comparison of two sources of different colours will vary somewhat according to the distance of one of the sources from the photometer head, and will again vary according to whether the colour vision of the observer is normal or abnormal. Practically the colour difference of the sources to be compared may not usually be very great, and the illumination of the photometer head will not vary over a very wide range. Nevertheless, it is impossible with present standards to determine satisfactorily the candle power of (say) a mercury vapour lamp. The Purkinje effect, or the change from rod to cone vision, causes the trouble. The author proposes to place the photometry of different coloured lights on an exact footing by relying solely on ultimate measurements with electrical apparatus.

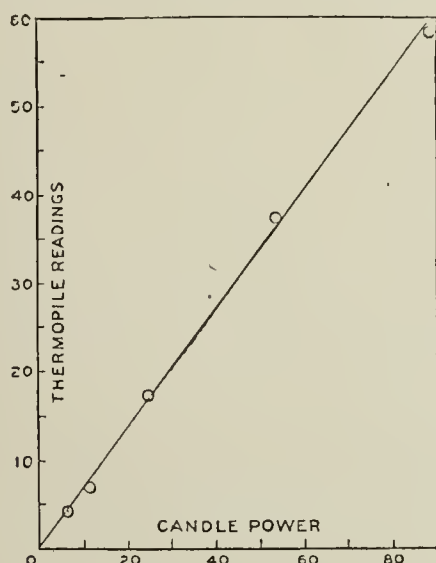
The thermopile cannot be used for the measurement of candle power, because it gives the same value to the energy of every radiation, irrespective of its wave-length or visibility. The light-producing effect of the same quantity of energy is much greater in the middle of the spectrum than at its ends. If a light filter capable of stopping all the infra-red and ultra-violet radiation and of reducing the energy of the visible spectrum in inverse ratio to its light-producing effect is placed in front of the thermopile, the radiation will be weighted according to the visibility, and the deflections will be proportional to the light received. This combination of thermopile and light filter constitutes a kind of electric eye having the property of registering the intensity of the light to which it is exposed. M. Féry has already proposed [*vide* "JOURNAL," Vol. CII., p. 575, and Vol. CIII., p. 504] to put such a method into practice by using a filter consisting of an aqueous solution of copper acetate with a radiomicrometer; but the author does not consider this arrangement to be quite satisfactory. The relative visibility of light of different wave-lengths for different intensities of that light has been determined by Professor König; and since his colour vision was normal, the table drawn up by Nutting from his results may be taken as applying to the average human eye.

The filter chosen must be one capable of accurate reproduction; and in this respect solutions of salts which can be varied in strength seem most suitable. Researches carried out in the Physical Laboratory of the University of Glasgow have led the author to the conclusion that the most suitable filter is an aqueous solution of copper sulphate of the strength 0.200 gramme-molecule per litre in a thickness of 3 cm., followed by an aqueous solution of potassium bichromate of the strength of 0.0025 gramme-molecule per litre in a thickness of 1 cm. The values of the molecular extinction coefficient of the salt solutions for different wave-lengths have been determined by the author and others, and are given in the paper. On plotting out their values alongside logarithmic curves deduced from Nutting's table for the visibility of light of different wave-lengths for different intensities of that light, it is apparent that the author's filters weight the radiation of the visible spectrum correctly according to its visibility to normal colour vision when the illumination of the field is about 6 metre-candles. If the illumination of the field is different, the minimum of the curve may be easily shifted by reducing the strength of the copper sulphate solution and increasing that of the potassium bichromate or *vice versa*. But if the strength of the copper sulphate is appreciably reduced, an additional thickness of water, or an aqueous solution of ferrous ammonium sulphate, must be used to stop the heat rays and maintain a sufficient margin of safety in the infra-red portion of the spectrum.

The author proceeds to calculate the transmissivity of the different constituents of the filter and of the whole filter for different parts of the spectrum. The calculations show that the filter is weakest in the infra-red at wave-length 1.27μ , but that if the strength of the copper sulphate is not much reduced, the stopping power of the filter is ample. Having thus found by calculation that the radiation received by a thermopile through his filter should be proportional to the light incident on the filter, he proceeded to determine by direct experiment if this actually was the case. A Rubens thermopile consisting of twenty couples on a length of 2 cm. (the wires soldered together with silver beads flattened into discs of 1 mm. diameter and having, therefore, a receiving area of about 0.157 square cm.) was used. A very highly sensitive Du Bois Rubens galvanometer was used, and was protected from vibration by a special suspension device. A 32-candle power carbon filament glow-lamp run at its marked voltage of 250, gives about 2.6 per cent. of its total radiation as light; but when the filter is set up in front of it, only a fraction of this 2.6 per cent. passes through—perhaps only about one-thousandth of the total radiation passes through the filter. Such a lamp was set up at a distance of 33 cm. from the thermopile, with the filters in front of it; the potassium bichromate filter being next the thermopile. A photometer bench was set up on the other side of the lamp with a metallic filament lamp run off a storage battery at its end. Comparisons of the two lamps were made by a wedge photometer. The horizontal candle power of the metallic filament lamp was determined against a Hefner lamp, and found to be 7.13 standard candles. Readings were then made of the carbon lamp at different voltages, alternately with the thermopile and with the photometer. One set of results for five different voltages is shown plotted in the diagram, p. 413. The curve should be a straight line if the readings obtained by the thermopile and filters agree with the photometer readings; and the diagram shows that the agreement in the circumstances is very good. The strength of

the solutions in the filters has been varied, and the proportionality was found to remain.

It thus appears that a thermopile with the filter described can be employed for measuring candle power, and especially mean spherical candle power. In the latter case, it is only necessary to set up equally sensitive thermopiles over the sphere and connect them in series with the one galvanometer. The difficulties connected with integration are thus avoided, and the method does not require the use of a darkened room. The high sensitiveness of the galvanometer required renders the method, however, scarcely suitable for commercial application; but it might be used for defining the unit of light and providing a satisfactory basis for the comparison of lights of different colour irrespective of their intensity and of the observer's idiosyncrasy. The amount of light lost by reflection at the glass surfaces and by absorption in the glass can be determined and its effect eliminated.



The author proposes to define the unit of light intensity as follows: "The unit of light intensity is that source the total intensity of radiation from which at an optical distance of 1 metre after passing through an ideal filter would be x ergs per square centimetre per second; the ideal filter to be one possessing the light-absorbing properties of a 3 cm. thick aqueous solution of crystallized copper sulphate, of strength 0.200 gramme-molecule per litre and a 1 cm. thick aqueous solution of potassium bichromate of strength 0.0025 gramme-molecule per litre; but neither to reflect nor to absorb any light in any other way."

This definition presents the advantage of connecting up light closer with the C.G.S. system. The value of x for the standard candle in the units specified is, roughly, 0.8.

"Transactions" of the Belgian Gas Association.

We have just received from the Secretary of the Association (Heer van Heede, Engineer of the station of the Imperial Continental Gas Association at Molenbeek-Koekelberg, Brussels) the "Transactions" for the year 1910-11. The contents consist of a report of the proceedings at the annual general meeting held in Brussels on June 23, 1910, under the presidency of M. Prisse; the text of the papers presented; a report by M. T. A. Vander Willigen, the Brussels representative of Messrs. Humphreys and Glasgow, on the unification of screw-threads, of the Committee on which subject he is a member; a notice of the gas exhibits at the Universal Exhibition, by M. de le Paulle, one of the Brussels Engineers of the Imperial Continental Gas Association; the accounts for the year ended June 1, 1911, and those connected with the Gas Pavilion at the Exhibition; and the list of members. Most of the papers, which are fully illustrated, were on the automatic lighting and extinction of lamps. The rest were two papers by M. Bromham, Engineer under M. Aerts, at the Brussels Municipal Gas-Works, describing his system of regulating the supply of primary air to generator furnaces and his centrifugal sulphate of ammonia drier, both of which have been mentioned in the "JOURNAL;" and one by M. Regout, in association with his two Engineers (MM. Bertholet and Houtvast), on "The Utilization of Coke-Oven Gas for the Lighting of Towns." Appended to this paper is the specification prepared by the Municipality of Ostend for the use of the parties tendering for the lighting of the town by coke-oven gas, some particulars from which are given elsewhere. The meeting of the Association last year was specially interesting from the fact that it was of an international character; it being, as already recorded in the "JOURNAL," attended, by invitation, by members of the Société Technique du Gaz en France and of the Institution of Gas Engineers, who were very cordially received by their Belgian colleagues.

The Gaslight and Coke Company have just had erected at their Fulham works one of the most modern patterns of Avery weighbridges. It has a capacity of 20 tons, and is graduated by 7-lb. divisions. The platform measures 16 ft. by 8 ft., and the pillar and steelyard are of the latest type, no loose weights being used, while the weighments are printed on tickets at the time of weighing. Thus disputes and discrepancies are avoided.

GAS-TESTING AND ILLUMINATING POWER IN CANADA.

Adoption of the No. 2 "Metropolitan" Burner.

The number of the "Intercolonial Gas Journal of Canada" for June, which has just come to hand, contains the first instalment of the official report of the proceedings at the fourth annual meeting of the Canadian Gas Association, which was held in Quebec from the 15th to the 17th of June, under the chairmanship of Mr. J. S. Norris, who occupied the position in the absence of the President, Mr. Arthur Hewitt.

Among the first business was the reading by the Secretary (Mr. John Keillor, of Hamilton) of the report of the Executive Committee, in the course of which they reviewed the work of the year. The most important feature of it was their action in connection with the adoption of the No. 2 "Metropolitan" burner for testing the illuminating power of gas. Following the lines of the report of the Committee on "The Illuminating Power and Calorific Value of Gases Made in Canada,"* and the subsequent discussion at the Hamilton convention, the Committee sent a deputation, consisting of Messrs. Hewitt, Keillor, and Wallace, to Ottawa, in February, to discuss the matter with the Deputy-Minister (Mr. Gerald) and the Chief Electrical and Gas Inspector (Mr. Higman). The result of the interview was exceedingly gratifying to the Committee, as they said they were sure it would be to the Association. The Government officials, after due consideration of the claims made by the deputation, decided to substitute the new burner for the Sugg standard burner, which has been in use since the passing of the Gas Inspection Act in 1886. The Committee were informed by the Chief Inspector that a supply of the new burners had been ordered from England; so that in a short time all the testing-stations throughout the Dominion would be equipped, and future testings for illuminating power made, with them.

The question of reducing the illuminating power of gas to 14 candles was also discussed by the deputation with the Government officials, with a view to recommending at a later date the lowering of the candle power to a standard consistent with the requirements of modern gas appliances. With this end in view, the Committee strongly recommended the Association to request next year's officers to prepare a memorial on the subject, or otherwise lay before the Deputy-Minister and the Chief Electrical and Gas Inspector such information, based on modern-day uses of gas, as would convince the Government that a reduction in the candle power to a standard equivalent to a minimum of 450 B.Th.U. net is in accordance with the best gas practice in Great Britain and Germany, and should, in the interests of gas consumers and gas companies alike in Canada, be carried into effect as soon as possible.

* See "JOURNAL," Vol. CXI., p. 196.

Company Registrations in the Past Half Year.—According to an article in the "Investors' Guardian" for the 5th inst., there was a marked decrease in the number of companies registered in the first half of the present year compared with the corresponding period of 1910. The number in the latter period was 3744, with a total capital of £131,323,169; and in the former 3102, with a total capital of £85,066,932. In the first total, gas companies stand for £170,462, and water companies for £104,500; in the second, for £645,700 and £63,000 respectively.

Construction and Management of Small Gas-Works.—We have received from the publishers, Messrs. John Allan and Co., of 8, Bouverie Street, E.C., a work on the above subject by Mr. Norton H. Humphrys, Assoc.M.Inst.C.E., F.C.S. The text is a reprint, with additions, of articles which appeared in the "Gas World;" and it is followed by a section on "Actual Costs and Capacity of Recently-Erected Works," by Mr. J. H. Brearley. In connection with the chapter on "Accounts, Memoranda, and Tables," Mr. Humphrys had the assistance of Mr. J. W. Frost, the Accountant to the Salisbury Gas Company. The book costs 7s. 6d. net.

Spontaneous Combustion of Coal.—According to Messrs. A. W. Parr and F. W. Kressman, oxidation processes begin in freshly-mined coal at ordinary temperatures, and they are of different character and vary in their speed and intensity. In general, each kind of coal has a critical temperature of oxidation, below which the process, resulting from external factors, does not prove ultimately destructive, and stops when the exciting causes are removed. But above this temperature the oxidation becomes auto-genous, and results in the ultimate destruction of the coal. Auto-oxidation begins at from 200° to 275° C., according to the fineness of division of the coal; while ignition does not occur under about 550° C. The temperature of autogenous oxidation depends upon a number of factors, which include (a) external sources of heat, (b) fineness of division, (c) easily oxidizable compounds, (d) iron pyrites, (e) moisture, (f) oxidation of carbon and hydrogen. Autogenous oxidation begins at 200° to 275° C.; while above 300° C. an exothermic decomposition begins, and raises the temperature until ignition occurs usually at 350° to 400° C.

IRISH ASSOCIATION OF GAS MANAGERS.

Annual Meeting at Queenstown.

WITH a great deal that was against them—particularly in the matter of distance—the members of the Irish Association of Gas Managers held a meeting at Queenstown last Tuesday, which, in all respects, reflects the greatest credit upon them. The attendance was quite satisfactory.

The President (Mr. J. Paterson, of Queenstown), in his address, gave a *résumé* of what has been done in the way of providing a gas supply for the town—a narrative of recovery from an almost hopeless situation in which the Gas Company found themselves (through no fault of their own) in the end of the last century. That the Company have been brought back to prosperity was made clear by the convincing array of figures and statements placed by the President before the meeting. Such things being capable of accomplishment, must be matter of gratification to all who are well-wishers of the gas industry. It would certainly be difficult to name a more apposite illustration of the fact of a way being found where there is a will, than is afforded by the recent history of the Queenstown Gas Company.

Two papers were read before the meeting. The first was by Mr. G. F. Hurst, of Birmingham, and was descriptive of furnaces and burners for the use of gas in industrial occupations. As was pointed out, there is not much scope for such appliances in Ireland; but the information given in Mr. Hurst's paper will be appre-

ciated by many outside that country. In the other paper, Mr. A. Percy Hoskins, F.I.C., F.C.S., of Belfast, dealt with problems of purification—giving in severe chemical formulæ the action and reaction set up in the use of lime and oxide of iron, used either singly or in combination. Mr. Hoskins' treatment of the subject was such that, although he dealt with technical terms evidently of a somewhat puzzling nature to the majority of his hearers, his explanations were understood by even the uninitiated in chemistry. From his remarks and the discussion which followed the paper, managers of small gas-works will learn much about purification which will enable them to go through their work with more certainty and in less "rule-of-thumb" fashion.

Note must be taken, for the benefit of intending visitors to the meetings of the Association, that next year's meeting is to be held in the second week of July. This step has been taken with a view to improving the attendance at the annual meetings; and the remark is not inappropriate that, strangely enough, for the same reason the North British Association have this year changed their annual meeting from a date in July to one in September.

Next year's meeting of the Irish Association is to be held in Dublin, with Mr. C. B. Outon, of Inehicore, as President; and as there is already in hand one paper for the meeting, and taking into account Mr. Outon's happy business ways, there is every reason to anticipate (if the new date be agreeable to the general body of members) that there will then be a profitable gathering.

The Annual Meeting of the Irish Association of Gas Managers was held in the Queen's Hotel, Queenstown, last Tuesday. Considering the great distance to be traversed by many of the members to reach the place of meeting, there was a wonderfully good attendance, almost entirely, however, of members resident in the southern half of the Island.

WELCOME TO QUEENSTOWN.

The PRESIDENT (Mr. J. Paterson, of Queenstown) said, before they started their formal proceedings, he wished to introduce to the members two gentlemen, representative of the Town Council, who had kindly attended to offer the Association a civic welcome on behalf of the town of Queenstown.

Mr. CLAYTON LOVE, one of the gentlemen referred to, began by tendering an apology for the absence of the Chairman of the Urban District Council and of the Town Clerk, both of whom were in London on business. They, however, expressed regret at having to be absent. On behalf of the Council, he bade them "Cead Mile Failte"—a hundred thousand welcomes. He thought that Queenstown had been deeply honoured by the conference the Association were having that day being held in their township; and he thought they had particularly to congratulate Mr. Paterson upon their presence there. He hoped the conference would be of advantage to all of them individually, and to those whom they represented, whether corporations or companies, because of the interchange of ideas between the gentlemen before him, who represented the best of the gas industry in Ireland. Those who entrusted to them important matters, such as public lighting, would, he was certain, have their interests well looked after. He hoped that they would carry away with them happy recollections of their visit to Queenstown.

Mr. J. PURCELL also spoke a few words of welcome.

The PRESIDENT proposed a hearty vote of thanks to the two gentlemen; and it was heartily accorded.

THE REPORT OF THE COMMITTEE.

The HON. SECRETARY and TREASURER (Mr. George Airth, of Dundalk) read the report of the Committee. It was stated therein that the meeting last year in Belfast was largely attended, and though only two papers were read, besides the President's address, there was scarcely enough time to get through all the business. The Committee this year attempted to get papers by asking each member to volunteer to write one. They were not successful, as only fourteen replies were received out of thirty applications sent, and not one volunteered a paper. Two members suggested subjects for discussion, but would not undertake to introduce them. This was very discouraging; and the Committee earnestly impressed upon the members the necessity of coming forward with papers in good time, so as to assist the work for which the Association was formed. During the year a subscription was started for the widow and daughter of a late member of the Association. This resulted in £24 4s. 6d. being subscribed, to which the Committee added a further sum of £10, making in all £34 4s. 6d., for which they had received a very grateful letter of thanks. They had to record with regret the death of two of their members during the year—Mr. Robert Marshall, of Dromore, and Mr. Robert Harrison, of Monaghan. Mr. Marshall attended the meeting in Belfast last year, and was esteemed by all who knew him well. Mr. Harrison was a young man, in the prime of strength and vigour; but a sudden illness cut short his career. He was loved by every member of the Association, who only that year had elected him to the highest office they could give him. He was

their District Representative on the Council of the Institution of Gas Engineers. A number of members attended his funeral, and paid their last respects to their deceased colleague—acting as pall bearers. A wreath was sent in the name of the Association. The ballot-papers sent in this year exceeded the number sent last year by 7; the number received being 29.

THE BALANCE-SHEET.

The AUDITOR (Mr. G. W. Norman, of Dublin) presented the accounts for the year, from which it appeared that there was a balance in hand of £49 15s. 6d.

The PRESIDENT moved, and Mr. F. EUSTACE (Tullamore) seconded, the adoption of these reports; and the motion was unanimously agreed to.

MR. PETER HURLL'S ABSENCE.

Mr. J. WHIMSTER (Armagh) said that their old and respected friend, Mr. Peter Hurl, who, if he remembered rightly, became a member of the Association in 1882, and who in 1894 read a very interesting paper on the manufacture of fire-clay retorts, was absent he believed for the first time since then. He proposed a resolution to the effect that the meeting had learnt with sincere regret of his severe illness; and expressing sympathy with Mrs. Hurl and the family, and the hope that Mr. Hurl would have a speedy recovery.

The HON. SECRETARY seconded the proposition.

The PRESIDENT supported it; remarking that Mr. Hurl had been a regular attendant at their meetings. He suggested that a telegram should be sent to Mrs. Hurl, expressing their regret at her husband's absence.

The proposition was agreed to and the President's suggestion acted upon.

REPORT BY DISTRICT REPRESENTATIVE.

The HON. SECRETARY read the report by the District Representative on the Council of the Institution of Gas Engineers (Mr. F. Eustace). He stated that he attended three meetings of the Council of the Institution, and that the chief business transacted was the launching of the Publicity Scheme. The scheme would be of the greatest benefit to the industry, and deserved the fullest support of all concerned in the manufacture and distribution of gas. He attended the conference in connection with this undertaking held in London in April, and was pleased to say the result had, so far, been most successful, inasmuch as the greater number of gas undertakings across the water had promised their fullest support to the scheme. He strongly recommended his brother managers in Ireland to urge on their companies and local authorities the great necessity of giving the scheme the support for which they looked—viz., 2s. 6d. for each million cubic feet of gas sold. He would not elaborate on the good that must arise from advertising, &c., the different ways and means of applying gas. The members were already aware that advertising was the greatest medium through which success in business was attained.

The PRESIDENT said he considered the report a very good one. It showed that Mr. Eustace attended to his duties in a thorough manner. In reference to the Publicity Scheme, he did not know that it commended itself to them all; and after he had put the report to the meeting, he should ask Mr. Shadbolt, the President of the Institution of Gas Engineers, to explain to them the scheme more fully than they understood it. He moved acceptance of the report of their District Representative.

Mr. C. W. STOTT (Parsonstown) seconded the motion; and it was at once agreed to.

THE PUBLICITY SCHEME.

Mr. R. G. SHADBOLT (Grantham), speaking at the request of the President, said he had not come prepared to lay before them an elaboration of the Publicity Scheme. He had not come prepared as a kind of advocate of the cause, or to state reasons why and wherefore for the scheme. He took it for granted that, like all intelligent people, they had made themselves thoroughly conversant with the state of affairs; and he hoped they were prepared to support the scheme to the utmost of their ability. Let him first say that if they never had a less careful and less attentive representative than they had had during the past year, there were very few points indeed which would be missed by the Irish Association. As a member of the Irish Association himself, he felt ashamed to find, when the list of promised supporters of the scheme was being prepared, that there were only five undertakings in Ireland who had notified their intention to support the scheme. It was news to him to learn from the President that the scheme was probably not understood. He thought the necessity for it was very clear. There might be differences in the matter of the charge among their smaller undertakings; but this was only the fringe of the matter. The scheme was not purely local, nor in any way parochial in character or nature. As the industry was a world-wide industry, existing wherever civilization existed, if they were to take their proper place as an industry, they could not advertise too widely, nor too clearly. They did not propose world-wide advertising to begin with; but they did advocate, and they claimed, that the half-crown per million cubic feet of gas made which they were asking the gas undertakings of the United Kingdom to contribute for the purpose, would be money thoroughly well spent. Considering the enormous circulation of newspapers, whenever an article might be published for the acquainting of the artisan with what gas could do for him in his household, there would be thousands upon thousands of impressions made; and this fact alone was worth the half-crown per million on the entire gas industry for that particular year. The great aim of the Publicity Committee was, not to interfere with local conditions, but to deal on a broad basis with the subject of advertising—to make the public acquainted with what they could do for them, and how efficiently they could do it. The public had become so accustomed to advertising statements as to what could be done, that they looked for them; and if advertising were not carried out by a particular industry, that industry would suffer. They were all aware that they could make gas fairly cheaply now, if they could only sell it; and they were likewise aware that, unless they could go on increasing the quantities of gas they sent out, they would become moribund, the price would increase, and the public would not be satisfied. The one thing which they might take for granted would occur was that, by local advertising, and such means, the requisite particulars and schemes might be worked out at much lower cost than when each had to meet his own needs unaided. These, they thought, were sufficient reasons to warrant any body of business men bringing the subject before the administrators of their respective gas undertakings, and saying that the time had arrived when something must be done. It was not a question now of whether they should commence. They had commenced; and between now and October, when the scheme would be put in force, he asked them to give the matter their best consideration, and not put it on one side because they either thought that they were going on nicely or that their contribution would not be missed. They wanted everyone to feel that, in contributing to the success of the scheme, in helping themselves they were also helping all. Let them remove the stigma which had been fixed upon them by the publication of the list, as members of the Irish Association, so that when the list was revised, and a fresh announcement was made in October, instead of their being five Irish undertakings in the list, the number might be nearer fifty. If this number were realized, he should feel that it had been worth his while to be a member of the Irish Association, and he would be proud of the Association.

The PRESIDENT thought Mr. Shadbolt had shown them clearly that it certainly would be to the advantage of all gas undertakings to contribute towards the Publicity Scheme. He could add nothing to what had been said, and so well said, by Mr. Shadbolt; but he thought it was a matter which everyone of them should consider seriously. It was not a huge amount which they were asked to contribute; and he thought it would be a very good thing if all the works could see their way to contribute the small sum of half-a-crown per million cubic feet. He commended the subject to them, and hoped that an endeavour would be made to remove the stigma on Ireland, in the matter of the support of the scheme.

REPRESENTATIVE ON THE COUNCIL.

Discussion took place upon the subject of the election of a representative on the Council of the Institution of Gas Engineers, in succession to the late Mr. R. Harrison. The President expressed the wish that the President of the Association might be brought in as the representative during his year of office. In the end, it was resolved to appoint the President, Mr. Paterson, to the office, for the remainder of the current year.

ELECTION OF OFFICE-BEARERS AND NEW MEMBERS.

The result of the ballot for the election of office-bearers and members was announced, as follows:—

President.—Mr. C. B. Outon, of Dublin.

Vice-President.—Mr. W. H. Roberts, of Newtownards.

Members of Committee.—Mr. C. W. Stott, of Parsonstown; Mr. J. D. Smith, of Belfast; and Mr. W. E. Young, of Tipperary.

Auditor.—Mr. G. W. Norman, of Dublin.

Hon. Secretary and Treasurer.—Mr. G. Airth, of Dundalk.

NEW MEMBERS.

The following were proposed for admission:

Members.—Langlands, S. B., of Glasgow; Donaldson, G., of Mallow; Tracey, M., of Carrick-on-Suir; M'Evoy, P. J., of Midleton; Fitzpatrick, J. F., of Cahir; and Wild, W., of Skibbereen.

Associate Members.—Richardson, James, of Edinburgh; and Hannah, A., of Denny.

Mr. D. W. TOOMS (Waterford) moved that Mr. Outon be elected representative on the Council of the Institution of Gas Engineers for the year from June, 1912, to June, 1913.

This was agreed to.

Mr. OUTON expressed his best thanks for the honour, which he felt all the more in that this was the second time they had conferred the office of President upon him.

DATE AND PLACE OF NEXT MEETING.

Mr. J. E. ENRIGHT (Tralee) introduced the subject of the desirability of changing the date of the annual meeting of the Association. It had been pointed out, he said, that August was too late in the year for the managers of small gas-works, where there was only one man, and where they might be taking on additional retorts, and getting ready for street lighting in September. He would suggest that the second week in July would be the best time for them to meet; and he moved to this effect.

Mr. T. J. REID (Ballina) seconded.

Mr. R. YOUNG (Youghal) in supporting the motion, pointed out that the attendance at their annual meetings was diminishing.

Mr. D. W. TOOMS moved that the subject be remitted to the Committee for consideration.

Mr. J. WHIMSTER recalled that, when the date of the meeting was fixed for August, it was felt that they could not meet in July, because the meeting of the North British Association was in that month. But he understood that the North British Association were changing from July to September; and he thought there would be no difficulty in their changing from August to July.

Mr. ENRIGHT expressed his willingness to fall in with Mr. Tooms' suggestion; and the subject was remitted to the Committee for consideration.

Mr. T. HORNBY (Longford) moved that the meeting next year be held in Dublin.

Mr. H. W. SAVILE (Drogheda) seconded.

Mr. OUTON expressed his willingness that the meeting should be held in Dublin; and said that his endeavour would be to make the gathering as great a success as possible.

The motion was agreed to.

Mr. HORNBY moved that the meeting next year be held on the second Tuesday of August.

Mr. T. J. REID seconded.

Mr. ENRIGHT moved that it be held on the second Tuesday of July.

Mr. P. J. M'EVoy (Midleton) seconded.

The proposal to hold the meeting on the second Tuesday of July was eventually adopted.

THE PRESIDENT'S ADDRESS.

The PRESIDENT then delivered his address, as follows:

Gentlemen,—Allow me, on behalf of the Queenstown Gas Company and on my own behalf, to add to the welcome already extended to you by the Queenstown Urban District Council.

I thank you for having honoured me by accepting my invitation to visit Queenstown, and for your presence here to-day. I trust that your brief sojourn in the South may be pleasant and profitable, and that you may carry away pleasant recollections of this meeting. I further thank you briefly, but sincerely, for the honour you conferred upon me by electing me your President—an honour which I assure you I fully appreciate, and of which I am deeply conscious.

A LOSS TO THE ASSOCIATION.

The first place in our thoughts to-day in opening our proceedings is given by the family of our late esteemed and lamented immediate Past-President, of whose death, after a very brief illness, we were all grieved to learn but a few days ago. Mr. Robert Harrison was a prominent figure at our gatherings, and took a keen interest in the welfare of our Association—kindly and unassuming, and ever ready to extend the hand of friendship to his professional brethren. Need I say the heartfelt sympathy of all present is extended to the bereaved relatives of him whom we mourn; and I would ask our Hon. Secretary, Mr. Airth, to convey to them this expression of sorrow and sympathy.

REPRESENTATION.

Dealing, firstly, with the affairs of our Association, I think that I may confidently congratulate you on the position which it occupies to-day, as representing the gas industry of Ireland. Some three or four years ago, one of our Past Presidents, in his inaugural address, had occasion to deplore the fact that there were so many gas-works in Ireland unrepresented in our Association, and particularly regretted that so few of the large works were

represented. This is being remedied, as the membership roll is increasing steadily year by year. Glancing at the rules for the years 1906 and 1910, I find the membership has increased during the past four years from 100 to 141; while the number of gas-works has remained stationary.

Looking further into the subject, I find that there are only six works in the country with a yearly make exceeding 10 million cubic feet which are not represented in our Association; while of the larger works, every one with a yearly make of 42 millions and upwards are now directly represented, in which are included the nine largest works. In other words, out of a total annual make of 5596 million cubic feet, our members represent 5276 millions. This is, I consider, highly satisfactory, and I have no doubt is largely due to the increased zeal and interest taken in our Association by its members and the Committee, and is indicative of the appreciation of the good work it is doing.

Thus the Association is growing in numbers and strength, and I trust in usefulness, and is yearly becoming what I am sure we all wish it to be—an Association truly representative of the gas industry of Ireland. But let us not rest contented until we can number among our members representatives from every works in the country. Out of this desire arises the question, what valid reason can there be why those who have not already joined us should continue to remain outside? I cannot believe that it is through any lack of interest in the Association or in the profession to which they belong, but am inclined to attribute it to their modesty and in some cases to the fact that they do not know whom to approach with a view to becoming members.

During the past year, I have often thought on the subject, and have come to the conclusion that it would be well if our Hon. Secretary would have a circular printed which he could post to all non-members who are eligible for membership, indicating briefly the objects of the Association and inviting them to join, or, should they desire information, to communicate with him. This circular could also be posted to newly-appointed officials. By so doing, we would evince to them the desire of the Association to offer the hand of welcome and friendship.

It is a natural desire, born of that ambitious spirit which prompts us to higher attainments, with each successive occupant of the chair during his year of office to, if possible, enhance the benefits and practical usefulness of the Association to its members; and with this end in view, I suggested to your Committee that a circular should be printed and sent to all the members about three months prior to the annual meetings, inviting them to prepare papers for submission at the ensuing meeting, or, alternatively, if they had any subject of interest, to bring it forward for discussion. Your Committee immediately adopted the suggestion, and circulars were sent out forthwith. I had ventured to hope that this partial departure from the usual routine of set papers, and a slight relaxing of the formality governing our proceedings, would have aroused a more active interest in our meetings by a number of our members; but I regret to say the responses were the reverse of encouraging. There were two or three subjects merely suggested for discussion. Now, this is not as it should be. Members should consider it a duty and a privilege to bring forward any subject, be it technical or commercial, which they consider would be of interest and benefit to the Association, and to open the discussion on such subjects.

DATE OF MEETING.

Another matter which I consider worthy of serious consideration, and one which is constantly being brought up at our meetings, is the date of our annual conferences. We have often heard it contended that the date being fixed so late in the season, and at a time when the public lighting in many of the smaller towns is just restarting after the idle season, makes it impossible for a good many of our members to leave their works to attend our meetings. July has often been suggested as a more suitable month, and the only reason I know that has been advanced against a change to that month was the fact that the North British Association held their meeting in July, and that therefore the two would clash. The North British Association having changed the date of their meetings from July to September, this reason for adhering to August for our meetings does not now hold good; and if the interests of the Association and its members are to be better served, by changing the date, I should unhesitatingly say let us do so. As, however, the subject has never been seriously considered in all its bearings, I would commend it to the serious consideration of the Committee during the coming year, and, if thought advisable, to change the date to a more suitable one. No selfish motives or mistaken sense of dignity should be allowed to bar or impede the way to the adoption of anything calculated to increase the sphere of usefulness of the Association, always bearing in mind that our body is one composed largely of managers of small works who cannot make it convenient to absent themselves from their works at all times. We should encourage all to join our ranks, and as far as in our power lies so arrange matters that they are enabled to attend our meetings and join in the proceedings.

APPEAL TO YOUNG MEMBERS.

Here I would appeal to our younger members to take a more active part in the provision and discussion of subject-matter for our gatherings, and not to think, because they are in charge of small works, their views and opinions would be unwelcome. A brief description of difficulties encountered and overcome, of any appliance adopted to meet specific requirements, or of experi-

ments tried with a particular object in view, even a recital of results accruing or obtained by the adoption of some piece of plant, or of means or methods adopted to accomplish an end. All of these would form suitable subjects for our meetings, and would be welcomed, and oftentimes prove of more interest and real value to a great many of our members than volumes (say) on "Vertical Retorts" or "Stoking Machines" all of which are, of course, excellent in their own way and place. As has been well said by one of our Past-Presidents: "You cannot estimate a man's worth in millions of cubic feet or by the number of lifts in his holders."

THE POSITION OF THE INDUSTRY.

Passing from the affairs of our Association, my thoughts turn to those of the gas industry generally, and of Ireland in particular. It is pleasing to note that, with few exceptions, most undertakings are in a position to show or record steady progress and increased sales, together with, in many instances, a reduction in price. Such progress and increases are evidence of the adoption and the pursuit of approved business methods and the progressive policy with which those responsible for the conduct of affairs are imbued, unlike our more fortunate brethren across the Channel, whose concern appears to be the meeting of increased demands, due to the natural growth and expansion of the cities and towns with their large and ever-increasing industrial population. We in Ireland, unfortunately, are confronted with a different and more serious problem—being that of maintaining and increasing our output with an ever-decreasing and shrinking population such as most of us have to record.

Ireland, too, is the happy hunting ground for rival systems of light and power, due in a large measure no doubt to the fact that in most places the price of gas is necessarily somewhat higher than in districts of similar size across the water which are in close proximity to the coalfields and manufacturing centres, and so are enabled to obtain all their coal supplies, retorts, and fire-goods, pipes—in fact, everything in the way of raw and manufactured material (upon which we have heavy freight and carriage dues to pay)—at a much lower cost. Yet, notwithstanding all the disadvantages under which we labour, we are in a happy position of supplying to our patrons a source of light, power, and heat which, given a fair field and no favour, stands unrivalled as regards cost, convenience, and healthfulness.

THE OUTLOOK FOR VERTICALS.

So voluminous and expansive have been the papers and discussions on matters pertaining to the manufacturing side of our business at recent meetings, and so fully reported in the Technical Press, that I propose saying very little on the subject. I cannot, however, refrain from briefly expressing my belief in the possibilities of vertical retorts for even small works. I had the pleasure recently of visiting the Temple works of the Glasgow Corporation and seeing the experimental setting of vertical retorts erected there; and certainly I venture to say that no one who is interested in the subject could but be favourably impressed with what I shall term the ideal conditions of gas making as carried on in this setting of retorts. There was an entire absence of those laborious and purgatorial conditions usually associated with the operation of drawing and charging of retorts; there was not a semblance of smoke or dust; and there being no hot coke to quench, one missed the usual clouds of sulphur-laden steam arising from this operation.

These points in themselves are, in these days when we are endeavouring to help towards the purification of the atmosphere and combat the fog-fend by inducing people to make further use of gaseous fuel in their domestic fires, to my way of thinking, ample reason for giving the system serious consideration, more especially by those whose works are situated in residential districts.

Not the least, however, of the many excellent features accredited to the system, some of which are a larger yield of gas per ton of coal, more and better coke saleable, an improved quality of tar, an increased return on ammonia, lower labour cost, and longer life, is a vast improvement in the conditions under which the men perform their work.

The latter point is one which I feel sure will carry weight with us, who, as employers, are ever anxious to improve the conditions of labour as far as lies in our power, knowing only too well that it pays us to do so. Under improved conditions, we are likely to attract a better type and more reliable men. Who among us can but have been moved to compassion at seeing the men who, during the past few weeks of tropical heat, have had to stand before the retorts drawing and charging?

Personally, with all these points to their credit, I think that even a considerable increase in the first cost should not stand in the way of their adoption when existing carbonizing plant is worn out and requires renewing; and I must confess I really fail to see why small settings of verticals, suitable to quite small gas-works, could not be designed and erected at a cost not very largely in excess of horizontals. It is interesting to note that the pioneers of vertical retorts in Ireland and Scotland are works of quite modest capacity. To these, I am sure we wish every success, and shall watch the results with interest.

In the purifying department close observation and study of the process have brought about improved duty quite unthought of, but a few years ago. As, however, we are being favoured with a paper on this subject by Mr. Hoskins, of Belfast, I shall reserve my observations for a future occasion.

DISTRIBUTION ITEMS—PUSHING SALES.

The distribution, or gas sales, department is one which is constantly demanding increased attention. Time was when the average gas manager could afford, and was satisfied, to remain in his office or works and wait for prospective customers to come to him and apply for a supply of gas, when a form bound up in red tape was produced for signature, and as often as not a deposit was demanded as security. This completed, they would send and fix the meter—simply making the inlet connection with the main. Even this in many places was left to be done by the local plumber and at the expense of the consumer; everything from the outlet of the meter being left to the sweet will of the local plumber, whose knowledge of gas matters was oftentimes very deficient, and whose interest in the installation ceased with the payment of his bill.

What vast changes have taken place since those times! Nowadays we have to be out and about constantly among our consumers, always on the alert, bringing before their notice the many advantages of gas, and introducing all new appliances and seeking for prospective customers. Having obtained them, it devolves upon us to not only lay the service and fix the meters, but to carry the supply to the point of combustion, by piping the premises, installing all lighting fixtures and burners, stoves, water heaters, &c., for the proper working and maintenance of all of which we are held responsible.

These changed conditions, seldom voluntarily undertaken, but brought about by a system of evolutions, necessarily involved the provision and up-keep of a well-manned and equipped outdoor or distribution department, together with the keeping of quite a formidable stock of stoves, fittings, and all gas consuming appliances, which, as a natural sequence, required the provision of additional capital, permanent and floating, and at the same time have thrust upon us the burden and expense of gratuitously attending to all consumers' minor wants, such as the cleaning and adjustment of burners and stoves, clearing stoppages, repairing leaks, &c. These further necessitated considerable additional expense and outlay out of revenue account on the suppliers of gas—an expenditure which in many cases amounts to about 6d. per 1000 cubic feet of gas sold. Thus had not better working results been obtained, and economies effected in manufacture, these improved services could not have been given to the consumers, unless at an increased charge of about 6d. per 1000 cubic feet. In other words, the increased attention and services given to our consumers gratuitously is equivalent to a reduction in price of about 6d. per 1000 cubic feet. These are matters which should be borne in mind and brought forcibly before our patrons when the subject of comparative prices is raised, as it often is.

TECHNICAL EDUCATION.

Technical education is a subject which has often been enlarged upon, and sound advice given, by some of our Past-Presidents in their addresses; and it is pleasing to note from the long list of passes in both "Gas Engineering" and "Gas Supply" recorded in the results of the City and Guilds of London examination that the younger members of our industry are yearly becoming more alive to the benefits accruing to the study of technical subjects. There is still, however, room for improvement in this respect; and I would remind you that it is our duty to induce and encourage young men and lads in our employ to attend the technical classes now provided in most towns, and acquire that technical knowledge so necessary to the proper understanding and fulfilment of their daily work.

QUEENSTOWN AND ITS GAS SUPPLY.

In view of your having favoured me by deciding to hold this year's meeting of our Association in Queenstown, I feel called upon to give a few details as to the working of the Queenstown Gas Company's concern, with the management of which I have the honour to be associated. Queenstown, as you are doubtless aware, is a shipping port, possessing a natural deep-water harbour of extreme beauty, and one which is not excelled in any part of the world, affording, as it does, shelter to those leviathan ocean liners of the "White Star" and "Cunard" Companies.

Owing to its geographical situation being on the direct highway from Great Britain to the American Continents, it is a port of call for the huge steamers which carry our mails to and from America and land and embark large numbers of tourists and emigrants. It was, some two decades ago, when sailing ships were the order of the day, a shipping port of very considerable importance. The advent of steam-driven vessels, however, which have now practically superseded sailing ones, brought about a material and adverse change in its shipping interests, which have been on the wane ever since, and are now of comparatively small importance. We have no industries in Queenstown, and are dependent largely upon the remnants of the shipping trade, and to the Admiralty dockyard and ship-repairing yard and works situated on the adjoining island of Haulbowline.

Having briefly dealt historically with Queenstown's immediate past, you will be the better able to understand that it was not to be wondered at if the gas consumption remained stationary, or fell away in sympathy with the other interests mentioned, and you will more readily appreciate the difficulties to be met and overcome to stimulate it.

The Queenstown Gas Company was formed with a capital of £5000, and the works erected by Mr. William Morley Stears in the

year 1855-56; gas having been supplied for the first time towards the latter end of 1856, and continued uninterruptedly to the present day, with varying results, as you will hear later. The consumption having gradually increased until in 1879 it had reached about 11½ million cubic feet, the paid-up capital and debenture bonds, together with £3000 spent on capital account out of dividable profits, amounted to £17,000; the selling price being then 6s. per 1000 cubic feet.

The works having reached the limits of their capacity, extensions and enlargements became necessary, as also the raising of further capital to meet the cost of such extensions; and the occasion was wisely considered an opportune one to apply to Parliament for statutory powers. This was done, and powers were granted and embodied in the Queenstown Gas and Light Act, 1879. Thus the Queenstown Gas Company obtained their statutory powers at a time when meaningless and vindictive opposition such as we have witnessed of late years, and which seeks to impose impossible conditions on those wishful to get such powers, was not so rife. It is one of the few concerns in Ireland working under statutory powers and obligations.

In the Act of Parliament, powers were granted to increase the capital to £25,000, and to issue debenture bonds up to £8000—a total of £33,000 made up as follows: "A" shares representing old original capital (£10,000) ranking for 10 per cent. maximum dividend; "B" shares being amount expended out of profits on capital account (£3000) limited to 5 per cent. maximum dividend; "C" shares, additional capital to be raised £12,000 and to rank for 7 per cent. maximum dividend. The maximum price of gas was fixed at 6s. 6d. per 1000 cubic feet. On obtaining these powers, the Company issued £2000 of new capital; making the paid-up capital in the year 1880 £19,000, with a sale of 11½ million cubic feet, or over £1652 per million feet sold. The selling price then was 5s. 6d. per 1000 cubic feet. The price, of course, was a good one, and the Company were able to pay full statutory dividends. The price was lowered to 5s. 3d. in 1882, and subsequently to 5s. in 1883, at which figure it remained till 1895. The consumption, however, did not, as anticipated, increase materially from 1880 to 1895 (having fluctuated between 11½ and 13 millions), and stood in 1895 at roughly 12½ millions.

An endeavour was made in 1895 to stimulate the consumption by introducing differential prices, with a lower rate of 4s. per 1000 cubic feet for gas used for cooking purposes. This was not altogether unsuccessful; and by the end of 1896 the consumption had gone up by about 500,000 cubic feet. A further reduction was then made; the lighting rate of 5s. being lowered to 4s. 9d., and the 4s. rate to 3s. 9d. per 1000 feet, and remained at this figure until the end of 1899. The consumption had increased during the interval by nearly two millions—to about 14½ millions; and with the exception of one or two instances, full statutory dividends had been paid each year up to the half year ending June 1899.

RELATIONS OF CORPORATION AND COMPANY.

Like most industrial concerns, however, the Queenstown Gas Company were not destined to have an altogether unchequered career of prosperity. From some cause or other, with which it would serve no useful purpose for me to enter, the harmonious relations previously existing between the Local Authority and the Company became disturbed, and electric lighting loomed largely on the horizon. In the year 1896, the Queenstown Town Commissioners applied for, and obtained, a Provisional Order empowering them to generate and supply electric light. These powers, however, were not immediately put into force, but were allowed to remain dormant until the advent of the Cork Electric Tramway and Lighting Company, whereupon that Company were approached by the Queenstown City Fathers and invited to open and run an electric lighting works in Queenstown. The Town Commissioners, having the powers to do so, handed over to them the Provisional Order which they had obtained—presumably promising them moral support and all the public lighting within the area defined in the Order as compulsory, and which they could undertake. The Electric Company took the bait; and in due course erected their generating station and laid mains and cables; undertaking and carrying out the free-wiring of houses and premises and the supply of lamps and fittings gratuitously.

Here the Gas Company fell upon troublesome times. Coincident with the advent of the rival Company (1899 to 1900), an extraordinary meeting of shareholders of the Gas Company was convened, and the Board of Directors were reconstructed (using the words in the Directors' report), "in order to bring them more into harmony with the views of the shareholders in meeting the competition of the electric light." Unfortunately, however, circumstances combined to thwart and hamper the well-intended changes instituted by the new Board, who deemed it wise to further lower the price of gas, and reduced it from 4s. 9d. and 3s. 9d. to 4s. 2d. and 3s. 4d., for lighting and cooking respectively, as from Jan. 1, 1900; the dividend paid for the latter half of 1899 having been dropped from 10, 5, and 7 per cent. to 6, 3, and 4 per cent. on the "A," "B," and "C" shares respectively.

The coal market was another disturbing factor; coals and freights having advanced to almost famine prices, necessitating the paying of almost 50 per cent. advance on the previous year's prices, and amounting to an increase in expenditure of practically £800 on the year's coal bill—a sum sufficient to pay the statutory dividend on the capital of the Company (which now stood at £20,000) for eight months. The one redeeming feature in the

situation was the fact that the gas consumption continued to grow, having increased during 1900 by fully a million cubic feet, and now reached about 15³/₄ millions. This increase was undoubtedly due to the reduced price tempting consumers to use gas for cooking in preference to coal, which was selling at famine prices at the time; but, as was subsequently proved, it was only a temporary fillip.

By this time, the Electric Light Company had got their plant and mains laid down, and commenced the supply of light in the autumn of 1900. Naturally, a great number of the gas consumers, and particularly the best shopkeepers, hotels, clubs, &c., ever-desirous of being up to date, and having such facilities put in their way, adopted the new illuminant. Fully one-third of the public lighting, too, was given to the Electric Company; the natural sequence being a falling off in our consumption and loss of revenue. From this time forward, the decline was gradual but sure. The tide of adversity had set in; and it seemed hopeless to try and stay it. Briefly, the situation was this: The consumption kept falling away, and had dropped from 15³/₄ millions in 1900 (the highest point reached) to 14¹/₄ millions in 1903—a loss of over 1¹/₂ millions in 2¹/₂ years. The dividends, which had been dropped from 10, 5, and 7 per cent. in 1899 to 6, 3, and 4 per cent. in 1900, were continued at the latter figures until June, 1902; but the balance of undivided profits, which stood at £578 in 1900, had during the same period dwindled down to £5. No dividends or Directors' fees were earned or paid from June, 1902, to December, 1903, the profits, which were barely sufficient to pay the interest on the debenture bonds, ultimately dropping, in the June half year of 1903, to £3 5s. 1d. The capital account was overspent by about £400, and there was no available working capital. The depreciation fund had been depleted of £223.

Such was the state of the affairs of the Company when, in the late autumn of 1903, it passed into the hands of the present management. The outlook was, to say the least, not particularly bright. Having, however, surveyed and studied the whole situation, and being possessed of a deep-rooted belief in the possibilities of gas, as we all should be, it was undertaken with no misgivings as to our ability to again transform the concern into a successful one, and bring our efforts to a successful issue. Many factors combined to hinder the accomplishment of this end—the principal among these being the absolute lack of funds; but having put our shoulders to the wheel, there was to be no turning back. Hard work and slogging during long and anxious hours was the order of the day for quite a long period.

Immediately upon taking control a thorough examination was made of the works, and such repairs as were vital were at once entered upon. Two beds of retorts were reset on an improved system, new covers were made for the purifiers, a new boiler was provided and set, engines and exhausters overhauled, and many other minor repairs undertaken too numerous to mention.

PRESSURE AND BURNERS.

On taking a walk through the town an evening or two after my arrival in Queenstown, I was struck with the poor effect of the light from the few incandescent burners in use. On investigating, I found that the pressure in the shopping or lowest portion of the town, which is fully a mile from the works, was very deficient, being barely 11-10ths, and the nipples of the incandescent burners having been bored out to an extraordinary size and requiring the checking of all taps. I immediately gave instructions to increase the pressure at the governor outlet, which was 22-10ths from dusk to midnight and 15-10ths during the rest of the twenty-four hours. I was met with the reply that the pressure could not be increased, and that 22-10ths was the greatest pressure the holders would give. This rather surprised me. The holders were then three in number—one of two lifts of 64,000 cubic feet capacity, erected in 1880, and two smaller single-lift ones, each of 18,000 cubic feet capacity, erected, I should say, when the works were built in 1856. Incidentally, I naturally asked what about the larger holder, and was told that it had never been turned on to the town—it having been tried on several occasions with disastrous results each time; all lights in the town being put out. Ultimately, therefore, it was entirely abandoned as being unworkable. It had been used simply as a reserve store from which to feed the smaller holder. On making investigations, I found the root of the trouble in the district governor, which, in its then condition, was not suited to the greatly increased pressure of 6 inches thrown by the larger holder. I bye-passed the governor, and had it taken out—making

the necessary alterations to meet the new requirements—and put it to work again; turning the gas from the large holder direct on the district without further trouble, and increasing the pressure at the outlet of the governor to 30-10ths. This gave us a greatly improved pressure in the town; but the light from the incandescent burners was, if anything, worse, due to their having been bored out to such an extent as to make it impossible to get anything approaching a good bunsen flame.

In the interval, I had obtained a good supply of burners and mantles, &c.; and rather than tinker with the old ones, I sent men round to remove all the bad burners and instal good ones, and had them nicely adjusted. The difference made was very marked, and freely commented upon by the townspeople; the electric lamps (carbon filament) in the shops being admittedly fairly eclipsed and put in the shade. This move was, I estimate, the first step towards checking the onslaught of our rivals, and the wholesale loss of lighting consumers. All through the winter of 1903-4, I devoted as much time as I could spare from the works (which also demanded considerable attention) in the district, spending every evening looking out for defects and seeing that the lighting was kept to high-water mark. Any defect found had immediate attention next day; all defective mantles, chimneys, &c., being renewed—no charge being made for so doing. This policy was pursued all through the winter, and continued ever since with very marked results. The confidence and good feeling of the consumers which had been lost was steadily regained, and the relations between the Company and the consumers vastly improved; and it affords me the greatest pleasure to be able to state that the relations between the Queenstown Urban District Council and the Company and their respective officials are now of the most harmonious and forbearing character.

ACQUIRING NEW BUSINESS.

This much accomplished, we next turned our attention to the opening-up of new sources of consumption by holding cookery demonstrations and exhibitions of all kinds of gas-consuming appliances, and a constant and persistent canvass of every shop, house, and hamlet; no place being considered beneath our attention. The results were very gratifying, and progress has to be recorded right up to date. We have gone on gradually but surely adding increase upon increase, notwithstanding the increased efforts and tempting tactics adopted by our rivals.

In 1909, it was deemed prudent to abolish differential prices, and adopt a uniform price for all gas sold through ordinary meters. This was accordingly done, and came into force as from Midsummer of that year; the price being fixed at 3s. 11d. per 1000 cubic feet. This meant a slight reduction in price on the aggregate, and was a popular change with most of our consumers. A further reduction to 3s. 8d., with a special price to 3s. 4d. to large consumers, was made nine months afterwards, and took effect as from the 1st of April last year. During the intervening years, district pressures have been increased by degrees; 40-10ths being now carried during the lighting hours and 32-10ths in the day time.

The progress made up to the end of the last financial year (December last) is best shown in the table appended hereto, the figures of which I think speak for themselves. The increase in consumption and number of consumers, as shown in the table, naturally necessitated considerable extensions and enlargements of mains; the latter making heavy claims upon the revenue account.

While a good deal of attention was being paid to the district, the works were not by any means neglected. Many parts of the plant were renewed and improvements carried out, in addition to the usual upkeep. First of all attention was paid to the purifiers, as stated. Then the carbonizing plant—two beds having been renewed during our first year; and subsequently renewal and re-modelling the plant, together with the provision of self-sealing mouthpieces, was met and carried out as and when required. A new steam-boiler was purchased and erected. New purifiers and oxide revivifying shed were put up, and a new Livesey washer and new Clapham washer-scrubber were installed. One of the small holders was renewed; all the work in connection therewith being carried out by our own workmen. The sulphate of ammonia plant was remodelled by the provision of a continuous still and heater. Our offices have been improved and remodelled. We also erected an aerial railway or ropeway for the conveyance of our coal from steamers to the coal-store. With the exception

QUEENSTOWN GAS COMPANY.—Table of Financial Results, Years 1904 to 1910. Figures for 1903 Given for Comparison.

—	Gas-Rental.	Meter and Stove Rental.	Public Light-ing Rental.	Coke. Net Receipts.	Tar. Net Receipts.	Sulphate of Ammonia. Net Receipts.	Total Revenue.	Net Profits.	Capital Expended to Date.	Dividends Paid Per Cent.	Directors' Fees.
	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.			
1903 . . .	3038 15 10	175 10 9	398 7 3	681 19 7	82 3 11	5 0 2	3984 10 3	284 18 10	20,491 9 4	Nil	Nil
1904 . . .	3315 14 5	225 16 7	407 16 4	822 7 5	145 0 9	74 10 2	4777 19 1	1156 3 2	21,865 4 6	5, 2 ¹ / ₂ , 3 ¹ / ₂	50
1905 . . .	3426 2 0	319 6 10	438 8 5	843 1 3	132 2 1	105 4 1	4950 14 8	1174 8 1	22,276 1 7	6, 3 ¹ / ₂ , 4 ¹ / ₂	100
1906 . . .	3589 13 0	353 2 3	445 2 0	757 19 11	106 15 2	92 2 0	5067 2 0	1308 6 11	23,335 18 2	8, 4, 5	100
1907 . . .	3928 8 6	449 11 9	444 7 1	933 0 9	97 17 10	85 17 8	5526 16 3	1353 4 0	23,728 3 11	8, 4, 5	100
1908 . . .	3983 7 1	469 15 3	446 12 9	743 10 2	97 8 11	121 5 11	5648 2 9	1675 11 10	24,016 12 2	10, 5, 7	100
1909 . . .	4016 8 6	468 13 2	447 14 4	948 17 0	107 7 0	113 14 8	5745 12 2	1773 0 4	24,103 19 3	10, 5, 7	100†
1910* . . .	3992 2 2	497 13 2	452 13 5	907 14 8	109 16 4	136 1 6	5676 11 2	1787 11 5	24,200 4 3	10, 5, 7	100

* Price reduced to 3s. 8d. per 1000 cubic feet.

† Maximum dividend.

QUEENSTOWN GAS COMPANY.—Table of Working Results, Years 1904 to 1910. Figures for 1903 given for Comparison.

—	Coal Carbonized.		Gas Made.	Gas Made per Ton of Coal.	Coke Sold.	Tar Sold.	Sulphate of Ammonia Made.		Number of Consumers.	Number of Cookers in Use.	Number of Gas Fires in Use.	Number of Public Lamps.
	Tons.	Cwt.	Thousands.	Cubic Feet.	Cwt.	Gallons.	Tons.	Cwt.				
1903.	2218	5	19,740	8,900	16,372	11,222	0	15	464	75	15	140
1904.	2067	15	20,138	9,742	18,288	20,679	9	19	662	193	32	142
1905.	2034	10	20,388	10,023	20,280	20,341	12	14½	819	351	43	142
1906.	2003	16	20,834	10,401	20,016	20,269	16	0½	1004	498	60	143
1907.	2076	15	22,705	10,936	21,612	20,768	17	3¾	1101	571	85	144
1908.	2144	7	23,715	11,061	21,396	21,928	19	3	1121	591	101	145
1909.	2164	0	23,883	11,036	22,368	22,338	18	11	1098	598	116	145
1910.	2126	5	24,510	11,570	21,120	23,574	20	0½	1117	597	128	149

NOTE A : While the gas made in 1910 exceeded that of 1903 by over 4¾ Million cubic feet, the coal used was actually less by 92 tons.

of the splicing of the wire, the whole of the work of installation was carried out by the Company's employees.

There are still two or three items to be dealt with in the immediate future; one being the renewal of the second small holder, another the overhauling of the exhausting plant and engines and their house.

Thus, if we can lay claim to having attained a fair share of success during the past seven years, it has been obtained largely by dint of hard work, close and prompt attention to consumers wants, being ever on the alert to avail of all little improvements as they came along, keeping a close and watchful eye on all details, and, by no means the least, the loyal support and help through all difficulties extended to me by the staff and workmen.

Before closing my remarks, I should like to offer a word of tribute to the Technical Press, to which we in Ireland, isolated as we are from our professional brethren, are so much indebted and dependent upon to keep us abreast of the times and in touch with all new methods and improvements appertaining to our industry.

Mr. D. W. TOOMS had very great pleasure in moving a hearty vote of thanks to the President. Having been familiar with his history, and having had the privilege of his friendship for about twelve years, he expected that he would have a tale of no mean order to unfold to them. The address he had given showed that, by inherent ability, steady and personal application to work, and an unwavering belief in the possibilities of his labour, he had brought the Queenstown gas undertaking into the position of being second to none. This was to the benefit of them all, because if any individual gas-works were being knocked out by their competitors, all suffered indirectly, the same as they would all gain indirectly by the scheme of advertising which had been referred to. The President might congratulate himself upon the attention which was paid to his address. He (Mr. Tooms) had never listened to one with more pleasure.

Mr. T. J. REID, in seconding, said that the address had given him intense pleasure indeed. It was a narrative of effective and strenuous application, under the most desponding circumstances, and showed how matters could be brought to a successful issue, and how a concern such as the Queenstown gas undertaking, which apparently was not in a very happy condition, could be made successful in face of the opposition of rivals.

THE PRESIDENT'S MEDAL.

The HON. SECRETARY thought that by the way the members had acclaimed their vote of thanks, the President might take it that he was cordially thanked for his address. They were proud before in having Mr. Paterson as their President; they were all more so now, after seeing the splendid manner in which he had brought forward his address. The pleasant duty now devolved upon him (Mr. Airth) of presenting to Mr. Paterson the Presidential Medal. He wished that their late President had been there to do it; but he had been called to another sphere. He trusted Mr. Paterson would long wear the medal, and that he would look upon it as a kindly mark of their appreciation of his doings.

The PRESIDENT thanked the members very heartily and very sincerely for the reception they had given to his address. He thanked them all for the kind present, which had become an established institution now, and which, therefore, he need not say was unexpected. He appreciated it none the less.

THE READING OF PAPERS.

The reading of papers was then proceeded with. There were three on the agenda—viz.: "Notes on Purification," by Mr. A. Percy Hoskins, of Belfast; "The Construction and Working of a Small Sulphate of Ammonia Plant," by Mr. T. Hornby, of Longford; and "Gas Apparatus for Workshop and Laboratory Purposes," by Mr. G. F. Hurst, of Birmingham. The communication by Mr. Hurst was taken first, and was followed by the paper by Mr. Hoskins. By the time the discussion upon it ended, it was five o'clock, and, with Mr. Hornby's consent, his paper was held over till next year.

VOTE OF THANKS.

The PRESIDENT proposed a vote of thanks to the readers of the papers. Mr. Hoskins' paper had brought out a very good discussion. It had, as it were, thrown a new light on the subject. He hoped all would go home and make experiments. It was only by these means that they could get good results.

The vote of thanks was awarded; and the proceedings then terminated.

THE DINNER.

The members and friends, including ladies, dined together in the Queen's Hotel in the evening, on the invitation of the Chairman and Directors of the Queenstown Gas Company. Mr. F. M'CARTHY, a Director of the Company, presided, in the absence of the Chairman—Mr. J. O'Meara. The toasts which were honoured were: "The Prosperity of Queenstown," proposed by Mr. T. J. Reid, and responded to by Mr. Clayton Love; "Our Hosts, The Queenstown Gas Company," proposed by Mr. M. Purcell, and acknowledged by the Chairman; "Kindred Associations," proposed by Mr. G. Airth, and responded to by Mr. R. G. Shadbolt; and "The Irish Association of Gas Managers," proposed by Mr. Graham, and responded to by Mr. Outon, who, in the course of his remarks, said that his employers, the Great Southern and Western Railway Company, purchased gas from forty private companies, and owned eight coal and two oil gas works. They had only one station lighted by electricity; and there was no appearance of the number being increased. There were 650 vehicles on the Company's lines, which were lighted by gas; and the number was likely to be increased.

During the evening, the proceedings were enlivened by very enjoyable musical contributions, given by members of the company, the arrangement for which was, as usual, in the capable hands of Mr. G. W. Norman.

THE EXCURSION.

Next day—Wednesday—an excursion took place, the first stage of which was by rail to Youghal, where luncheon was served in the Imperial Hotel. The party, numbering about fifty, visited the old Church, and the house in which Sir Walter Raleigh lived at Youghal. Then they took steamer up the Blackwater to Cappoquin; driving thence to Mount Melleray Abbey. Tea was served to them there by the Monks, who afterwards showed them the Monastery. The return journey was by the same route as the outward.

PRESENTATION TO MR. JAMES WHIMSTER.

At Youghal, on the outward journey, the President—Mr. Paterson—made the presentation of an address to Mr. James Whimster, of Armagh. The address was in these terms:

"It was with profound regret that this Association received your resignation of the position of Hon. Secretary and Treasurer, after twenty-two years of faithful and loyal service to its every interest and that of its members. As founder of the North of Ireland Gas Managers' Association, which developed into the above Association, we feel it our bounden duty to record in some permanent way the grateful acknowledgments which are due to you. In the work of the Association since its inception, we recognize that to you in large measure its success belongs, and the great and lasting benefits which have accrued to its members are primarily due to your keen foresight in bringing together your brother managers to discuss matters appertaining to their profession. We trust and pray that you may be long spared to come among us at our annual meetings, when we feel sure that your genial presence and helpful words will do much to still further the good work which you initiated so many years ago.

Signed, on behalf of the Association,

J. PATERSON, *President.*

C. B. OUTON, *Vice-President.*

G. AIRTH, *Hon. Secretary and Treasurer.*

August, 1911.

The address was an illuminated one, within an ornamental border, in which were shown the coats of arms of the four provinces of Ireland.

Mr. PATERSON, in making the presentation, briefly referred to the services of Mr. Whimster at the formation of the Association, and all through his years of office.

Mr. R. G. SHADBOLT also referred in complimentary terms to Mr. Whimster's work.

Mr. Whimster was unfortunately not present.

At St. Stephen's Church, Hampstead, on the 3rd inst., the marriage was solemnized of Mr. John Harold Sayner, the only son of Mr. John Sayner, of Harrogate, and Miss Florence Edith Fletcher, the only child of Mr. S. H. Fletcher, of Dover.

THE USES OF COAL GAS APPLIANCES FOR INDUSTRIAL PURPOSES.

By G. F. HURST, of Birmingham.

[A Paper read before the Irish Association of Gas Managers.]

The author's object in presenting this paper is a two-fold one. At the start, let it be understood that this is no compendium of costs, consumptions, and temperatures, and various other data dealing with specific gas-furnaces actually under test. The Technical Press has of late published a considerable number of such papers, each paper being almost invariably followed by a storm of heated criticism from those whose practical acquaintance with the subject they presume to touch is perhaps more limited than their desire for the light of publicity for their signatures. On the contrary, the author's object is, first, to give, as the result of many years of practical experience with all classes of furnace work, a general survey of the various methods of applying coal gas to industrial requirements, of the construction of furnaces and burners to suit them for various temperatures and conditions necessary in different classes of work, and of the difficulties likely to be encountered by gas undertakings in persuading the potential users that the adoption of coal gas will be for them an economically sound proposition; secondly, to promote a good discussion, as he believes that much more can be accomplished for the progress of the industry by interesting the gas engineers personally than by years of advertisement in the Press.

As before mentioned, the Technical Press have presented us with many experimental papers during the last few months; and the results given in such papers are extremely valuable, both to the experimentalist and to the practical man. Unfortunately, many results genuinely obtained in laboratory practice, although done on a works scale, are not—though the author does not say cannot be—repeated with the same success in the foundry and the workshop. This is due to several contributory causes—for instance, the standard of labour employed, and the often unavoidable conditions under which the work has to be done. The average workman detests changing his methods of working, although with practice the change would cause his work to be easier for him. Time after time the author has met with cases where apparatus has been condemned by the workman without adequate trial, simply because he looks on it as something new, and something by means of which his employer is to obtain more work out of him than by the old method. The fact that it may be easier for him to produce this extra work does not weigh with him at all. He does not understand the principles of the new apparatus and does not want to. Under these conditions, it is not surprising that many effective and efficient appliances are discarded almost as soon as they are fixed, and the consumer for the future indiscriminately condemns all gas-heated apparatus. Such cases often involve the manufacturer in financial loss, and certainly cause the gas undertaking to lose a valuable outlet for its product, all of which, moreover, would go to swell that highly important item—the day consumption of gas.

A further difficulty met with by the gas engineer in trying to introduce gas to the industrial consumer, in place of solid or liquid fuel, is the difficulty of adequately assessing the gain and loss on either side—viz., by the old solid fuel method and by the new method. There are points about both which it is impossible to translate into £ s. d. The consumer, after a trial, is apt merely to look at his gas bill, and compare it with his previous coke or oil bill. It is extremely difficult to say exactly how much he benefits by being able to keep his gas-heated furnace temperature within 5° C. of a given point, when his coke-furnace can with difficulty be kept within 100° of this point. But that he does benefit, there can be no manner of doubt. This and other points—such as the absence of ash and dust, the lack of irregularities in temperature due to the necessity of fuel replenishment, &c.—are among those which cannot be put down in hard cash.

The use of coal-gas appliances for industrial purposes has now become a matter of great importance to all gas undertakings. In all manufacturing towns, the gas-furnace offers a larger field for an increase in gas output than many engineers have yet realized. Furnaces consuming up to 4000 cubic feet per hour are now in daily use, and, for processes that are worked intermittently, they show a large saving in fuel costs to the users. In addition to this, the increased speed of production (which is often doubled), and the consequent saving of labour, together with the further saving due to the absence of stoking, clinkering, and ash removal, make the gas-furnace a most paying investment. The adaptation of coal-gas appliances has also enabled many consumers to produce a class of work far superior to, and much more uniform in quality than, that ever obtained by the use of solid fuel.

In order to thoroughly satisfy the consumer, it is necessary to select the type of furnace with the greatest care; and at the start we are confronted with three possible methods of applying gas to the work in hand, each of which, under certain working conditions, and provided the construction of the furnace is carried out on the correct lines to suit the class of work for which it is intended, possesses advantages over other systems of application.

Where temperatures not exceeding 1100° C. are required, and the size of the furnace is within certain limits, which vary with its shape and the nature of the work for which it is designed, a natural-draught furnace can generally be installed. The easy

method of adjustment, the accurate regulation of temperature afforded when heating up, cooling down, or running at a given temperature—which, as before mentioned, can be easily maintained within a limit of 5° C.—the fact that there is no outlay for power-blower, gas-compressor, or the necessary power required for running them, together with the small cost of fitting, are important factors highly in favour of natural-draught furnaces. As the modern draught furnace is constructed, it is almost impossible to make any serious error in adjustment or cause extravagant consumption of gas; and of the three types of gas-heated furnaces, it requires the least experience to produce good results. Natural-draught furnaces can, within certain limits as to size, be made for any temperature up to 1250° C., with the exception, of course, of lead and oil-tempering baths and salt and cyanide dipping furnaces; while the processes for which they can be used are many and varied.

Recent improvements have been made in the construction of natural-draught furnaces by which the whole of the air necessary to support combustion is taken through the burner-tubes, so that no matter what the consumption of the furnace, provided it comes within the range for which it is designed, no cold air over and above that necessary for combustion is admitted to the furnace. A furnace built on this principle is more efficient in heating up and at high temperature than one constructed with large air-ways independent of the burner. But its chief claim to superiority is in maintaining temperature. As no unnecessary cooling air is allowed to circulate round the inside of the furnace, its temperature can be maintained by the consumption of a very much smaller quantity of gas than is the case with the old type of furnace. The lower the temperature which has to be maintained, the more marked is its superiority in this respect.

High-pressure gas in itself is an admirable method of applying gas for furnace work where temperatures not exceeding 1400° C. are required. The use of properly proportioned burners, adjusted to give the necessary maximum temperature, and put in correct positions to ensure an even temperature throughout the furnace, places a convenient range of temperatures at the disposal of the user. The range of temperature in any given furnace is not so extensive as that afforded by natural-draught furnaces. Although the price of a good gas-compressor is somewhat high, and adds considerably to the cost of a furnace installation, the cost of fitting-up a high-pressure gas-furnace is likely to be considerably less than that of an air-blast furnace of the same size, as it requires only one supply pipe of small dimension, as against the large air and gas delivery pipes necessary for the blast furnace. High-pressure gas crucible furnaces are now being used for melting aluminium, brass, gun-metal, manganese-bronze, glass, &c., on commercial lines; while oven furnaces for annealing silver, German silver, brass and copper stampings and spinings, are also extensively used, with most excellent results.

By the system of applying gas at ordinary pressure with air-blast, the highest temperatures are obtainable with coal gas and air; the limit for all practical purposes being approximately 1700° C. The largest sizes of muffle and oven furnaces are invariably fitted with air-blast or high-pressure gas-burners, as there is a limit in the size of furnace that can be fitted satisfactorily with natural-draught burners. In addition to this, on questions of prime cost, efficiency, and facility of working, large natural-draught furnaces are not to be recommended.

Generally speaking, the air-blast burners now on the market are the most unsatisfactory of the three types of furnace burners, and those in which, in recent years, the least improvement has been made; their main fault being that there is no arrangement for the proper mixing of air and gas before reaching the point of ignition. Some makers even to-day are still using the old type of blow-pipe burner, where gas and air mix practically at the point of ignition.

There are five types of furnaces suitable for use with either natural-draught, high-pressure gas, or air-blast burners—viz., muffle, oven, sagger, crucible, and pot furnaces.

Muffle furnaces, including tube furnaces, are intended for use for all processes where it is absolutely necessary to protect the contents of the furnace from the products of combustion. For instance, they are employed in the firing of under-glaze and over-glaze china and pottery, and of art enamels, and for annealing, carbonizing, or hardening and tempering certain classes of steel work. They are also used where it is necessary to pass an independent supply of air over the contents of the muffle, as in assaying and oxidizing. For these processes, a muffle, fitted with an independent flue or else provided with slits in the back, allowing a current of air to be drawn into the combustion space, is generally used. Many engineers also employ this pattern for case-hardening. The work to be hardened is packed with the hardening compound in the muffle. Owing, however, to the fact that a muffle has to be filled and emptied from the front, this pattern is not as convenient for the purpose as the sagger furnace described later.

Oven-furnaces are similar in construction to muffle-furnaces, except that instead of protecting the contents of the furnace from the products of combustion by using a muffle, there is substituted for it an open hearth or tray, over which the heated gases and flame pass to the flues. Where such protection is unnecessary, oven-furnaces show a large saving in gas (often as much as 25 per cent.) over the corresponding muffle-furnaces. The oven-furnace is used for general heating work, and for annealing, hardening, and tempering. Where much case-hardening work has to be

done, and where the size and shape of the work vary considerably, the surface of the steel has to be impregnated by the carbon to different depths. In these cases the oven-furnace allows of the various parts requiring different treatment being placed in the furnace in separate boxes specially made for the purpose, and of each box being taken from the furnace after the required time has elapsed for the correct treatment.

Sagger furnaces are constructed on lines similar to muffle and oven furnaces. The sagger is a rectangular box which takes the place of the muffle or tray, and has a loose cover, while access to it is effected by means of a sliding cover on the top of the furnace. Sagger furnaces are chiefly used for case-hardening and carbonizing. They show several advantages in these respects over the muffle-furnaces for certain classes of work. For instance, a sagger may be withdrawn and replaced by another without the necessity of cooling the furnace down. Again, work placed in a sagger can be properly packed and supported in cases where it might possibly become warped. The efficiency of a sagger furnace is also slightly higher than that of a muffle-furnace, as the sagger is completely enveloped in flame.

There are two types of crucible furnaces—stationary and tilting. For natural draught they are only supplied in the stationary pattern; but those fitted with air-blast or high-pressure gas-burners can be supplied in either type. For temperatures exceeding 1100° C., natural-draught crucible furnaces cannot be used, and even at this temperature are somewhat extravagant in gas consumption. But in spite of this, they are very extensively used for refining jewellers' sweepings, making gold and silver solders, glass enamels, and in similar processes, owing to their easy manipulation and the evenness of temperature afforded. There is a limit to the size in which they can be made; and this limit varies with the class of work for which they are intended. For high-pressure gas or air-blast, they can be made to take crucibles with a capacity up to 600 lbs. of iron, suitable for melting aluminium, brass, gun-metal, manganese-bronze, copper, &c. Crucible furnaces to melt pure nickel require special construction; air-blast burners with a very powerful air-blast are absolutely essential.

Dipping or pot furnaces are designed for hardening, case-hardening, or tempering by means of substances which are liquid at the temperature for the operation. Work of irregular shape, and which requires absolute uniformity of hardening, or engravers' plates and similar articles, which must be kept quite free from oxidation, are treated in this class of furnace. The hardening mixture is placed in the pot—usually a cast-iron one—and raised to the necessary temperature, which, of course, is higher than its melting point. The work to be hardened is then immersed in the liquid mixture until the required temperature is attained. It is then chilled by plunging it into an oil-bath. Lead, cyanide, and mixtures of salt and cyanide are the materials generally used for the different processes of hardening. Lead or oil is employed in a similar manner for tempering such articles as springs, cutters, and other tools.

Having thus briefly glanced at the principal types of furnaces and the different methods of heating them, the author would fail in his avowed intention if he were to include any of the many concrete instances as to costs, &c., that have come within his experience. He feels that if this paper, by bringing some of the industrial uses of coal gas before his audience, arouses interest in the question from the gas engineer's point of view, and leads to discussion, his object in writing it will have been more than accomplished. In spite of the mournings of the Electrical Press, the gas industry is far from dead yet; and in this portion of its field with which the author has dealt, he is convinced that the near future will see it reap a generous harvest.

Discussion.

The PRESIDENT, having expressed the indebtedness of the Association to Mr. Hurst for his paper, went on to say that, unfortunately, in Ireland they had not the necessity for the use of such appliances; but he hoped the day was not far distant when these things might be as necessary in Ireland as in England or any other part of the world.

Mr. JAMES WHIMSTER (Armagh) remarked that, while the paper was being read, he could not help thinking how little there was of this sort of thing in Ireland. These appliances would be all very well in the Midlands of England. Mr. Hurst's paper should appeal to people there far more than it did to them. But the paper showed the possibilities of gas; and they were always glad to hear of these things, because they did not know the day when some of their customers might come in and ask if there were such a thing as doing certain work with gas. While there was nothing of this sort, so far as he knew, in Armagh, they had something kindred, in a cloth-singeing machine. It was so seldom used that the quantity of gas consumed did not amount to very much. They had also another machine called a monotype machine, in use by printers, in which the type was melted singly. This machine required a lot of gas. It was well to know such things existed. He had seen the heating of branding irons, for stamping boxes, done by gas.

Mr. R. YOUNG (Youghal) remarked that they had an art glass works in Youghal, which he had tried to get gas used in; and the only difficulty with it was the cost. He believed it was the best medium for doing the work. They had it in view again to put in a gas-furnace; and he would like, if possible, to have some figures on the subject. What they had at present was a furnace using coke.

Mr. HURST explained that gas was more suitable than coke for such work, because of the sulphur in coke. He knew of gas being employed although the cost of it was three or four times that of coke.

Mr. H. HAWKINS (Limerick) said that, in his town, there were a large number of places where boxes were branded by gas-heated stamping-irons; and they worked very successfully. Butter boxes and the like were so stamped. It was found to be much cheaper than coke.

Mr. HURST said this would be the case if the work were constant; but where they were used only now and again, he thought the cost with gas would be greater than with coke.

Mr. D. W. TOOMS (Waterford) said he was informed that gas-heated brands were much cheaper than any other. If he wrote to an apparatus maker inquiring as to the best apparatus, and as to the consumption of gas in it, he invariably found he must add about 30 per cent. to whatever figure the maker gave for the consumption. This put a manager who might have recommended certain apparatus in a very false position. He agreed with what Mr. Hurst had said about apparatus being condemned by workmen. Any gas engineer or manager would bear him out in this—that in placing out gas apparatus on hire, they required to see, not only that the apparatus was fixed accurately and carefully, but that it got justice in use. Mr. Hurst spoke of air-blast burners being the most unsatisfactory of the three types of furnace-burners on the market. He would like to know what improvements had been made in recent years on the other two types of burners. Twelve or thirteen years ago, it was the only type of burner in which it was possible to get 10 or 15 per cent. of increased temperature. If sufficient care were bestowed on the air-blast furnace, could it not also be improved?

Mr. T. J. REID (Ballina) called attention to laundry work as a possible outlet for gas. There were very few places in Ireland where apparatus dealing with iron could be adopted.

Mr. HURST, in closing the discussion, said he had invariably found that, when intermittent work was being done, the cost came out greater with gas than with coke. He could not give any reason for it; but it was the fact. Natural blast-furnaces were, he thought, universally used for the melting of soft metals; and a manufacturer, replying to a question about consumption, would quote the consumption for this furnace adjusted to 10-10ths. If they put the apparatus on a pipe working at 3 inches pressure, they would consume 33½ per cent. more gas, for which they would be getting absolutely no return. As regarded the improvement of air-blast furnaces, they were making a considerable number of tests in this direction; and before long, he thought, they would find an improvement upon them as great as with other sorts of furnaces.

The PRESIDENT said they would all keep the paper for future reference. It would be of considerable value to the members, whose best thanks were due to Mr. Hurst.

Liverpool Students' Success at the Last Gas Examinations.—

Some of our readers may be aware that classes in "Gas Engineering" and "Gas Supply" are conducted in Liverpool by members of the staff of Mr. Edward Allen, the Engineer of the Liverpool Gas Company. It is gratifying to find that at the last examinations Mr. Astbury, the Superintendent of the Linacre works, had 72 per cent. of the passes, and Mr. Thompson, the Superintendent of Workshops, 75 per cent. In addition, one of Mr. Thompson's students (Mr. William Heathcote) obtained, as announced in the "JOURNAL" last week, the first prize in the Ordinary Grade (£2 and a bronze medal) in "Gas Supply."

Duty on Gas-Making Coal Imported into Canada.—According to the report presented by the Executive Committee of the Canadian Gas Association at the last annual meeting, the efforts made by a Past-President (Mr. John C. Hay) to obtain the removal, or at all events the reduction, of the duty on bituminous coal imported into Canada have been continued. Colonel Thompson, of Ottawa, who is watching the interests of the Association in this matter, has informed the Committee that while it had been difficult for him to make much progress, on account of the larger question of reciprocity occupying attention, he is confident of eventual success in getting the duty wholly or partly removed. In any event, if the reciprocity arrangement goes through, gas companies will, it is stated, benefit to the extent of 8 c. per ton on 3-4 lump coal imported, which, on the quantity used for gas-making purposes, is equivalent to about \$25,000 (£5000) per annum.

Escape of Gas from Coal.—This subject is dealt with in the current number of the "Engineer" in connection with a notice of a pamphlet giving the results of certain experiments carried out by the United States Bureau of Mines. Several qualities of coal were tested for different lengths of time, and the quantity of gas given off varied greatly. At the end of 75 weeks, one coal had given off 1·821 times its own volume of gas, and was still showing signs of evolving more. Another at the end of nine weeks had evolved only 0·184 times its own volume of gas. Thereafter it apparently ceased to produce gas, even though the experiment was carried on for 26 weeks longer. As regards the loss of heating value due to this escape of gas, it is stated to be wholly insignificant. With the largest volume of gas evolved from any coal examined, the total loss of calorific value at the end of the 17½ months was only 0·16 per cent. of the original figure.

NOTE ON PURIFICATION BY LIME AND OXIDE.

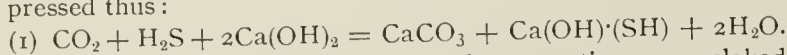
By A. PERCY HOSKINS, F.I.C., F.C.S.

[A Paper read before the Irish Association of Gas Managers.]

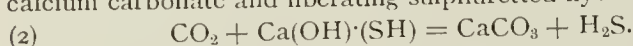
There is sometimes merit in a twice-told tale, and a hope that here and there a reminder of a fact half-forgotten, or a hint of something known and not yet acted upon, may be found by some of my audience, must be my warrant for presenting for consideration this note upon a somewhat threadbare subject.

To start at the beginning. The gases leaving the scrubbers contain, as impurities, carbonic acid (CO_2) and sulphuretted hydrogen (H_2S), together with smaller and, to many of us, practically negligible quantities of other bodies, chief among which is carbon bisulphide (CS_2). Of these impurities, sulphuretted hydrogen must be removed, and carbonic acid (if a standard illuminating power is compulsory) must be either removed or compensation made for the loss due to its presence. In Ireland, the agents in use are lime and oxide of iron (bog ore), used either separately or in conjunction.

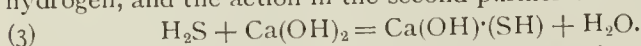
Neglecting for the moment the bodies occurring in smaller quantity, the action of the carbonic acid and sulphuretted hydrogen upon slaked lime, when used alone, may be approximately expressed thus:



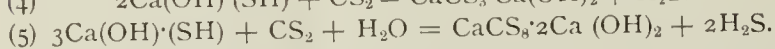
Carbon dioxide and sulphuretted hydrogen acting upon slaked lime yield calcium carbonate (chalk), calcium hydroxy-hydro-sulphide, and water. That is, the clean slaked lime at first absorbs both the carbonic acid and the sulphuretted hydrogen, liberating water. When the whole of the lime in the first purifier is combined in this way, a further action takes place; the carbonic acid entering (with sulphuretted hydrogen) at the purifier inlet decomposes the calcium hydroxy-hydrosulphide, forming more calcium carbonate and liberating sulphuretted hydrogen, thus:



So that while carbonic acid is still being absorbed in the first purifier, the second purifier is now dealing with an amount of impurity equal in volume to that entering the first, but consisting almost entirely of sulphuretted hydrogen; for in its absorption the carbonic acid is now displacing its own volume of sulphuretted hydrogen, and the action in the second purifier becomes simply:



In this second purifier, a further action takes place, sometimes of much importance—viz., the absorption of carbon bisulphide (CS_2), the principal of the sulphur compounds not sulphuretted hydrogen. The reaction, which cannot take place at any stage in the first purifier, as the presence of carbonic acid interferes with it, may be expressed by one or both of the following equations:



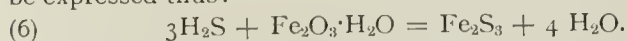
Or, in words, calcium hydroxy-hydrosulphide and carbon bisulphide yield basic calcium sulphocarbonate and sulphuretted hydrogen. A third or "clean" purifier then absorbs the traces of sulphuretted hydrogen and carbonic acid, due to the last-named reaction and to incomplete absorption in the other purifiers. When the first purifier is carbonated as thoroughly as possible, a fourth takes the place of the "clean" purifier, the first is cut off and emptied, and the reaction according to Equation 2 takes place in what is now the first purifier. Since it is the sulphur compounds in the spent lime which cause the well-known unpleasantness associated with spent lime when this method of working is adopted, it is manifestly desirable to carbonate a purifier as completely as possible, in order to reduce the nuisance to a minimum. While this is a satisfactory method for purifying the gas, it suffers from the following disadvantages:

- 1.—Heavy cost of lime.
- 2.—Heavy cost of labour, from frequent changing.
- 3.—Nuisance from spent lime.
- 4.—Difficulty in disposing of spent lime.

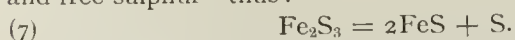
This last is usually more pronounced in towns than in agricultural districts, where the fresh spent lime is useful for destroying weeds, larvæ, &c., in ground from which the crop has been removed, and the weathered spent lime for lightening heavy soils. The actual manurial value is slight, especially when the foul gas has been efficiently scrubbed to remove ammonia.

When oxide of iron (bog ore) alone is used for purification, the carbonic acid passes unchanged into the finished gas, and so dilutes it with a body which depreciates both the heating and lighting power, the latter by about 0.75 candle for every 1 per cent. of carbonic acid present.

The action of the oxide in removing sulphuretted hydrogen may be expressed thus:

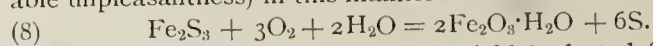


Sulphuretted hydrogen and hydrated oxide of iron yield ferric sulphide and water. A considerable proportion (from 17 to 30 per cent.) of the ferric sulphide formed breaks up into ferrous sulphide and free sulphur—thus:

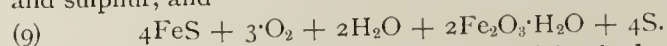


When the oxide thus fouled is dug out and exposed to the air, the sulphides of iron are decomposed by the oxygen of the air

(with the evolution of much heat, and frequently with considerable unpleasantness) in this manner:



Ferric sulphide, oxygen and water yield hydrated ferric oxide and sulphur, and



Ferrous sulphide, oxygen, and water yield hydrated ferric oxide and sulphur. The oxide is thus "revivified," and made fit for use in the purifier again. This process may be repeated until, after some ten or twelve revivifications, the oxide, containing from 55 to 75 per cent. of sulphur, becomes inert. On account of its valuable sulphur content, it can then be sold, and will usually fetch a price equal to the original cost of the oxide, which thus buys itself.

The disadvantages of using oxide only in this way are:

- 1.—The non removal of carbonic acid.
- 2.—The very slight reduction of the sulphur compounds other than sulphuretted hydrogen.
- 3.—The nuisance and danger of firing when revivifying the spent oxide.

[Since the abolition of the "sulphur clauses" the second objection has become of minor importance.]

The advantages over simple lime purification are:

- 1.—Less frequent changing of purifiers.
- 2.—Much greater value of spent material.

When sulphuretted hydrogen is the only impurity which must of necessity be removed, the choice between lime and oxide will be largely governed by the local price and the facilities for disposing of the spent purifying agent. The fact that lime removes the carbonic acid, with its deteriorating effect on the lighting power, is sometimes important. But it must be remembered that lime has actually a more deteriorating effect upon the lighting power than has oxide, since the former has a far greater absorptive action upon the illuminating hydrocarbon vapours; and this, to some extent, balances the effect of the carbonic acid left in when only oxide is in use. Obviously, the two processes may be combined in such a manner that the lime is used to remove the carbonic acid, while the sulphuretted hydrogen is dealt with by the oxide. In this way, the disadvantages are in some degree lessened and the spent lime made less offensive in character. Yet labour costs are nearly as great, as with lime alone there are two classes of spent material to be disposed of, and there is no calcium hydroxy-hydrosulphide formed under conditions favourable to the removal of carbon bisulphide; so that, if this is removed, special "sulphide purifiers" must also be adopted. This means additional labour and care in control. This portion of the subject will not be dealt with here, as the main intention of this note is to deal with cases in which either lime or oxide alone is sufficient to effect the necessary purification.

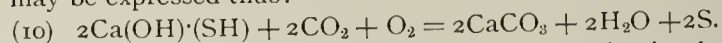
It is well known that when air is mixed with illuminating gas in proportions much too small to produce an explosive mixture, there is an enormous reduction in the candle power.

1 per cent. of air is stated to reduce the candle power 6 per cent.

4	"	"	"	25	"
45	"	"	"	100	"

But in spite of this, the introduction of a limited and carefully adjusted percentage of air into the gas, at an appropriate point in front of the purifiers, produces an extraordinarily beneficial effect upon the working of either lime or oxide, without producing any appreciable deterioration of the finished gas.

The revivifying effect of air upon spent oxide was explained briefly above (Equations 8 and 9); and when this takes place continuously in the purifier, the sulphur in the oxide may rise, under favourable conditions, as high as 60 per cent. without changing the purifier, and the oxide when removed is also found to be free from offensiveness in any way. Lime purifiers, in like manner, are considerably benefited by a similarly adjusted addition of air to the foul gas. In this case, the sulphur at first absorbed (Equation 1), instead of being driven forward again as sulphuretted hydrogen (Equation 2) by the incoming carbonic acid, is to a large extent deposited as free sulphur in the purifier; thus saving the corresponding amount of lime in the next purifier. This reaction may be expressed thus:



Calcium hydroxy-hydrosulphide and carbon dioxide in the presence of oxygen yield calcium carbonate, water, and free sulphur. This free sulphur may rise as high as 10 per cent. on the dry spent lime, which, when freshly removed from the purifier, is quite unobjectionable in character.

The advantages of almost doubling the active period of a lime purifier, of considerably more than doubling the life of an oxide purifier, of saving a large amount of labour, and of producing in each case an innocuous spent product, are too obvious to require further emphasizing.

The two important points to consider, when the addition of air is made, are: (1) The quantity to be added; (2) the point of introduction. With regard to the former, since the action of the air is concerned solely with that of the sulphuretted hydrogen in the purifier, the quantity to be added depends upon the amount of sulphuretted hydrogen present. One per cent. of sulphuretted hydrogen requires 0.5 per cent. of oxygen, or $2\frac{1}{2}$ per cent. of air; and as about 1 per cent. is a usual amount of sulphuretted hydrogen to find at the inlet to the purifiers, about $2\frac{1}{2}$ per cent. of air

should be present in the gas at this point. It is sometimes recommended to make the inlet to the purifiers the point of introduction, and objection has been taken to the addition of air in consequence, on these grounds: (1) Cost of pumping air into gas which is already under pressure; (2) loss of illuminating power caused by the air unless some illuminating hydrocarbon is injected at the same time; (3) the advantage gained in the purifier is not commensurate with the extra cost and trouble.

These objections are valid when the air is added at a point where the gas is under pressure; but they may be completely avoided by choosing an appropriate place where the gas is at a pressure less than atmospheric. Such a point is at the inlet to the condensers, when the exhaustor is between the condensers and the washer. The vacuum here is sufficient to draw the air through a meter for measuring, and a valve for regulating, the quantity passed. The air, mixing at once with the hot foul gas, becomes saturated with the vapours of illuminating hydrocarbons which would otherwise be condensed and dissolved in the tar; so that, the air being fully carburetted, there is no appreciable loss of illuminating power, and the cost of introducing and carburetting the air is infinitesimal.

Air may, of course, be introduced accidentally at any point where a leak exists between the retorts and the condensers; and the best way to adjust the rate at which air should pass through the meter is to so regulate the valve that the purified gas does not contain more than 0.1 to 0.2 per cent. of oxygen. With ordinarily sound settings and connections, the air passing through the meter should be from 2 to 2½ per cent. of the volume of gas passing through the condensers. This figure refers to coal gas. With carburetted water gas, which rarely contains more than 0.2 per cent. of sulphuretted hydrogen in the foul gas, the quantity of air required is correspondingly less, and from 0.5 to 1 per cent. is ample.

As in other places, so in Belfast, additional advantage and convenience have been derived from working the oxide purifiers on the "rotation" principle. The order in which the boxes take the gas is changed each day, thus: First day, 1, 2, 3, 4; second day, 4, 1, 2, 3; third day, 3, 4, 1, 2; fourth day, 2, 3, 4, 1.

The oxide in purifiers run in this way since October, 1910, is still working perfectly; and though it has been occasionally necessary to empty a purifier, this has been, so far, only on account of rising pressure, and not from any failure to absorb the sulphuretted hydrogen. The oxide now contains some 40 per cent. of sulphur, reckoned on the dry basis; and our experience corroborates that of Mr. H. Townsend, of Wakefield, as mentioned in his letter in the "JOURNAL OF GAS LIGHTING" for July 11 last, that when the box to be discharged is made the fourth in the series for a few hours before being taken off, neither heating nor nuisance of any kind is produced when the box is emptied.

In the case of the lime purifiers, when the same proportion of air is used as with oxide, there is an entire absence of nuisance from the fresh spent lime (which, indeed, evolves only a trace of sulphuretted hydrogen even when acidified), while the quantity of gas purified per ton of lime has increased by about 40 per cent.

Put briefly, the gist of this message to you is this: Experience shows that air introduced in the quantity named and in the manner described, together with proper rotation of the oxide purifiers; (1) Economizes very largely in labour and purifying material; (2) removes all nuisance with spent lime or oxide; (3) exercises no detectable deteriorating effect upon either the illuminating or the heating power of the gas; (4) the additional cost is inappreciable. If some of my audience, who have not already done so, will try the experiment, the object of this note is attained.

Discussion.

The PRESIDENT having invited everyone to join in criticizing the paper,

Mr. T. J. REID (Ballina) remarked that the paper was an admirable one. He had followed it with great interest; but he was afraid its application in some of their small gas-works in Ireland could not be extensive. In describing the advantages of using oxide instead of lime, Mr. Hoskins gave less frequent changing of purifiers, and much greater value of spent material. He would like to know if these were really the only advantages, because in Ireland, where they could not obtain lime readily, it seemed to him that natural oxide had great advantages over lime. In his own case, the difference between oxide and lime was considerable, and made the use of lime, in such circumstances, opposed to any idea of economy. The admission of air before the purifier was a practice they had all been well aware of for many years past; but he was afraid in most works the method of measuring the quantity of air introduced was erroneous. Possibly the quantity overstepped the 2½ per cent.; and he queried if, in a small gas-works, the trouble taken to measure the quantity of air introduced would warrant its adoption.

Mr. H. HAWKINS (Limerick) said he took a deep interest in the paper, as he and his brother were the pioneers in the practice of introducing air. Thirty-one years ago, they introduced the subject of the drawing in of air; and he believed it had been working continuously in various gas-works ever since. To-day, he was working it somewhat similarly to what they did then, but in a little different way. He had a small apparatus, which he made some four-and-a-half years ago. It cost about 7s. 6d. He put it into operation on the four purifiers, 35 ft. by 25 ft.; and he never changed a purifier for a year and nine months. He would not have changed it then, if it had not been that the pressure got too

high. Previous to the adoption of this process, it used to cost about £12 a week for purification. Twelve men were employed on purification alone. It was a very old custom they had, of carrying the purifying material in a bag—about 2 stones at a time. They used to start to empty a box on Monday morning, and would get it emptied by Wednesday night; and by Saturday at 2 o'clock they had it refilled. The last box he emptied was, he thought, in September, 1910. He put eight men on; and they finished the work by 10 o'clock. They had it re-filled by about 2 o'clock. So it cost him but little for purification. He might tell them the oxide which came out realized more than the cost of the new material.

Mr. C. B. OUTON (Inchicore) presumed the chief object of the author was to bring under their notice the utility of the combination of lime and oxide. This combination, he took it, could only be made in reasonable sized gas-works. In one of the works which he managed at Inchicore, with an output of 28 millions, they had been in the habit, during the last 15 years, of using a combination such as Mr. Hoskins described, but in a somewhat different way; and he would like an expression of opinion as to the scientific qualities and the proper order of their method of working. They had six purifiers, 12 feet square; the last two being oxide, and utilized for catch purposes. The remaining four were connected together by a dry centre-valve, and the gas circulated in them anti-clockwise. Two of the diagonal ones were filled with oxide; the remaining two diagonal ones contained lime. The usual method of working was by a system of rotation, as recommended in the paper. No. 1 would be spent lime, No. 2 oxide, No. 3 clean lime, and No. 4 oxide. The object of working in this way, though he might be incorrect, was to remove the bisulphide of carbon compounds in the first purifier, and also cause the carbonic acid to pass on to the second, together with the sulphuretted hydrogen. In the second, of course, the latter impurity was generally removed; and in the third one, the carbonic acid was taken out by the clean lime. He had learned that day, from the paper, that the first impure lime box might contain something like 10 per cent. of free sulphur. This was entirely new to him. When the second purifier was showing signs of fouling considerably, and thus imparting its sulphuretted hydrogen to the clean lime—to the third box—the method was reversed. No. 1 was made the clean lime, and No. 3 was then made the first; so that the ordinary method of rotation would be 3, 4, 1, 2. This system was perpetuated throughout the entire year. The intention was to reproduce, on a small scale, what, he believed, was done in large gas-works at one time, but where they had complete sets of purifiers for each. He admitted 1½ to 2 per cent. of air at the inlet to the exhaustor—that was, at the outlet of the scrubber; the exhaustor being placed between the scrubber and the washer. So far as he could judge from Mr. Hoskins' paper, it would be much more advantageous to admit the air at the inlet to the condensers, in order to absorb some of the lighter hydrocarbons which would otherwise be deposited in the condensers along with the tar. The admission of air had the desired effect of removing the noxious unpleasantness, both in the lime and in the oxide purifiers. The fifth and sixth boxes, to which he had already referred, were simply catch ones, for the purpose of removing all traces of sulphuretted hydrogen during the changing of the centre-valve. They had not been renewed for over eighteen months. The two diagonal oxide boxes were only changed once every nine months; and then the change was due to the rising of the pressure, to which Mr. Hoskins had already referred. He would be very much obliged for an expression of opinion from Mr. Hoskins as to the efficiency of the combination to which he referred, as he believed he was the first to adopt it.

Mr. J. WHIMSTER (Armagh) joined in the expression of thanks to Mr. Hoskins for his paper. Unlike Mr. Reid, however, he thought it was eminently suitable for an Association like theirs, and for managers of the very smallest works. A knowledge of the principles of purification seemed to him to be even more essential to the managers of little works than to those having charge of big ones. The latter had generally men under them to attend to these things so carefully that they did not require to look after them themselves; but if the manager of a small works did not understand the principles on which he was working, he was sure to get into trouble. He (the speaker) had been called in several times to small gas-works where they could not get their gas purified, and he found that they had been changing purifiers every day. The fact was that they had been trying to purify gas with clean lime, and it could not be done. He cured the trouble by simply making them empty one box and fill it with spent lime. Then the purifiers did their work. The first purifier, with spent lime, took out the carbonic acid, and the clean lime then took out the sulphuretted hydrogen. While he thought Mr. Outon's principle was right enough, it was not doing what he fancied it was doing. The third purifier in his series could not be carbonated, and work as a purifier afterwards. He did not know anything about oxide purification, as he had not required to use it. Oxide was not cheap in his quarter, and lime was. Lime purification did not cost him more than ½d. per 1000 cubic feet; and this was cheap enough.

Mr. W. E. YOUNG (Tipperary) stated that in the works he managed he put in air at the hydraulic main. He had not a tar-column, and consequently he had a tar-seal on the main. He put in a good proportion of air at the hydraulic main, without depreciating the illuminating power of the gas. His make of gas was about 80,000 cubic feet per 24 hours. He had only two purifiers (he thought they were 10 feet square); and though he had only

the two boxes, in the depth of winter he could work the rotation system quite successfully. The purifiers were tested every morning. Possibly during the morning, when the retorts were working strong, they might get a foul test; but when the retorts went off, he got a clean one. He had sometimes gone on for three months without having changed a purifier. He thought it was better to take in air either at the condensers or the hydraulic main than at the inlet to the purifiers.

Mr. J. E. ENRIGHT (Tralee) stated that up till 1907 he purified with lime. In that year he introduced new purifiers, of larger size, and started using oxide; and he then had serious complaints about the quality of the gas. He thought the matter was more prejudice than anything else, because ordinary people had the idea that lime added to the illuminating power. Till then he had had three purifiers. These, with a make of 20 million cubic feet, cost almost £100 a year. In 1907, he bought £40 worth of oxide; and he was still using it. His annual make of gas was now 27 million cubic feet. They had not changed a purifier since January. He admitted air at first at the inlet, and now at the outlet of the condensers—from 2 to 2½ per cent. He thought he would try the inlet to the condensers again.

The PRESIDENT said he had had some experience in introducing a small quantity of air for revivification *in situ*, and with very marked results. He had advised two or three of his brother managers to do the same; and he thought they could all bear testimony to the effect that it had been a material advantage to them to do so. Within the last three or four years, great prominence had been given to the use of air. He started exactly seven years ago, before he had heard much about it, experimenting with the admission of small quantities of air. He did so still; and it was really marvellous the results he had. People might say that it was impossible to work with two boxes; but he could tell them, without fear of contradiction, that with two boxes they got remarkable results, and they never had any complaint. At the present time they were working with two boxes, and the last change was made in February. He had passed more than 10 million cubic feet of gas since the last change; and the boxes were only 10 feet square. He could compliment Mr. Outon, who had six boxes, and who made practically the same quantity of gas with four times the purifying capacity. It was a debatable point as to which was the best place to introduce air. He was inclined to think Mr. Hoskins was right, and that the inlet to the condensers was the proper place, because it stood to reason that there the gas would pick up some of the lighter hydrocarbons. But why not go farther back, and introduce the air at the hydraulic main, as Mr. Young, of Tipperary, did? Did it not stand to reason that the gas would pick up more of the hydrocarbons in the hydraulic main, where the gas was very much hotter, particularly if they pre-heated the air before introducing it? With him the air entered in a hot state; and it was really surprising to find how little variation took place in the illuminating power. As to the cost, it was strange that in one year he should have made a profit in his purifying account. This was due, of course, to his having under-estimated the stock of oxide. During that year he sold spent oxide containing 63 per cent. of sulphur, and actually made a profit on purifying. Mr. Hoskins seemed rather to contradict himself, when he spoke of a depreciation both of heating and of lighting power—the latter by about 0·25 of a candle—when oxide alone was used, and later on said the loss was inappreciable. He (the President) would not like it to go forth from the meeting that the proper admission of air had any deteriorating effect on the quality of the gas. He did not believe that it had.

Mr. HOSKINS, in closing the discussion, said Mr. Reid had some doubt as to whether the rotation system could be applied in small works. He (Mr. Hoskins) thought this had been already dissipated. In the experience of several gentlemen, two boxes had been rotated; and he supposed that if they were to alternate between the sending of the gas up and the sending of it down they would get some form of rotation with one box. They were about to introduce the gas to the top of the purifiers; and, if he were in charge of works, this was where it would be admitted. His paper, which, after all, was merely ancient experience dished up again, was intended only to induce them to try such things. There was no difficulty whatever in small gas-works in measuring the quantity of air admitted. They knew what their make of gas was; and if the regulating cock were set to give about 2 per cent., he thought that, even in small works, this would not involve very much labour or cost. He intended his paper to be applicable to small works. The choice of the purifying agent must really depend on the cost of the raw material and the facilities existing for the disposal of the product. He was very proud indeed to learn from Mr. Hawkins that the process he recommended had been going on for thirty-one years. His object was not to try to introduce a combination of lime and oxide, but rather referred to works where they might probably use a combination, but where, in all probability, they were using either the one or the other. In every case, the introduction of the quantity of air mentioned would have the desired effect. Whenever lime became carbonated, it could not take out any more carbonic acid or sulphuretted hydrogen. Speaking off-hand, if he were putting in spent lime first, he would fill this particular box, and put the clean lime next, and absorb all the extras that were going forward; and in the second purifier they would get nothing but calcium hydroxy-hydrosulphide. When they introduced into an ordinary lime purifier the quantity of air he had recommended, the sulphuretted hydrogen was oxidized; and he had repeatedly got anything from 6 to 10 per cent. of free

sulphur in the foul lime purifier, apart from other sulphur which was still in combination. This meant that a corresponding quantity of sulphuretted hydrogen which would go to foul the next purifier was in the form of water, and did no harm at all. If they introduced air into gas under pressure, they had to pay something to get it in. What was exactly the point between the retort and the inlet of the exhauster at which air should be admitted? It certainly should not be at the outlet of the condensers, for the reason that, in introducing air, which was non-luminous, even if they could make it combine with the gas and carburett the air, if they did it at any point where the gas was still warm, and still depositing light hydrocarbons, it did not matter whether it was at the hydraulic main or the foul main, if the gas was still hot, and contained hydrocarbon vapours. Sending the air in at the inlet of the condensers was simply a matter of convenience. If they liked to put it in at the top of the retort-bench, there was no reason against it, only the place was troublesome to get at. He did not quite understand the difficulty Mr. Whimster had in purifying gas with fresh slack lime. The foul gas went into the clean lime, and carbonated it; and if they carbonated lime it was done. This was quite interesting to him, as he had not come across it before. It must be very largely a question of the time-contact; and in that case it should soon cure itself. Lime would certainly not work if it were put in freshly slack and hot; but if it stood for a day or two it would be all right. The reason for putting air in at the inlet of the condensers was that at the outlet the gas was fairly cold, most of the light hydrocarbons had been deposited, and they could not get quite so satisfactory an introduction as they would at the inlet. He did not think pre-heating the air was necessary, because the gas was hot at the inlet of the condensers, and the 2½ per cent. of air they put in would be sufficiently heated, at the temperature of the gas, without the necessity for pre-heating. As to the apparent contradiction, the reason they did not get any depreciation in the illuminating power of the gas was that, as the air they introduced was carburetted, it did not have any deteriorating effect. He had made a great many experiments as to the depreciation of illuminating power by carbonic acid, and found it to be within a very small fraction of 0·75 candle for every 1 per cent. of carbonic acid present.

Reduction in Price at Sheffield.

At a meeting last Wednesday, the Directors of the Sheffield United Gaslight Company decided to reduce the price of gas by 1d. per 1000 cubic feet, from the time of the reading of the meter-indices for the September accounts. The charges will from that date be 1s. 3d., 1s. 1d., and 11d. per 1000 cubic feet, according to consumption, and 11d. per 1000 cubic feet for gas-engines. The charge for the public lamps from Oct. 1 will also be at the rate of 11d. per 1000 cubic feet.

Improvements at the Bury St. Edmund's Gas-Works.—At the recent half-yearly meeting of the Bury St. Edmund's Gas Company, at which the usual dividends of 10s. and 7s. per share, less income-tax, were declared, the Chairman (Mr. F. C. Andrews) stated that there had been a considerable increase in the sale of gas in the past six months. He called the shareholders' attention to the improvements which are being carried out, and stated that when they are completed, as it was hoped they would be by the end of September or the beginning of October, the Company would, he thought, be in possession of model works. At the close of the meeting, the Directors and shareholders inspected the improvements, which the Engineer and Manager (Mr. A. F. Young) assured them would greatly contribute to the Company's welfare.

Gas Supply in Russia.—According to an article in the Engineering Supplement to "The Times" last Wednesday, St. Petersburg consumes more gas for public lighting purposes than Moscow; the requirements for the current year being estimated at 163,700,000 cubic feet and 112,100,000 cubic feet respectively. In Moscow, the private consumption has increased annually from 213,400,000 cubic feet in 1907 to an estimated total of 297,000,000 cubic feet for 1911. The prices for 1910 were 5s. 5d. per 1000 cubic feet in St. Petersburg, 6s. 4d. in Moscow, and 6s. 3d. in Odessa; but for 1911 Moscow will charge at the lower rate of 5s. 10d. Odessa has now practically determined to extend its system at a cost of 2,000,000 roubles; while St. Petersburg is considering the construction of new plant capable of an annual production of 2000 million cubic feet of gas. Similarly, Moscow is also proposing to meet growing demands.

Failures of the Electric Light on Bank Holiday.—Owing to damage to a cable in Nelson Road, Yarmouth, there was a fracture of the electric light for nearly an hour between eight and nine o'clock on the night of Bank Holiday. Private houses, shops, restaurants, and places of amusement were suddenly deprived of light; but wherever a gas installation was available it was at once brought into use. The Wellington Pier and Gardens, being lighted from another circuit, escaped embarrassment and consequent loss. The Britannia Pier, however, which at one moment was a blaze of light, was the next plunged into semi-darkness. The audiences at the places of amusement affected took the failure in good part; and there was no accident through panic. A total failure of the electric light installation in the Pier Pavilion at Herne Bay occurred on Monday last week. The unfortunate circumstance was the more serious inasmuch as the building was crowded with holiday folk, and a specially attractive programme had been prepared. It was, however, fully carried out, by having recourse to the prudent provision under such contingency of a gas supply, which consisted of a series of inverted incandescent burners. No inconvenience was therefore felt. This is another instance of gas coming to the rescue, and making good the result of tricks on the part of its erratic rival.

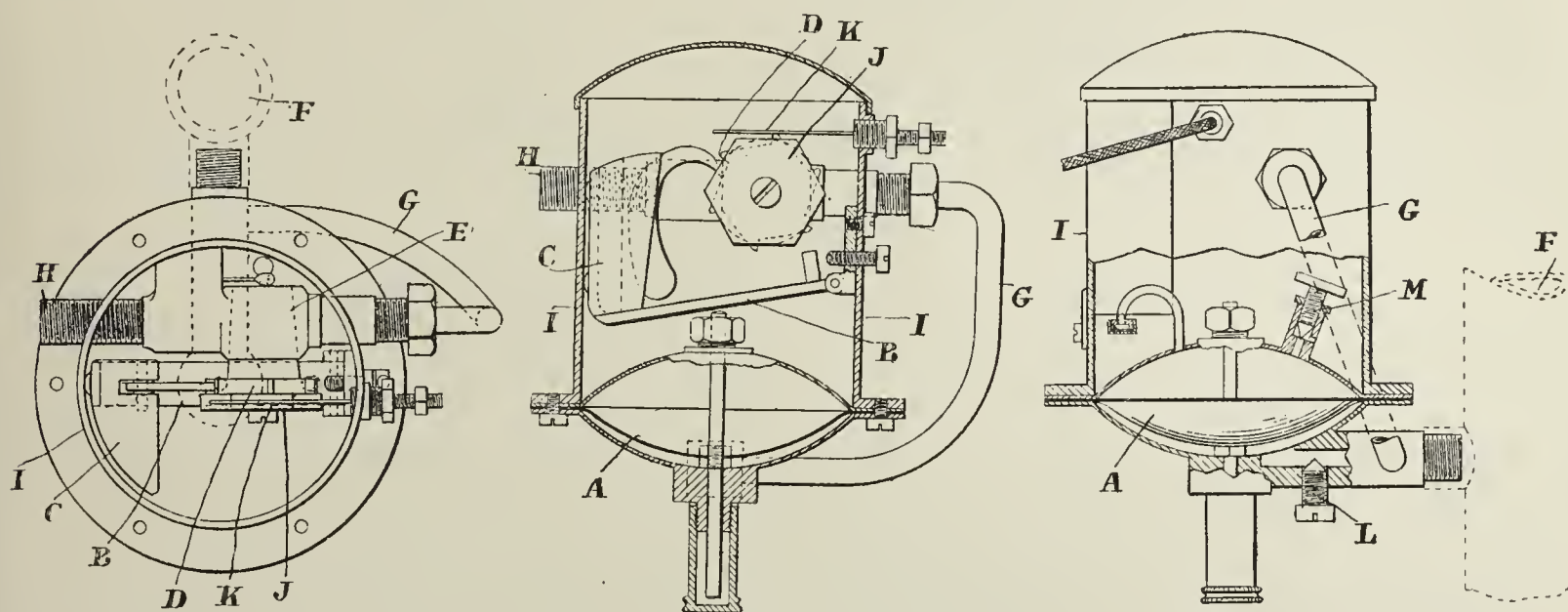
REGISTER OF PATENTS.

Igniting and Extinguishing the Pilot Jets of Gas-Burners.

ROSTIN, H. P., of Tottenham.

No. 16,656; July 12, 1910.

This invention relates to appliances by which, while gas is being admitted to the burner, a bye-pass is opened temporarily, and at the same time an electric contact is formed and broken—thus allowing an electric current to flow through a platinum wire, which, being heated up, ignites the bye-pass gas and in due course the gas is ignited at the burners; the pilot jet being extinguished after ignition of the main burner. It consists of a simplified construction of appliance by which the whole operations of turning on the gas, lighting the pilot jet, extinguishing the pilot jet, and turning off the gas are effected by an increase of pressure in the main.



Rostin's Pilot Lamp Lighter and Extinguisher.

electric circuit at the same time as the plug allows the gas to enter the bye-pass tube. The latter extends to near the burners; and at the outlet of it is fixed a platinum wire to be heated by the current so as to ignite the pilot jet.

As the pressure sometimes rises so rapidly that the movement of the diaphragm, and consequently of the cock, would be too quick to allow the operations stated above to take place reliably, it is necessary to retard the movement of the diaphragm. For this purpose the passage of gas to below the diaphragm is restricted by a screw L by which the flow can be regulated to any speed. As, however, in cases of high pressure lighting this may not be sufficient, another screw M regulates the exit of air from the chamber above the diaphragm. Thus the operation is made to last sufficiently long to ensure reliable working. A non-return valve leads from the chamber above the diaphragm, to allow of quick replacement of air above it after lowering the gas pressure.

As further a diaphragm, if made of leather or the like, could be stretched out by the pressure of gas, especially when high pressure is employed, it is necessary to make provision to prevent this occurrence as well as a possible percolation, and consequently loss of gas, through the diaphragm. To this end the concave top plate enclosing the diaphragm is so dimensioned as to allow it to touch it when fully expanded; and "thus the leather gets pressed against the harder material, which preserves all the strain and saves the diaphragm."

Delivering Oil to Water-Gas Plants.

STELFOX, J. C., of Victoria Street, S.W.

No. 30,026; Dec. 24, 1910.

This invention relates to the delivery of oil by steam pressure of the type in which the liquid is admitted to a chamber by gravity or by condensation of steam within the chamber and is expelled therefrom by steam pressure—the steam also serving to heat the liquid; and it has for its object to provide apparatus particularly suitable for use in connection with the carburettor of a water-gas plant, possessing the advantages pertaining to apparatus described in patent No. 25,385 of 1905, "but of simpler and cheaper construction."

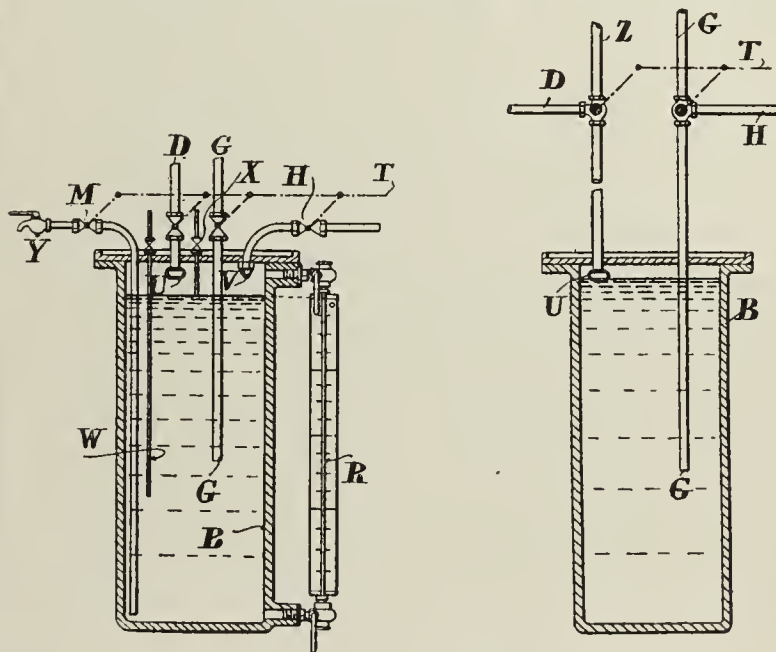
The present apparatus comprises a single cylinder or chamber, the upper portion of which is adapted to receive charges of the liquid to be delivered, while the lower portion—consisting approximately of the lower half of the cylinder—is adapted to contain water due to the condensation of the steam, and to retain the same for a time sufficient to permit of the transfer of heat to the charge; thus considerably increasing the heating efficiency of the apparatus. The inlet and outlet for the liquid charge, the steam supply inlet, and the outlet for water of condensation, are controlled by valves connected to an operating rod; the arrangement being such that when, by means of the rod, the steam supply is cut off and the liquid outlet closed, liquid will be caused to enter the cylinder. On the other hand, when, by means of the rod, the liquid outlet is opened, the steam supply opened, and the liquid inlet closed, the liquid will be displaced from the cylinder by the direct action of the steam.

The illustrations show a plan of the apparatus with the top removed, a longitudinal section, and a part sectional elevation.

A flexible diaphragm A is placed between two concave plates of metal so as to form a chamber with the diaphragm inside. When there is no pressure under the diaphragm or when it is at day standard, the diaphragm is held down by a weight, spring, or in any suitable manner. When gas, however, is turned on and gets to the diaphragm, or when the pressure is raised, the diaphragm is caused to expand and a rod attached to it raises a hinged lever B having a weight C to which is attached a balanced pawl which turns a ratchet wheel D fixed on the plug of the gas-cock E in such a manner that the plug opens the passage of gas from the supply pipe F, through the pipe G, and then to the bye-pass pipe H while it is being turned, and closes it again when the diaphragm has reached the point of maximum expansion.

The lever B is provided with a stop which acts against a regulating screw projecting inside the casing I so that the travel of the balanced pawl is regulated and ensures the gas-cock being moved to the correct position. Alongside the ratchet wheel D is fixed another wheel J of hexagon shape, and containing insulated parts corresponding with the perforations of the plug, so that a contact rod K is able to close an

Two forms of apparatus are illustrated. In the first, B is the cylinder; D, a valved steam pressure connection into the top of the cylinder through a steam distributor U; H, the valved connection from the tank or reservoir (not shown) from which the liquid is to be drawn, ending in a nozzle or sprayer V in the top of the cylinder; G, the valved discharge connection through which the liquid is to be delivered; W, a test-pipe running down below the bottom of the discharge pipe as a means of ascertaining whether the water has risen to this level if the gauge R (hereafter referred to) is not in use; X, a valved air-vent terminating below the level of the steam inlet, so as to control and maintain an air space in the upper portion of the cylinder;



Stelfox's Oil Deliverer to Water-Gas Plants.

M, a valved outlet for the condensed water terminating at the outer end in a regulating cock Y, which can be adjusted to allow the water to escape at any desired rate; and R, a gauge glass and cocks with scale, which is slightly movable, so that it can be adjusted to compensate for any difference in the level of the condensed water at the beginning and end respectively of each discharge or "run" which may occur owing to the discharge of water through the outlet M being more or less than is condensed and collected at the bottom of the cylinder during the same period.

The levers of the four cocks or valves on the connections M, D, G, and H are connected, according to one method, by an operating rod T, so that M, D, and G are open when H is shut, and *vice-versa*. The

cylinder being full of oil—except for the condensed water in the bottom—up to the end of the air-vent X (which coincides with the zero of the movable scale in its central position), the connection H being open, and the connections M, D, and G shut, the rod T is moved over, shutting H and opening M, D, and G. Steam under pressure then enters the top of the cylinder through the connection D, depressing the surface of the oil and discharging it through the connection G. At the same time the condensed water (which sinks below the oil) is discharged through the connection M; the regulating cock Y being set to keep the level of the water as nearly as possible constant. When the desired quantity of oil has been delivered, as indicated upon the gauge and scale (the latter having been so adjusted that the water-level is opposite the same point on the scale as it was at the beginning of the discharge), the rod and cocks are reversed—M, D, and G being shut off, and H opened. The steam then in the upper portion of the cylinder is condensed by the incoming oil, which automatically fills the cylinder to the zero-level ready for the next discharge or “run.”

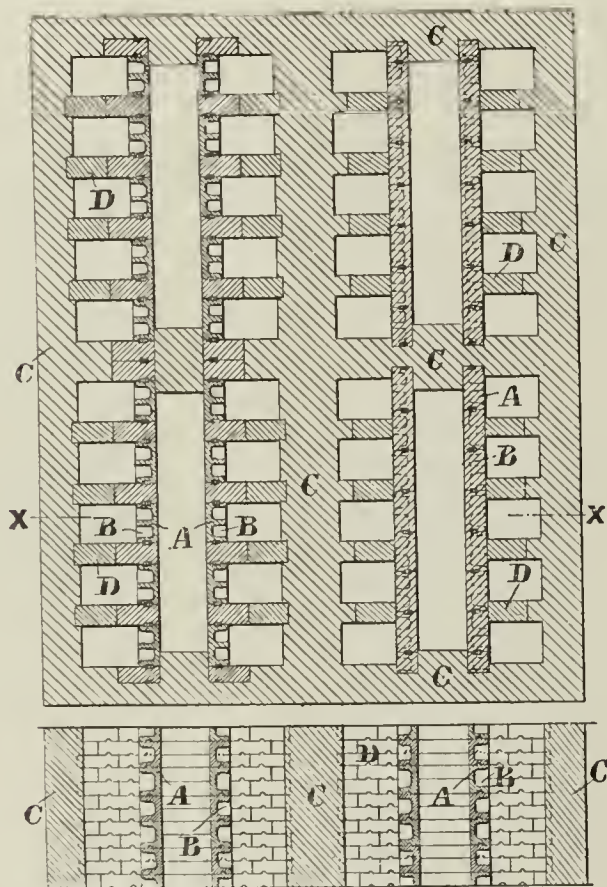
The vent X can be replaced by a combined air and steam exhaust pipe Z connected with the steam supply by means of a three-way cock, as shown in the second sketch. Thus, when the steam is cut off, in conjunction with the other operations already described, the cylinder is simultaneously opened to the atmosphere through the exhaust pipe Z, permitting its steam and occluded air to escape. The three-way cock is placed at a level higher than is likely to be attained by the liquid entering through H. With this arrangement, the oil inlet H and outlet G can also be combined in one connection with a three-way cock (as shown), or the inlet H can be automatically controlled by a non-return valve, opening to admit the liquid, but shutting against the steam pressure in the cylinder. There may also be provided in this arrangement a scale or test pipe, and an outlet for the water of condensation, having its valve connected to the operating rod T, as in the first construction shown.

Vertical Retorts.

WOODALL, H. W., of Lytchett Matravers, Dorset, and DUCKHAM, A. M'D., of Little Bookham, Surrey.

No. 16,630; July 12, 1910.

The patentees, in their specification, point out that the difficulty due to the strains set up in the structure of vertical retorts owing to expansion and contraction has been met by “providing a substantial lining of hollow bricks forming also the heating flues and constituting an independent structure separate from the outer brickwork.” According to their present invention, the difficulty is overcome by constructing the retort in such a manner that the lining bricks and the brickwork containing the heating flues are bonded together to form a whole, which is free to move in the supporting brickwork, as shown in the illustration—a horizontal section through a setting of four retorts, and a part vertical section on the line X.



Woodall and Duckham's Construction of Vertical Retorts.

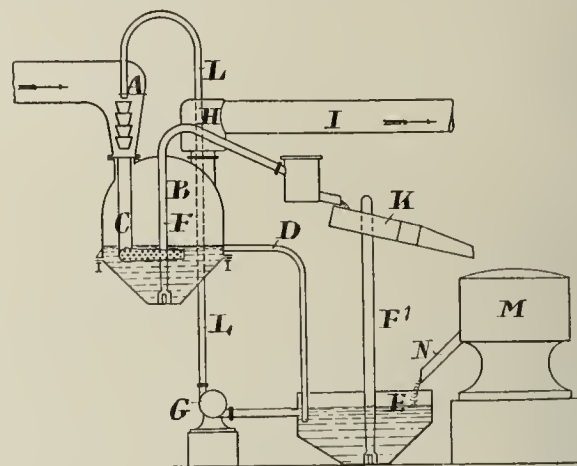
The bricks A of which the sides of the retorts are constructed are made with tongues and grooves, and have panels or recesses B in their faces which form inner surfaces of the flues; the other faces, which form inner surfaces of the retorts, being plain. The walls C form the back walls of the flues and the ends of the retorts; and the four of these walls which form the outside of the structure are surrounded with brickwork (not shown), which supports the whole and prevents radiation. The surrounding brickwork, however, is not in any way connected with the walls. The division walls D of the flues are also constructed of tongued and grooved bricks bonded both with the side walls of the retorts and the walls C which constitute the backs of the flues.

Sulphate of Ammonia Manufacture.

HENSS, E., of Soden-at-Taunus, Germany.

No. 20,875; Sept. 7, 1910. Date claimed under International Convention, Sept. 8, 1909.

For the purpose of obtaining sulphate of ammonia from dry distillation gases deprived of tar in a hot state, the patentee proposes that the gas should be brought by means of a suitable acid jet injector (diagrammatically shown at A) into thorough contact with sulphuric acid, whereby the largest portion of ammonia is converted by the acid into ammonium sulphate and passes with the acid falling down, into the saturator B. In this way, it is not necessary to give the gas the “dipping” into the depth used hitherto; on the contrary, it is sufficient to have a considerably smaller “dipping,” as only small quantities of ammonia are to be combined.



Henss' Sulphate Apparatus.

The small “dipping” results, it is said, in the gas after escaping from the liquid in B being still under sufficiently high pressure to pass into the gasholder without necessitating separate gas-conveying devices. The gas arrives at C, and is distributed in the usual manner.

The salt settling at the bottom of B is pumped, as well as the salt settling in E, by means of ejectors F F' to the draining apparatus K, and passes from the latter to the centrifugal machine.

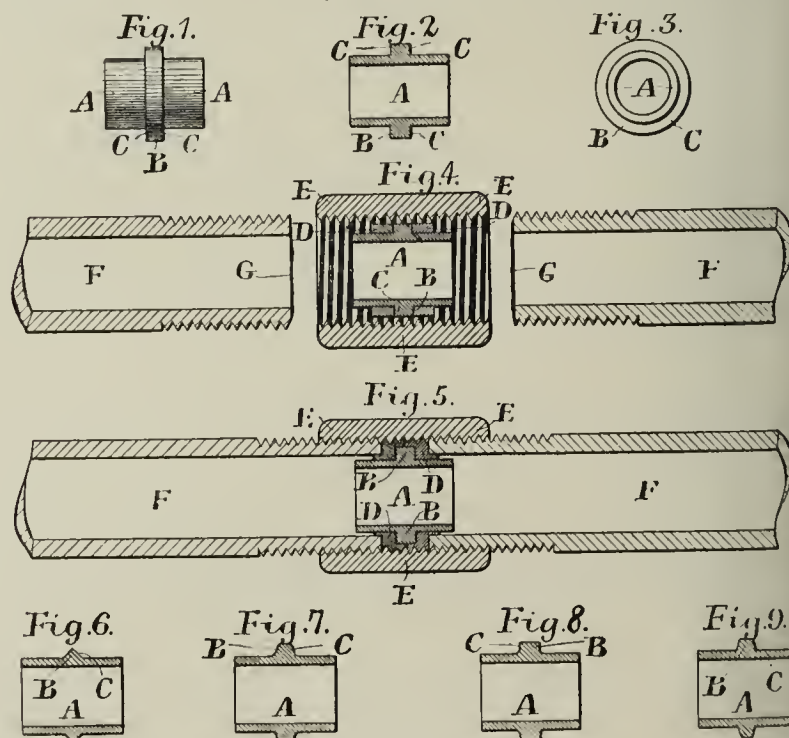
The lye obtained in the centrifugal apparatus M escapes through the pipe N into E, where is also introduced the washing substance, and passes through the pump G and pipe L into the acid injector A. The boxes B and E are connected by an overflow pipe D in order to ensure circulation of the washing substance; and the gases washed pass through the condenser H into the gas-pipe I.

Pipe Joints.

BARRETT, S. R., of Birmingham.

No. 30,189; Dec. 29, 1910.

This invention has for its object to enable a sound fluid-tight joint to be made between ordinary screwed pipes and socket fittings for gas or water, without the necessity of specially preparing either the ends of the pipes or the sockets. It relates to the type of joint in which an internal ferrule is used in conjunction with packing materials.



Barrett's Pipe Joints.

An internal ferrule is employed with a projecting collar or flange provided with true sides, which are preferably smoothly machined or faced. The sides may be parallel or coned or grooved or waved as desired; but they are always “truly and smoothly faced.” Washers or packing of soft metal (such as lead) are placed upon each end of the ferrule, which is then inserted centrally in the ordinary tapped socket or union; and the two pipes are screwed tightly into the socket. As they are screwed, the ends bed themselves in the soft washers; but

as the latter bear against the smoothly faced sides of the collar, they rotate freely upon the smooth bearing as the pipes are turned, "and are not therefore cut to bits but are gradually pressed outwards until the material flows into the threads of the socket and forms a secure joint."

Fig. 1 is an elevation of a ferrule with a flange or collar; fig. 2, a sectional view; and fig. 3, an end view. Fig. 4 is a sectional view of the ferrule in place in a socket or union, with two pipes ready for screwing into the union; and fig. 5 shows the joint completely made. Figs. 6, 7, 8, and 9 show modifications.

The ferrule A is produced with a collar or flange B faced on its sides at C to form a smooth bearing surface for lead washers D or other suitable packing. Lead, the patentee remarks, has been found very suitable as a packing, and may be formed into washers, which are convenient for handling, or may be cut off from strip or wire and packed or wound into place. Other packing material, such as india-rubber, may be used; being chosen "with a view to obtaining the best joint having regard to the fluid that is to pass the pipe system." The diameter of the ferrule is approximately the same as the internal diameter of the pipes to be joined; and the diameter of the collar or flange is approximately that of the interior of the socket or union.

The washers are placed on each side of the collar of the ferrule; and the latter is then inserted centrally in the socket or union E, as in fig. 4. The pipes F are then screwed tightly into the union E in the usual way; and the end faces G (which are not machined but may be uneven) embed themselves in the washers. As the pipes turn, the washers rotate upon the smooth bearing faces of the collar, "so that they are not cut to pieces by the rough ends of the pipes; but, as the latter close in, the material of the washers is gradually caused to escape and flow into the threads of the union and around the pipe ends, and a thorough joint is made.

Instead of being parallel, the sides of the collar may be conical as in fig. 6, curved as at figs. 7 and 8, truncated conoidal as at fig. 9, or otherwise formed "so long as they are true at the sides to form a bearing or abutment to enable the washer or packing to flow into the threads of the union under compression as the pipes rotate."

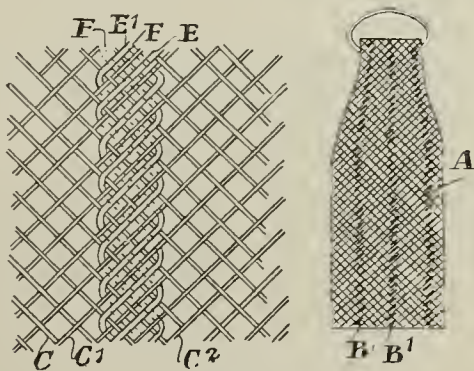
The invention is adaptable wherever joints requiring special treatment of the pipes would be too costly or the special pipes could not be obtained. All the machining and preparation that is required is on the small ferrule.

Incandescent Gas-Mantles.

HÖHLE, W., of Barmen, Germany.

No. 465; Jan. 7, 1911.

This tubular fabric for incandescent gas-mantles is on certain portions of its circumference stiffened by stronger strands of threads that are not inserted in the fabric as is usually the case, but consists of a braid itself connected with the general fabric by being braided with it as shown.



Höhle's Incandescent Gas-Mantles.

The tubular braided fabric A contains stiffening portions B B¹, which are formed by single threads braided together with the main fabric. The threads C C¹ C² are the threads which form the main fabric and which are crossing each other as is the case in an ordinary braid. E E¹ and F F¹ are threads which within the main fabric cross each other and at the same time are connected with the adjacent threads C C¹ C².

Automatic Gas-Analyzer.

MERTENS, A., of Cruybeke, Belgium.

No. 11,851; May 16, 1911. Date claimed under International Convention, May 18, 1910.

This invention relates to apparatus designed to measure, in a mixture of several gases, the proportion by volume of one or more of the constituent gases. It is more particularly suitable for measuring the percentage of carbonic acid in the combustion products of a furnace.

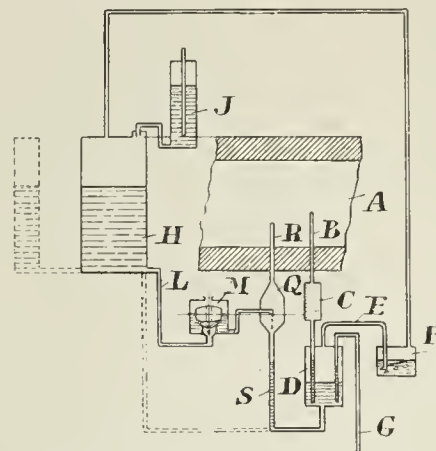
The apparatus is chiefly distinguished from known plant of the kind by the fact that it does not register for each analysis the proportion by volume of the gas under consideration, but gives at the end of a determined time a mean result covering a determined number of analyses.

To this end the arrangement—which, as usual, comprises a gas-displacer, and an absorber—is characterised by the fact that the gas-displacer is fed with liquid from a receptacle of given volume connected to a kind of Mariotte vase tending to compensate for any flow of liquid from the receptacle directly a depression is produced therein, and also by the fact that the absorber is connected to the receptacle in such a way that the volume of gases remaining after passing through the absorber is sent into the receptacle feeding the gas-displacer.

Under these conditions, at each operation of the gas-displacer there issues from the receptacle which feeds it a volume of liquid corresponding to the capacity of the gas-displacer; and there enters into the receptacle a volume of gas corresponding to the capacity of the gas

displacer, less the quantity of gas absorbed. Thus the Mariotte vase furnishes to the feeding receptacle a volume of liquid serving solely to make up the difference between the volume of liquid which has left and the volume of gas entering the receptacle—that is to say, the volume of gas absorbed in the absorber. By a simple proportion, therefore, the relation of the quantity of absorbed gas to the total quantity of gas which has been analyzed can, after a number of analyses, be easily established.

In practice, the apparatus would be combined with a delivery regulator, allowing of proportioning the volume of gases analyzed in a unit of time to the pressure existing in the enclosure containing the gases—for example, to the draught of the flue to which the apparatus was connected if the percentage of carbonic acid in the products of combustion of a furnace was to be measured.



Mertens' Automatic Gas-Analyzer.

In the diagram, A indicates a flue to which is connected (by a pipe B provided with a dust-filter C) a gas-displacer D, connected by a pipe E to an absorber F of suitable construction. The suction of the gas into the displacer is effected by the automatic emptying of the displacer through the medium of a syphon G. The forcing of the gas into the absorber is effected through the feeding of the displacer with a liquid (as water, for example) conducted from a receptacle H—an operation entirely automatic. The liquid flows from H into the displacer until the moment when the syphon automatically fills and causes the rapid emptying of the displacer, which emptying is accompanied by a suction of gas that stops when the syphon empties itself and the forcing of the gas sucked in recommences by a fresh arrival of liquid from H. The receptacle H is a closed vessel connected to a Mariotte vase J, regulated so as to cause the flow of a certain quantity of liquid from H directly a depression is produced in it. Moreover, the absorber F is connected to H so that the non-absorbed gas is forced into H.

In working the apparatus, the Mariotte vase J, as well as the receptacle H, is provided with a graduation allowing of easily ascertaining the volumes of liquid which have flowed from them. Consequently, when, at the end of a given time—after a certain number of hours work, for example—it is desired to have an idea of the mean conditions of working of the furnace (say, the mean proportion of carbonic acid contained in the combustion products), it is only necessary to take note of the quantity of liquid which has run from the Mariotte vase J, as well as the quantity which has run from the receptacle H. The latter quantity is easily determined by adding to the volume V, indicated by the graduation as having flowed from H, the volume v of the liquid

which has flowed from the Mariotte vase J. The proportion $\frac{V}{v+V}$ then immediately gives the proportion of the gas absorbed with relation to the total quantity of gas treated.

In the apparatus thus constructed, account is not taken of the clearances which always have to be filled with liquid. To furnish the necessary quantity of liquid to compensate for the effect of these clearances, a compensating vessel (indicated in dotted lines) is connected to the receptacle H.

When it is required to measure the percentage of carbonic acid in the products of combustion of a furnace with the object of ascertaining the loss of fuel which results from imperfect combustion, it is not sufficient to know the mean percentage of carbonic acid in a collection of samples taken at regular intervals; it is not even sufficient to know the percentage of carbonic acid in each of the samples taken separately as given by registering analyzers. In fact, the loss of fuel during a given time varies not only with the mean percentage of carbonic acid in the products of combustion during this time, but also with the quantity of gas which has passed into the flue during the same time. To take account of this fact, it is possible to cause the volume of gases analyzed in the unit of time to vary with the draught of the flue; and to this end, instead of connecting the receptacle H directly to the gas-displacer D, a pipe L, leading from H, extends to a chamber M, in which the level is maintained constant by a float which more or less closes the liquid inlet through the medium of a pin or point valve. The chamber M is provided with a flow pipe the end of which is at the same level as the liquid contained in M. The pipe extends into a chamber Q connected to the flue by a pipe R and to the gas-displacer D by a pipe S. In these conditions, the quantity of liquid which flows from H into M, and, consequently, towards the displacer D, varies with the intensity of the depression which is produced in the flue A; and it is the extent of this depression which regulates the delivery.

Gas-Burners Using Compressed Air.

EBERLE, K., of Friedenau, near Berlin.

No. 2151; Jan. 27, 1911.

Gas-burners using compressed air, in which the currents of gas and compressed air cross each other in an ante-chamber of the burner-tube, and then flow into the latter in a straight and unchanged direction, are

well known—according to the patentee. By his invention, such burners are provided with an arrangement by which the jets of gas and compressed air (after meeting one another) are given rotary or whirling movements in a different direction of flow, in order that they may be thoroughly mixed, by means of suitable guide or deflecting surfaces of different kinds, before the mixture of gas and air flows to the burner-tube. The arrangement may be such that each gas-jet is encountered by a jet of compressed air.

The gas is supplied by a pipe B, and the compressed air by a pipe C to a double tap or cock A, which is itself of known type. The gas flows through the cock into a pipe D—closed at the end and provided with an enlarged head or other suitable guiding or deflecting surface I. Above the head several laterally directed outlet apertures K are provided in the pipe D. The pipe is enclosed by a chamber F, which is separate from the mixing-chamber G, to which chamber the compressed air is conveyed by means of the pipe E from the cock. Several apertures or pipes H (the latter carried into the mixing-chamber) lead from this chamber in such a way that the mouth of each is near or over a gas outlet aperture K. The mouth of H may be of such a form that the compressed air escapes in a broad stream, which encounters the gas current at a suitable angle and has a suction or propulsive action thereon. A pipe N, leading to the burner-head X, is connected with the chamber G surrounding the pipes H and D and the head or guide surface I. A funnel-shaped enlarged guide or deflecting surface S is so arranged within the chamber G in front of the entrance to the pipe N that the current of compressed air and gas forced between I and G towards the pipe N cannot pass directly into the inlet aperture of the pipe N, but is first diverted therefrom and caused to take an altered direction of flow before it passes into the burner-tube N.

The action of the apparatus is as follows: When the cock is opened, a passage is clear first for the gas and then for the compressed air. The gas introduced at ordinary pressure into the pipe D passes out of the lateral apertures K into the chamber G. The compressed air then flows through the pipe E into the chamber F and through the apertures or pipes H into the chamber G. The compressed air current here encounters the gas current crossing it at a suitable angle, and carries the latter with it, and the mixture then encounters the head or deflecting surface I, rebounds from the latter, and is set in a whirling movement (a movement rotating from the inside to the outside) before it flows through the space between the head I and the walls of the chamber G.

In order further to complete the thorough mixture already obtained in this way, a guide-surface S is provided at a suitable distance from the head or guide-surface I and in front of the inlet aperture to the pipe N, by means of which surface S the direction of flow of the mixture of gas and air is altered in such a way that a rotary or whirling motion from the outside to the inside is produced. The current of compressed air and gas thus only enters into the pipe N and flows in this more or less prolonged and somewhat narrow course to the enlarged burner-head X, after thorough admixture, effected with a varying direction of flow, has taken place at two (or more) places.

Manufacture of Gas in Retorts.

LEWIS, G. P., of Coleman Street, E.C., and TRUE, C. L., of Walham Grove, S.W.

No. 17,043; July 18, 1910. No. 4047; Feb. 17, 1911.

The invention described in this combined specification relates to means for increasing and supplementing the yield of gases produced by the destructive distillation of carbonaceous matter in retorts; and it consists of "the injection of a stream or spray of chemically emulsified petroleum or oil residues upon or into the mass of heated coal or carbonaceous matter while the latter is undergoing the process of distillation, for such a length of time as may be advantageous."

The enrichment and increase of volume of gas produced in retorts by means of a stream of oil is (the patentees point out) well known; but the temperatures generally employed tend unduly to decompose the oil and lead to the deposition of carbon in the interior of the retort. They say they find that by emulsification of the oil before its introduction into the gas-retort, the result is that the oil is "stabilized" in such a way that it is not decomposed until it strikes the bed of hot coal in the retort. In this way, the deposit of soot is avoided, and the oil gas is properly mixed with the coal gas.

The petroleum or oil residues may be emulsified by agitation with alkalinated soapy water, prepared by adding 10 lbs. of an alkali, such as caustic soda, and 10 lbs. of ordinary soap in solution, to sufficient water to make the whole up to 33 gallons of the mixture. The mixture is added to the petroleum or oil residues in varying proportions according to the standard of enrichment that may be desired; but generally the proportions would be one gallon of the mixture to two or three gallons of oil or oil residues. The resulting mixture of oil and soapy water is then thoroughly incorporated and emulsified in any suitable form of agitator.

The stream or spray may be passed through an injector attached to the end of the retort or to the retort-lid. In the case of a single-ended horizontal retort, the supply pipe would preferably pass the stream through the front end or retort-lid, and be directed to the back end of the retort. In the case of a double-ended horizontal retort, the stream would be directed to the middle portion of the retort, except when the

retorts have the ascension pipe at one end only, in which case the stream may be directed to impinge upon the surface of the coal which is being carbonized in the half-length remote from the end provided with an ascension pipe.

The alkalinated soapy water may also be treated with chlorine gas, by allowing a stream of such gas to pass through it prior to its admixture with the oil or oil residues. Chloride of lime may also be added to the soapy water before addition to the oil or oil residues, and has also the same effect—viz., increasing the miscibility of the oil and soapy water. Moreover, the chlorine or chloride of lime may be added to the mixture of oil and soapy water, to perfect the mixture of the two latter. The purpose of the chlorine or chloride of lime is to facilitate the mixing by assisting in breaking-up the oil globules more quickly—thereby ensuring a better emulsion. Suitable proportions would be 1 part of lime-chloride to 100 parts of the mixture of oil and soapy water.

Testing the Illuminating Power of Gas.

CARR, H. O., and NAIRNE, U. O. S., of Wandsworth, S.W.

No. 18,199; July 30, 1910.

This invention (in the words of the patentees) seeks to provide means or apparatus for testing the illuminating power of gas in a gas-works as it comes direct from the exhausters, or in cases where two or more houses are controlled by one exhauster, for testing the gas from each house at any point on its own exhaust main.

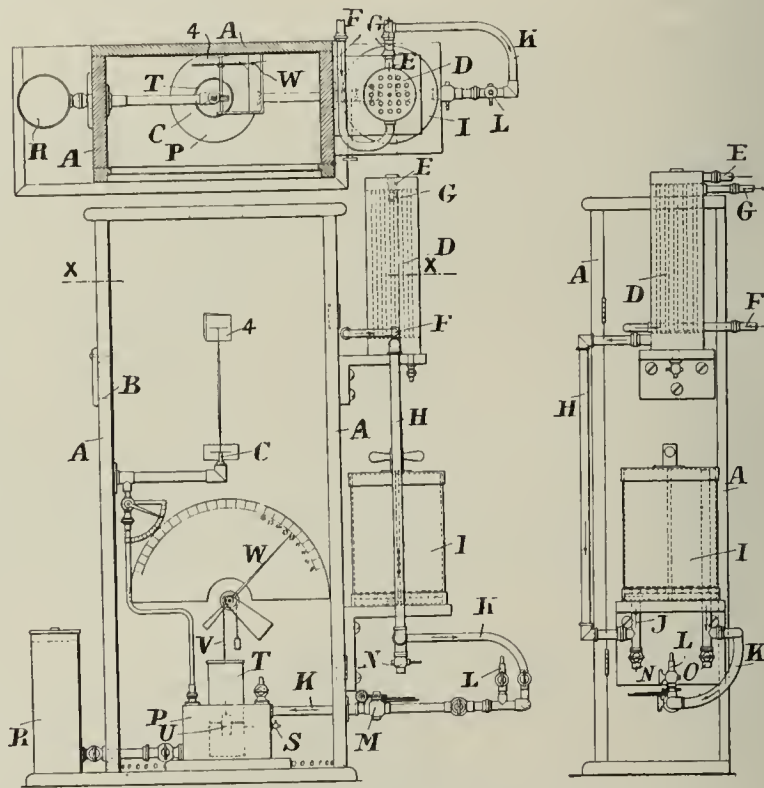
They say: This is of immense importance in gas manufacture, as it enables any inequality in the gas to be at once noticed and the causes thereof removed, instead of having to wait for the manufacture of a quantity of gas, the testing of which will not, after all, locate the origin of any inequality or defect that may be found.

The testing means according to this invention comprises a condenser and purifier for the foul gas and a jet photometer arranged in combination therewith; the arrangement being such that a sample of the foul gas as it comes from the exhausters may be at once purified and tested—there being no need to wait for the whole of the gas to take its full course through the ordinary plant before any tests are attempted.

It is remarked in the specification that although the photometer is associated directly with purifying and condensing means for the purpose of effecting tests in the early stages of the gas manufacture, it may be used for testing gas at any time by merely cutting out the purifying and condensing appliances referred to. This enables comparative tests to be made between gas that has passed through the ordinary plant and gas that has come straight off the generators and has been dealt with only in the manner above referred to.

The testing apparatus constructed according to the invention was described and illustrated in the "JOURNAL" for March 21 last, p. 831; and so it is now merely needful to reproduce the specification drawing and the lettered account of the plant.

The arrangement is shown in front elevation, side view, and cross section on the line X.



Carr and Nairne's Illuminating Power Tester.

The photometer is enclosed in a casing A (normally kept locked to prevent tampering with the apparatus), with an aperture at B for lighting the jet C. Outside the casing are shown a condenser D having an inlet gas-pipe E and inlet and outlet water-pipes F G. The gas passes from the condenser by the pipe H and enters a purifier I by the pipe J. After passing through the purifier, the gases leave by the pipe K, to which is fitted a burner L for the stale gas. The pipe K is also fitted with a cock M, provided with a micrometer adjustment. N and O are outlet cocks fitted to the purifier for cleaning out purposes. The pipe K delivers the gas into the chamber P supplied with water from the vessel R up to a fixed level determined by the overflow cock S, which is closed after the level has been adjusted. T is a chamber within the chamber P, and opening into it at the bottom. U is a float within the chamber T suspended by the chain V from the arbor of the indicating hand W. The gas entering the chamber P influences the level of water in it, and with it the height of the water in the inner chamber T and the float which rests on the surface.

CORRESPONDENCE.

[We are not responsible for opinions expressed by Correspondents.]

Income-Tax Allowance for Depreciation.

SIR,—Depreciation, and the allowance therefor by the Income-Tax Department, is so much in the air just now, that I have been in correspondence with my old friend Mr. Alfred Lass, who read a very important paper on the subject before the Chartered Accountants Students' Society in London in December, 1888.

The views expressed by Mr. Lass are so sound, and so much in accord with my own long experience in dealing with a number of different gas undertakings, that I have suggested to him that he should give permission (which he has done) that the same might be published; and I cannot help thinking that the Sections D and following of the enclosed pamphlet would be of interest to your readers and of value to the industry.

HY. E. JONES.

Palace Chambers, Westminster, S.W., Aug. 9, 1911.

[The pamphlet sent by our correspondent is a reprint of Mr. Lass's paper, which appeared in full in the "JOURNAL" for Dec. 11, 1888. We agree with the suggestion at the close of the letter, and give elsewhere Section D of the paper, which bears specially upon the subject dealt with.—ED. J. G. L.]

Corrosion of Service Pipes.

SIR,—Mr. Hole is, I am afraid, lacking in a sense of humour. He began this correspondence with a letter in which he insinuated that I was guilty of quibbling and misquotation; and now, in his last letter, he lectures me on the ethics of controversy. In these circumstances, I have not treated Mr. Hole inconsiderately, and trust it may now have dawned on him that he could not throw such insinuations at any one without laying himself open to reply.

I regret to have again to ask Mr. Hole to state whether he has found ashy subsoils to give an alkaline reaction. If so, it is impossible for me to regard "acidiferous" as a correct term for a body which is alkaline. Might I ask Mr. Hole if he would refer to an iron tank carrying sulphuric acid as composed of "acidiferous iron" or if he would refer to the walls and ceilings of dwelling-rooms which according to recent research absorb a large proportion of the trace of sulphur acids produced by the combustion of coal gas, and which give an alkaline reaction, even as in the case I tested, where the plaster had been up forty years, as "acidiferous walls and ceiling?"

I again repeat, it is the porous nature of ashy subsoils that causes them to promote corrosion, permitting as it does access of air and moisture containing minute traces of carbonic acid, or somewhat analogous to what every engineer knows as a "between wind and water" corrosion takes place.

Greenock, Aug. 12, 1911.

JAMES M'LEOD.

PARLIAMENTARY INTELLIGENCE.

HOUSE OF LORDS.

The following further progress has been made with Bills:—

Bills read the third time and passed: Halifax Corporation Bill, Margam Urban District Council Bill, Rotherham Corporation Bill, St. Helens Corporation Bill.

HOUSE OF COMMONS.

The following further progress has been made with Bills:—

Lords Bills read the third time and passed: Gas Orders Confirmation Bills (Nos. 2 and 4), Gas and Water Orders Confirmation Bill, Merthyr Tydfil Corporation Water Bill, Rhondda Urban District Council Bill, Swansea Gas Bill.

South Metropolitan Gas Company's Workmen and the National Insurance Bill.

At the close of last week, Sir Henry Kimber gave notice of his intention to ask the Chancellor of the Exchequer last night whether he had been informed of the case of the workmen in the employ of the South Metropolitan Gas Company, some 6000 in number, who gain all the benefits afforded by the National Insurance Bill, except maternity benefit, at considerable less expense under the fund which they have established with the assistance of their Company, their contribution being 3d. per week as against 4d. per week under the Bill, and their sick benefit being 12s. per week as against 10s. per week under the Bill—this benefit including workmen up to the age of 65 years as against 10s. per week up to the age of 50 years, 7s. per week for over 50 and under 60 years, and 5s. per week for over 60 years under the Bill, the benefits also covering the first three days of sickness which the Bill excludes; and whether he would be willing to exclude them, and any other similar body who provide not less favourable terms than those offered by the Bill, from the compulsory clauses of the Bill.

The Chancellor of the Exchequer, in his reply, said: My attention has been called to the case referred to by the Hon. Baronet. As every penny contributed by employers and workmen under the National Health Insurance will be applied exclusively for the benefit of the workmen under their own administration, it follows that they cannot lose through being brought under the Bill; and since they will have the State grant in addition to their own contributions, it further follows that they must gain. If they can so manage the fund as to provide larger benefits than the minimum indicated in the Bill, they will be in a position to enjoy those larger benefits. I am not prepared to penalize all the best-managed provident funds by withdrawing State aid from them.

METROPOLITAN WATER BOARD BILL.

On the consideration of this Bill, as amended, last Thursday, The EARL of RONALDSHAY reminded the House that the Bill empowered the Metropolitan Water Board to construct certain reservoirs; and those to which he wished to draw attention were Nos. 6 and 7, near Littleton, in Middlesex. They were very large; and in order to construct them it would be necessary to sink a trench for a very considerable depth until the London clay was reached. The effect would be to drain the water from the adjacent lands; and what he asked was that during the period of construction of the reservoirs a statutory right should be given to the residents in the vicinity to demand compensation for any injury that might thus be done to them. He therefore moved the insertion of a new clause providing for compensation to be given to owners of land within a radius of two miles from the site of any reservoir, where their sources of water supply had been diminished by the operations of the Board.

Mr. C. MILLS supported the motion.

Mr. STANIER opposed the clause. He asked the House to support the Committee who had considered the Bill, and pass it in its present form.

Mr. DAWES said there was no precedent for Parliament authorizing compensation to be given for temporary disturbance during construction; and he hoped the House would not accept an amendment which would alter the general law by a Private Bill, and thereby create a bad precedent.

Mr. JOYNSON-HICKS said Parliament had always taken care that the rights of owners of underground water should be protected. In almost every Bill relating to railway or engineering works, where tunnels or cuttings went deep into the soil, a clause was inserted whereby the promoters of the Bill undertook to pay compensation to owners of underground water for loss, temporary or permanent.

Mr. BURNS, in opposing the clause, said the Bill had been before a strong Select Committee of both Houses, who heard all the petitions and the evidence for three months. The clause now sought to be inserted was considered and rejected by the Committee. It had been said that this was a contest between a number of small holders against a wealthy corporation. Even wealthy corporations were entitled to protection in the discharge of their public duty. But the inquiry before the Select Committee proved that no damage would be done to the small holders. This being so, he thought the Water Board, who were not making any profit out of their undertaking, should not be handicapped by the irritating and obstructive clause proposed. He promised to use his influence with the Board so as to ensure that everything possible was done to prevent any hypothetical damage to the small holdings.

After some further remarks,

Mr. EMMOTT (Chairman of Ways and Means) appealed to the House to come to a decision. His opinion was that they ought to support the Select Committee, who had had all the facts before them.

On the question that the clause be read a second time, the House divided, and the clause was rejected by 222 votes to 103.

Mr. MILLS moved, as an amendment, to strike out of the Bill the power given to the Board for the construction of reservoirs Nos. 6 and 7. He said these reservoirs were not only not necessary for the adequate supply of water to London, but would destroy the amenities of the district.

The EARL of RONALDSHAY seconded the amendment.

Mr. BURNS pointed out that if the amendment were carried there would be only one reservoir left. He appealed to the House not to kill the Bill, and waste the large amount which the Water Board had spent in the fulfilment of a public duty.

Mr. JOYNSON-HICKS replied that the fact that the Committee struck out reservoirs Nos. 1, 2, 3, and 4, and that the promoters withdrew No. 8, showed that the Board put before Parliament a wholly improper scheme.

The honourable member was speaking at a minute before eleven o'clock (the debate having been opened shortly after eight), when the House divided on a motion for the closure by the President of the Local Government Board. This was carried by 218 votes to 101; and on a subsequent division the amendment was rejected by 148.

The further consideration of the Bill was adjourned.

MARGAM URBAN DISTRICT COUNCIL BILL.

House of Lords Committee.—Thursday, July 27.

(Before Lord LEAMINGTON, Chairman, Earl ELDON, Lord BRABOURNE, Lord DIGBY, and Lord WYNFORD.)

This is a General Powers Bill promoted by the Margam Urban District Council, in which authority is sought to acquire the gas undertaking in Margam of the Aberavon Corporation.

Mr. VESEY KNOX, K.C., and Mr. HUTCHINSON, K.C., appeared for the promoters; and Mr. WEDDERBURN, K.C., and Mr. MEAGER represented the Aberavon Corporation, who petitioned against the gas portions of the Bill.

Mr. VESEY KNOX, in opening, said the only opposition against the Bill was in respect of the parts relating to the supply of gas, and the transfer to the promoters of the gas undertaking of the Aberavon Corporation within the area of the Margam Urban District Council. The proposal was that the purchase should be made under the Lands Clauses Acts, so that the Corporation would get the fullest compensation to which they were entitled. Formed in 1884, the Local Government District of Margam developed with great rapidity, owing to the large expenditure upon Port Talbot, which was partly in Aberavon and partly in Margam. In 1884, Margam was a small place; but it had so grown that it was more populous than Aberavon. The Corporation of Aberavon first got power to supply gas in 1866. They acquired a small Company supplying gas in Aberavon; the purchase price being £2141. Under their Act, the Corporation were confined within their own administrative area. The price of gas was fixed at 5s. 6d. per 1000 cubic feet, and the Corporation were empowered to apply the gas

profits to any purpose they liked within the borough area. This was a power he would ask their Lordships to take into account in considering whether it was right that the promoters should seek authority to supply their own district with gas. In about 1880, the Corporation supplied the Great Western Railway Station within the Margam area, and in 1884 further powers were taken, in order to supply Michaels-town Lower. Fresh borrowing powers were secured by the Corporation in 1896 for the erection of gas-works on a new site; but these powers were not exercised for another ten years. The Corporation were given borrowing powers up to £50,000; and being now at the end of their tether financially, they applied to the Local Government Board for a Provisional Order authorizing further borrowing. The Margam Council, being long dissatisfied with their gas, thought it a favourable opportunity for getting the control of the supply in their own area, and promoted the present Bill. In the Commons, the Committee passed the Margam Bill and rejected the Aberavon Provisional Order. He contended that the policy of Parliament had been not to allow one local authority to supply gas within the area of another, unless the supply was given by consent. Margam had grown from a population of 6000 in 1891 to 15,000 in 1911. In the same time, Aberavon had increased from 6000 to 10,000. Margam, too, had an assessable value of £61,000, as compared with £31,000 in the case of Aberavon. The Corporation had not exercised powers of repair, in respect of their works, for ten years; but since the Margam Bill appeared, they had shown feverish haste. The whole of their gas supply had, however, been ludicrously inadequate. Many streets in Margam were without mains until Margam guaranteed the Corporation against loss; and in parts of the district the only means of lighting was by oil. From the 100 consumers in the Margam area, the Corporation received half-a-dozen complaints every day. The supply was inadequate, and in proportion to the population the gas consumed was the smallest of any industrial district in the country. Though drawing large profits, amounting to £3550 in 1910, the Corporation had been entirely wanting in enterprise. After all deductions, the net profit was £1826, of which, roughly, £900 was made out of Margam and could have been applied as a whole to the relief of Aberavon rates. The village of Bryn, which the promoters were prepared to supply, had been asking for gas for years; but the Aberavon Corporation would neither give the village a supply nor let anyone else do so. It was not a healthy sign that the petitioners' gas loans should be equal to three times the assessable value of the borough.

Friday, July 28.

When the proceedings were resumed to-day,

Major Gray was examined by Mr. VESEY KNOX. He said he had been Chairman of the Margam Urban District Council for ten years, and gave up the position at the last annual meeting in April. He had been a member of the body since 1884, when the Council was first constituted. The area of the urban district of Margam was a little over 18,000 acres. In 1884, the urban district had a population of 5000. In the year before the urban district was formed, the Aberavon Corporation obtained a Provisional Order for the supply of gas to the village of Hafod-y-porth. The Margam Urban District Council at the time was not formed; so they were unable to oppose the Order. The Corporation having obtained the powers, they did nothing more for a number of years, and remained content with the main which they took up to the Great Western Railway Station. Since then the Port Talbot Docks had grown considerably. Although Aberavon had, under a guarantee from Margam, carried a main up to Ynys-y-gwass, the streets of the village, and also the streets of Mynyddbychan, were lighted with oil. In Bryn, which was a short distance away, they were unable to obtain gas from Aberavon. The present population of Bryn was about 1000; but as the collieries were opened up, it would now constantly increase. There would be great developments in this district, and also along the Dyffryn Valley. Hafod-y-porth had increased by leaps and bounds, and now had a population of 14,717, with a rateable value of £81,000 and an assessable value of £61,000. Aberavon was also developing, but not so fast as Margam—the population having only increased from 7533 to 10,300 in 1911. The lamps in the streets in the centre parts of Margam were lit by Aberavon gas; but in order to get the Aberavon Corporation to lay the mains, Margam had in certain cases to guarantee the cost of so doing. This meant that if there was a profit the Aberavon Corporation got it; and if a loss, the Margam people paid it. The outlying parts of the district were all lit with oil. There had been constant complaints as to the gas supply. At times, the want of pressure was so great that they could get no light at all, and he had had to use candles. He did not recollect that they had ever suffered from a total want of supply; but they had never had such a supply as they required. The supply had improved in recent years; but still it was not what it ought to be. According to the accounts of the Aberavon Corporation, they were making considerable profit out of the sale of gas in Margam. The borrowing powers of the Aberavon Corporation in respect of their gas undertaking were limited to £50,000; and they had been exhausted except to the extent of £1600. Extensions of mains and additional meters were urgently required in Margam. Aberavon, in consequence of their Provisional Order having been rejected by the House of Commons, had no further borrowing powers. Therefore, if the present Bill did not pass, Margam, so far as gas was concerned, would be brought to a standstill. Margam had considered the matter many years before promoting this Bill; and finally they had come to the conclusion that the only way out of the difficulty was to get the gas supply into their own hands. If they were ever to give a supply to Bryn and other places in the south, they must have the control of the centre. They proposed under the Bill to acquire the gas undertaking in Margam under the Lands Clauses Acts. They had no wish to do any injustice to Aberavon, and were quite prepared to allow the Corporation a fair price. They had before this attempted to get the district lighted by electricity, which they had agreed to take from the South Wales Power Company. The attempt, however, was abortive, owing to the Power Company having come to grief financially. Margam was unanimously in favour of the Bill.

In cross-examination by Mr. WEDDERBURN, witness said he thought,

in a matter of this kind, the main interest was that of the consumer. He was aware that Aberavon and Margam were identical in interest, and were only divided by the river upon which their future mainly depended. The development began in 1894, since when the growth of Margam had been very rapid. In 1906, Aberavon obtained a new site for gas-works, with a view to supplying the whole of the area of both Aberavon and Margam. They did not suggest to Aberavon in that year that severance would be desirable, because at the time they were considering another scheme. He thought severance was first proposed by Margam to Aberavon in December, 1910. Previous to this date he had consulted their Parliamentary Agents. The whole point of the matter was that Margam desired to have some voice in the gas undertaking. If Aberavon continued the supply of gas, then Margam wanted the control of their own supply. If the Bill passed, he did not suppose that Aberavon would have to supply Margam for more than six months. He certainly believed that they would be able to acquire the land, erect the works, and take over the mains within six months.

Mr. WEDDERBURN: You could not do it in eighteen months. Assuming that it took eighteen months, how are the Aberavon Corporation to go on supplying you with gas during this period?

Witness admitted that it was a case for consideration as to whether one works would not be better for the supply of gas to these areas than two, but declined to admit that this was the only consideration. He believed that if the undertaking was severed, Aberavon would require all the works she now had for her future supply and development. They proposed in Margam to spend something like £25,000 on the gas-works.

Would you be greatly surprised to hear that it was more like £60,000?—I should.

If the Corporation of Aberavon state that with an expenditure of about £10,000 they can do all that is now necessary in the gas areas, both of Aberavon and Margam, and that as more become necessary they can extend, what do you say?—I can only say we are here to get the control of our own gas.

In re-examination by Mr. HUTCHINSON, witness said, so far as the Port Talbot Docks were concerned, all the water part of them was in Aberavon; but the wharves and all the dry portion, where the merchandise was dealt with, was in Margam. They were as a matter of fact lighted by the Dock Company, who made their own electricity. The real reason of his presence before the Committee was to assist Margam to get control of its gas, because, as he believed, it was absolutely essential in the public interest that they should obtain it.

Local evidence was then called to prove the unsatisfactory character of the gas supplied, both as to pressure and quality.

Monday, July 31.

The proceedings were resumed this morning, when

Mr. Frank Jones, M.Inst.C.E., was called. He said there were three methods by which, with the sanction of Parliament, gas might be supplied. The first was by a company, the second by a local authority supplying its own area, and the third by a local authority supplying an outside area. The last method was not so common; and, in his opinion, it was not desirable. In this case, the Local Authority were supplying an outside district, and had not the same interest in supplying the area as they had in supplying their own. In the circumstances in which they found themselves, section 161 of the Public Health Act of 1875 prevented the Margam authority from breaking-up the streets and laying down mains in the area now served by the Aberavon gas undertaking; but they could set up works to supply all the rest of the Margam district in which they had the sole right to supply gas. The result was that unless they purchased the part of the Aberavon gas undertaking which related to the gas area which it served in Margam, the Margam Urban District Council could not supply with gas their own people resident in the area. It was for such reasons as these that the Model Clause was put into Private Bills; and if there had been any authority representing Margam as a district at the time these powers were granted to Aberavon, the clause would have been inserted in the Aberavon Order. He had visited the district several times, and had gone carefully into the question of the gas supply, and had advised the Margam Council on the matter. In giving his advice, he took into account the fact that the population of Margam was 15,000, as against 1000 for Aberavon, and that the rateable value of Margam was double that of Aberavon. With towns of this size, he would expect that the gas supply would be greater in Margam than in Aberavon. It would not be true to say of the Port Talbot area that most of the population were miners. The figures given to him as to the gas supplied by the Aberavon undertaking was 40 million cubic feet—18 millions sold in Aberavon and 22 millions in Margam. These figures showed the smallest sale for gas, having regard to the size of the population, of any towns he knew. The Aberavon Corporation had not taken the strong steps which they ought to have done to get consumers. The consumption of gas in the two towns of Aberavon and Margam could quite easily be doubled on the present population. He advocated the introduction of slot meters and cookers. He attributed the very poor results in Margam chiefly to the fact that the Aberavon Corporation naturally did not desire to spend their money, with the rates behind it, in another district, and to the fact that the works were badly managed; and also to the fact that the Corporation did not know what the gas problem at Margam really was. The price also was unduly high—it was only reduced to 3s. 6d. per 1000 cubic feet last year. In regard to the working results, only 7000 cubic feet of gas per ton was obtained, when they should at least have got 9500 or 10,500 cubic feet. Looking at the fact that Margam was the more important place, and that it was increasing more rapidly, the best method of dealing with the district would be that the larger authority should have the control of the gas undertaking; and as it was not possible that Margam could get control of the existing works, the best thing they could do was to build works and supply their own district. They would then do it better and cheaper than it was being done now. There had been an enormous number of complaints for years. Works sufficient to undertake the supply of gas for Margam would cost £30,000 to erect. Whether or not the undertaking was

divided, at least £30,000 would have to be spent. He denied that if Aberavon were going to do the work properly, as they suggested they could, they could do it for an expenditure of £10,000. Of course, if they were going to continue in the same way as they had proceeded in the past, they could do it for this sum; but otherwise £10,000 ought to be spent at once on mains and slot meters in their district alone. His opinion was that if £30,000 had to be spent, Margam should have their own works. With new up-to-date works, he thought, gas could be made by Margam which they could start supplying at 3s. 6d. per 1000 cubic feet, and that they could reduce the price almost immediately to 3s. It would undoubtedly pay the Margam people to take up a supply to Bryn. There were 110 houses there, half of which would take gas at once. Gas ought also to be taken to the southern districts, where development was going on. So far as the Aberavon works were concerned, he thought if they only sold as much gas as they might to the present population, the whole of their works would be required for their own supply, without any Margam gas at all. He had no doubt that if the Bill were allowed to pass, Aberavon would receive fair compensation under the Lands Clauses Act; but if he were acting for Margam, they would get nothing more than was fair. His estimates were accurate; and he would for the sum of £27,000 erect works capable of making 40 million cubic feet of gas, with the necessary mains to convey it. On the other hand, if the Bill did not pass, £30,000 would have to be raised by Aberavon for this purpose.

In cross-examination by Mr. WEDDERBURN, witness expressed that there was no question why, with equally good management, both these areas of population should not be supplied by one works. If there was a severance, Margam would first of all have to buy up the Aberavon gas undertaking in Margam. He denied that the mains, &c., would have to be purchased for a sum based on their commercial value to Aberavon. Something would have to be paid for severance; but he did not think that this would represent a waste of public money. If Margam could get control of the existing works, he should advise them to do it; but he feared that the question of control did not now arise.

In re-examination by Mr. VESEY KNOX, witness expressed the opinion that the way the Aberavon Corporation carried on their gas undertaking was a scandal. He admitted that amalgamation would be better than severance, if it could have been arrived at; but he could not conceive that the larger population should have its gas undertaking in the hands of the smaller one, and not be able to obtain any control over it. As a practical man, he could not see any way out of the present difficulty except severance, unless Margam obtained the control of the existing works.

Mr. E. Herbert Stevenson, said he knew the district very well indeed. He was acting with his father when they were first instructed to advise the Aberavon Corporation as to the gas supply of the district. He then advised that new gas-works were required—that the old ones were worked out and were not worth reconstructing on the limited space which they occupied. In 1896, he gave similar advice. His advice was not taken until 1906. But in 1901 they consulted another engineer, who expressed the same opinion; and drawings were made and tenders asked for. The Corporation then decided that they would not proceed. In 1906, however, they did start. At that time Margam was not so large as now. The daily capacity of the Aberavon Gas-Works when he saw them was 246,000 cubic feet as a maximum; but since he had been down there, and while this matter was being considered by the other House, the Corporation had entered into a contract for the erection of new retorts. In his opinion, however, the apparatus, even with this increase, was not more than sufficient for the needs of the Aberavon Corporation. In Margam, the supply had been very inefficient. The price had been too high, and had stopped the consumers from taking the gas. It was admitted that many more people ought to be taking gas than was the case at present; and that they were not was, without doubt, owing to the bad supply and the high price. He reckoned that the profit from the gas supplied to Margam was 10d. per 1000 feet; so that every gas consumer in Margam was providing 10d. per 1000 feet of gas consumed by him to the relief of the Aberavon rates. While every gas consumer paid the same price theoretically, it was not so in fact, because the profits went to the relief of the rates inside the Aberavon area. The consumers in the outside area had no such relief. He was convinced that Margam could make a supply of gas much more cheaply with modern works than what they had been supplied with by Aberavon in the past.

In cross-examination by Mr. WEDDERBURN, witness said he thought that Margam should have its own gas supply. Broadly, he agreed with the evidence given by Mr. Jones. He was strongly of opinion that there was no way out of the present difficulty except by Margam having separate works. He declined to commit himself to a statement of what Margam would have to pay Aberavon if the Bill went through. His opinion was that the severance of the district meant an increased price of gas in the area cut off. Whatever Margam had to pay, it would get cheaper gas.

Mr. VESEY KNOX said this was the case for the Bill.

Mr. John Mogford, the Gas Manager at Briton Ferry, a few miles away, gave evidence on behalf of the Aberavon Corporation. He said he had tested the public lighting arrangements in Margam; and, so far as the Aberavon Corporation were concerned, everything was satisfactory. The lanterns supplied by the Margam Council, however, were most unsatisfactory. The glass in fifty lamps was broken, 31 had broken mantles, and others were fitted with burners for oil. The pressure was 14-10ths. He took a fitter from Aberavon when he made the tests.

Mr. Percy Jacob, a member of the Aberavon Corporation, said the Local Authority would have no difficulty in raising further capital for the extension of the gas-works, which were worth at least £75,000. The undertaking, after assistance by a rate-in-aid, was only now making a profit. Margam had been supplied at the same price as Aberavon, and had never been asked to levy a rate-in-aid.

Mr. W. T. Robbins, Assistant to the Lighting Engineer of the Great Western Railway Company at Margam, said the arrangements made with Aberavon were perfectly satisfactory.

Mr. Corbet Woodall said he had considered the Bill from the point of view of what was really best for the public; and, in his opinion, the

public interests would be adversely affected by the passing of the Bill. The two places were practically one in everything except control; and they would be better served by one control. Severance meant two sets of works to do what one set could well accomplish. He thought the small proportion of gas consumers was due to the cheapness of coal—viz., 6s. 8d. per ton. With coal at this price, people did not want gas-cookers. Aberavon was quite capable of doubling its gas output. The proposals of the Bill meant gross extravagance.

Mr. WEDDERBURN said this was his case. He asked the Committee to reject the Bill, and not to sanction a waste of public money.

Tuesday, Aug. 1.

When the proceedings were resumed this morning,

Mr. VESEY KNOX addressed the Committee in support of the measure. All that the promoters, he said, had to show was that there was a general desire on the part of Margam for a supply of gas, and the power of the District Council to give the supply. The opposition had failed to meet the real point. They had neither attempted to show that there was no such general desire, nor that the Council were not in a position to give the supply. They did not call their own Gas Engineer, who was the one man who was familiar with all the details. They preferred to call another gentleman, who was not cognizant with the details. Counsel pressed on their Lordships not to reverse the judgment of the other House. The only other reason that he could see why his learned friend asked them to reverse the decision of the House below was the letter written by the Parliamentary Agents, which had been referred to in the course of the Committee. The Margam Council, composed of gentlemen acquainted with all the facts, decided to promote the Bill. The Committee had the considered opinion of Mr. Byass, with his great experience, and who told their Lordships that it was essential that Margam should have the control of its own gas supply. Then there was the evidence of Mr. Lipscombe, the Agent of the Talbot Estate. If there was going to be this waste of public money, as suggested by Mr. Wedderburn, the person who would be most heavily hit would be the owner of the Talbot Estate. Yet the Agent emphatically stated that severance was the only course for Margam to pursue. Did not the evidence given by these gentlemen show that the only possible thing was that Margam should have its own Gas Committee? The question was whether, for all time, Margam gas should be supplied by a lesser borough, which Margam could not control. He suggested not. Were the people of Margam to be doomed for all time with regard to gas and its appliances to the inadequate supply which they at present had from the Aberavon Corporation? Some £25,000 or £30,000 admittedly had to be spent in these districts in the near future; and the question was, inasmuch as the greater part of it had to be spent for the benefit of Margam, whether Margam should not herself spend the money, and control her own gas. He suggested that the only way out of a perennial difficulty, which would arise if the Bill was rejected, was to grant the people of Margam the relief they sought, and allow them to supply their own gas. The Council were in favour of it, as also were the landowner of the whole of the land, the largest employers of labour, and the Dock Company. On the other hand, the only persons against it were the Aberavon Corporation who had never realized their responsibility for the supply of gas and never would. He therefore asked the Committee to say that the Margam people had proved their case. They were desirous of getting rid of this control, and were quite ready to pay anything that was fair and reasonable in order to compensate Aberavon for the loss of this portion of their undertaking.

Their Lordships having considered the facts in private,

The CHAIRMAN said the Committee were of opinion that the Bill might proceed. But they considered that when compensation was awarded, due consideration should be given to the fact that a certain amount of the existing plant would be rendered surplus; also that, if the promoters desired it, the month's notice which Mr. Knox expressed himself willing to give to terminate the supply should be given.

CANNOCK GAS ORDER.

A Purchase Clause.

The Committee of the House of Commons on Unopposed Bills had last Thursday several Gas Orders Confirmation Bills before them. Mr. WHITLEY, the Deputy-Chairman, presided.

Some discussion arose on the No. 2 Bill; attention being directed to clause 33 of the Cannock Order. The clause makes it compulsory upon the Urban District Council to introduce a Bill next session to acquire the undertaking.

Mr. BONNOR MAURICE explained that the Order was opposed in the House of Lords by the Urban District Council, and that during the progress of the Bill terms were agreed upon. The settlement arrived at included the insertion of a clause placing the Council under an obligation to purchase the gas undertaking of the Company. He admitted that he could not point to a precedent in any Order binding the local authority to purchase. The Board of Trade had never inserted a compulsory clause in an Order unless both parties were agreed; and in this case both parties did agree. He pointed out that the insertion of such a clause was a common practice in Bills.

Mr. PRITCHARD added that the clause was put in this particular form at the request of the District Council.

After further discussion,

The CHAIRMAN intimated that the Committee had agreed by a majority to allow the clause to pass. He added that presumably when the District Council introduced their Bill it would be unopposed, and it would therefore come before them next year. He warned them that in that case the Committee would have to be satisfied that the agreement between the Company and the Council in regard to price was a proper one.

The Bills were ordered to be reported to the House for third reading

LEGAL INTELLIGENCE.

DAMAGE TO MAINS BY SEWERAGE OPERATIONS.

As briefly reported in the "JOURNAL" last week (p. 365), his Honour Judge HOWLAND ROBERTS was recently engaged at the Windsor County Court in hearing a case in which the Slough Water Company claimed £46 18s. 9d. from the Slough Urban District Council in respect of the fracture of a water-main in the Stoke Road on Aug. 30, 1910. There was a counter-claim by the Council for £29 6s. 8d., for work done and inconvenience caused by the breakage.

Mr. HAYDON (instructed by Messrs. Goodacre, Harrison, and Darrell) appeared for the Company; Mr. CRANSTOUN represented the Council.

Mr. HAYDON, in opening the case, said the principal issue was whether the plaintiffs or the defendants were responsible for the fracture of the main and the consequent damage. The main was a 3-inch one, and was laid in 1895 diagonally to the roadway, and at a depth, according to the practice of the Company, of 2 ft. 6 in. There had been no fracture at any other time since the mains were laid. The length of the main was 18 feet. The Council made two sewers along the Stoke Road, at the point where the fracture occurred, and somewhere on each side of it, at a depth of about 18 feet. To do this they had to dig a very wide trench, going to a depth of 15 feet below the main. No notice was given to the Company by the Council of their intention to interfere with their pipes; but they received a letter from Messrs. Johnson and Langley, the Contractors to the Council, stating that during excavations they had uncovered a long length of water-main in the trench, and had found several of the joints leaky; and they asked the Company to inspect them immediately. His first submission was that the onus was on the Council; and, secondly, that where a statutory authority had powers to do work, it must exercise those powers so far as they might be necessary to avoid occasioning needless injury to third parties. He was going to contend that the Council altered the situation of the main.

The following evidence was then given on behalf of the Water Company.

Mr. J. H. Secker, the Engineer and Manager, stated that about 10 p.m. on the 30th of August last he was called up by a road foreman in the employ of the Council making complaints as to water leakage in Stoke Road. The valves of the main were shut off, and next morning he found there had been subsidences in the road, but not over the part of the main which was eventually found broken. After trying one or two places, a fractured main was discovered. One portion was about 3 inches lower than the other; and he repaired this with a slip collar. Underneath the fracture was a piece of broken timber, which was in a rotten state. The water was turned on again, and a further flow was found. The ground was excavated, and rotten timber was again come across, as was also another fractured main. Owing to the close proximity of the main to the brickwork of a manhole, it was impossible to put on a slip collar. In further excavations, a brick pier upon which the pipe rested was found, and to enable the fracture to be mended the pipe was cut and a new length put in. At the other end of the main there was solid support on undisturbed ground. The fracture was a recent one, and there was no reason to believe that there was a leakage before Aug. 30; and this was confirmed by records. The ground underneath and above the pipe was, with the exception of the top surface, shovelled out. It was not necessary to use a pick in any place.

In cross-examination, witness said the fact of water flowing from the fracture would make the ground underneath the pipe contract, and cause a consequent sinking of the pipe. He thought there was no soil underneath the pipe when it broke. The pipe had rested upon the wood for eight years; but providing the trench was properly reinstated, there would be sufficient ground to support the pipe.

Mr. W. Curr, the Company's Inspector, having given evidence,

Charles Maynard, an employee, who helped to repair the pipe, said the pieces of wood produced, which were rotten, were found underneath the fracture. The other timber was in a similar condition.

Mr. Owen Moore said he had inspected the fracture, and formed the opinion that there had been a subsidence of the earth, which had not been properly watered. There were other subsidences which led him to the belief that the whole trench had not been thoroughly consolidated. He explained the way in which the main could have been treated to render it safe, and this at a small cost; six arches of timber costing no more than £2 10s. The pipe used was an exceedingly strong one, considering the pressure of the water. His theory as to how the fracture occurred was that the timber became rotten, and the consolidation gave way until the whole collapsed.

Mr. Charles Simmons, a builder, said he recollected the Contractors to the Council making the sewer in the Stoke Road. The filling-in of the trench, in his opinion, was not as it should have been. The old saying was: "Three rammers to one shoveller;" but in this case there were six shovellers to one rammer, and, in addition, a large quantity of earth was carted away. He also was of the opinion that the trenches should have been flooded.

Cross-examined, witness told the Clerk of the Works about the material being carted away.

This was the Company's case.

Mr. CRANSTOUN, in opening the case for the Council, said he failed to see where there was sufficient evidence of negligence to make them responsible for what had taken place. It was said that the situation of the water-main was altered; but he supposed the alteration meant either letting it drop or making it higher. He suggested that the pipe had been relaid in exactly the same position as before, in the sense that the whole of the earth in the trench above the sewage-pipes to the water-main had not been tampered with, except a small portion under the main. The Council filled up this portion, and left everything else as it was.

The following evidence was then given in support of the Council's case.

Mr. W. White Cooper, the Engineer and Surveyor, said the Contractors were to make two lines of sewers in the Stoke Road; and the specification as to protecting water and other pipes, and the filling-in of the trenches, was very full. It was set forth that water was to be used if required by him; but he never found it necessary. The subsoil in the trench, for the first 8 feet or so, was brick earth, and below this were gravel and sand; and there was no necessity to water the subsoil for the purpose of consolidation. The work was carried out satisfactorily, and met with the approval of the Council. He paid particular attention to the spot, and ordered timber to be put in. Two pieces of timber were placed under each pipe, and this extended for 20 feet from where the breakage occurred. Since the work was completed, no subsidence had happened to cause a break or an accident all along the track. More than this, the Council had repaired the roads; the gravel being watered and rolled in by a 12-ton roller. The traffic was considerable and very heavy. He was of the opinion that the water-main sprang a leak which gradually increased and saturated the subsoil, leaving the pipe without the support it previously had. The 96,000 gallons of water which it was said were wasted got beyond saturation-point, and emerged on to the surface of the road. Under these circumstances, it was fair to assume that the subsoil was saturated, and consequently it would shrink. The leakage might have been going on for some months.

In cross-examination, witness expressed the opinion that the piece of pipe shown to him at the time of the fracture had a jagged head, whereas the one produced had a smooth one.

Mr. Alfred Hardy, who had been engaged in carrying out several main drainage works, said he was Manager for Messrs. Johnson and Langley, and filled this position in connection with the sewerage work at Slough. The contract contained stringent provisions with regard to the excavation and filling-in of the trench; and they were all faithfully carried out. He had never heard of a road holding good for eight years and then breaking without some other cause than insufficient ramming to bring it about. If the subsoil had subsided, it would have drawn the pipe out of the socket, and probably caused a leakage there. From such a break as the one in question, he should say it came from a heavy weight or jar at the top. A fracture could never improve. Water would flow and make the ground soft, so that in time it would collapse. If the water had been flowing for months, it would go to the weakest spot. Water-pipes were cast vertically; but it looked as if the pipe in question had been cast horizontally. Witness explained to his Honour how he thought the pipe broke. He added that, as Manager, it was his duty, when he found any gas or water pipes leaking, to call the attention of the Company to the fact; and their representatives then came to see to it. When they came to the pipes at the spot in question, it was found they were leaking; and they were repaired by the Company's men. Witness visited the place on July 24 and saw the road re-opened and found that one of the joints just outside the trench was leaking slightly.

Mr. H. Percy Boulnois, M.Inst.C.E., the City Engineer of Liverpool, said he had inspected the road in question. It was unusual to lay a water-pipe diagonally across a road, as it suffered more by traffic passing over it than if it was laid longitudinally; and the portion of the road in question was subject to very heavy traffic. If the filling-in of the trench had been negligently done, subsidences would begin to take place within three weeks. It was inconceivable that it would take eight years. From the plan put in by the plaintiffs, he should say that heavy traffic passing over the manhole broke the pipe. The effect of this would be to liberate water, which would follow the line of pipe, and create the subsidence. The rotting of the wood in the time showed that it must have been very wet. The planks were never intended as permanent supports. If the plaintiffs said they had lost 96,000 gallons of water through this defect, it must have caused the washing away of soil on a wholesale scale.

In cross-examination, witness said the pipe should not have broken except for a blow. It was a very good pipe, but not a first-class one. Asked how he would have dealt with the bearers, witness said he would have put the planks on edge instead of flat, because it would be a stronger support.

Mr. C. J. Jackaman said he had had experience in laying gas, water, and sewage pipes; and it was the proper thing to ram the earth into the trench. Watering should not take place on soil of this description. It was a general custom to lay timber under water-pipes to support them while the filling-in and ramming were going on. It was difficult to form an opinion as to how the fracture of the pipe in question was caused, as it was so rusty.

This concluded the evidence.

Mr. CRANSTOUN then addressed his Honour on behalf of the defendants. He submitted that there was no evidence of negligence, or that the damage was caused by negligence. Everything done by the Contractors had been done properly. Under all the circumstances, the case had not been made out; and therefore the defendants were entitled to judgment. As to the counter-claim, he contended that if the main had been laid too near the surface of the road he was entitled to the amount stated.

Mr. HAYDON having replied,

His Honour gave judgment. He said what he had to decide was whether or not the defendants were guilty of negligence in 1902-3, when the trench was excavated and filled in. This was the first question. If they were guilty, the next question was: Was the neglect in 1902-3 the cause of the damage which was discovered in August, 1910? It was necessary that the plaintiffs should make out this proposition as well as the other in order to be entitled to judgment. He had come to the conclusion that both propositions had been reasonably established. After dealing at considerable length with the evidence, he said he thought the plaintiffs had proved that the trench was not sufficiently rammed at the spot in question, and that the fracture was the result of their negligence. This being so, his decision must be for the plaintiffs; and inasmuch as the parties were agreed, before the case came into Court, that the damages should be assessed at ten guineas, judgment would be for plaintiffs for this amount.

Costs were allowed on the "C" scale.

MISCELLANEOUS NEWS.

SWINTON AND MEXBOROUGH GAS ARBITRATION.

The Award.

An arbitration was recently held in London to determine the price to be paid by the Swinton and Mexborough Gas Board for the undertaking of the Swinton and Mexborough Gaslight Company ; and a full report of the proceedings (which extended over five days) appeared in the numbers of the "JOURNAL" dated June 27, July 4, and July 11. The Arbitrators were Mr. Corbet Woodall for the Company, and Mr. Harry E. Jones for the Gas Board ; while Mr. A. J. Ram, K.C., officiated as Umpire. The amount claimed by the Company as the value of the undertaking was £56,900, in addition to the liabilities of the Company (other than on revenue account) at the date of transfer. The Board put the value at something like £24,450, plus expenses of re-investment, overspent capital, &c., and the mortgage to be taken over. Under the provisions of the Act, the Board had also to pay to the Company the costs of obtaining their Act of 1908, and the expenses of winding up.

We understand that the award in the arbitration has now been communicated to the parties, and that the sum to be paid by the Board for the undertaking is £60,370. This includes the mortgage debt and other liabilities mentioned in section 27 of the Board's Act.

INCOME-TAX ALLOWANCE FOR DEPRECIATION.

Mr. Alfred Lass on Repairs, Renewals, and Depreciation.

In our "Correspondence" columns will be found a letter from Mr. H. E. Jones, on the subject of "Income-Tax Allowance for Depreciation." The writer calls attention to the views bearing upon the subject expressed some years ago by Mr. Alfred Lass, in a paper read before the Chartered Accountants Students' Society in London, which he thinks it would be useful to reproduce. The paper was published in the "JOURNAL" at the time it was read ; but we give below the portion to which our correspondent calls attention. In it, Mr. Lass shows the principle upon which the calculation for renewals is based.

The subject which is now being approached is an exceedingly important one ; and it will be well to understand distinctly the meanings of the words, "repair," "renew," and "depreciate." According to the best authorities they are as follows : "Repair" means to restore after injury or dilapidation ; to amend any injury by an equivalent ; to make good for all practical purposes as it was before. "Renew" means to make again absolutely ; to restore to the first or original state. We repair that which has been injured ; we renew that which has become useless or worn out. "Depreciate" means to bring down to a lower price, or to lower the value.

As to Repairs.—Gas-works must at all times be kept in a thorough and efficient state of repair, the cost of which must be charged to the revenue account.

As to Renewals and Depreciation.—The cost of renewals must be charged to the revenue account in one of two ways—viz., either out of the profits of the year in which the ultimate failure of each portion of the buildings and apparatus occurs, or by setting aside every year out of the profits such a sum as will, if allowed to accumulate at compound interest, provide a fund sufficient to meet renewals as and when they fall due.

Plant and machinery may be repaired ; but these repairs will not provide for that imperceptible depreciation or lessening of value which is going on day by day, and which is only made good when the thing depreciated is renewed or restored to its first or original state. Take, for instance, a gasholder. It may be repaired as often as possible, but it cannot be kept in such a state from year to year as, at the expiration of its term of life, to be as good as new. Therefore, the holder must eventually be renewed by a new one being erected in its place.

In order to show more fully the amount which must be taken out of profits to meet the renewals of buildings, plant, and machinery, let it be assumed that works (exclusive of land), costing £130,000, and capable of producing 200 million cubic feet of gas per annum, are to be of exactly the same size and capacity, and as good in every respect at the end of 100 years as when originally erected, and of equal value. The various portions of the plant, machinery, and apparatus—such as buildings, gasholders, retorts, scrubbers, condensers, mains, &c.—which constitute the works have each a separate length of life ; and let it be further assumed that the following table represents the original cost and length of life of each of the respective portions of the plant, together with the cost of renewals during the period of 100 years.

The renewals in 100 years, therefore, amount to £313,666 ; or, in other words, the works, which originally cost £130,000, must on an average be renewed 2.41 (or, say, two-and-a-half) times during the period of 100 years. This sum of £313,666 must either be taken out of the profits of the year in which the ultimate failure of each portion of the buildings and apparatus occurs, or it must be provided for by taking out of the profits each year the sum of £1731, or 1½ per cent. on the sum of £130,000—the original cost of the works—which sum of £1731, if allowed to accumulate at compound interest at the rate of 3 per cent. per annum, will provide for each renewal during the whole period of 100 years, as and when it falls due.

Thus, whichever mode be adopted, the result will be that the works, which originally cost £130,000, will be, at the end of 100 years, of the same size and capacity, and structurally as good as when first erected, and of equal value. But in large cities and towns where the population is continually increasing, it becomes necessary from time to time, in order to keep pace with the demand for gas, to enlarge the works ; and as the works are enlarged, the renewals of the enlarged portions thereof will from time to time have to be provided for. Therefore, if 1½ per

Portions of Plant, Buildings, and Apparatus, Designated by the Letters A to O.	Original Cost.	Life in Years.	Number of Renewals in 100 Years.	Amount of Renewals in 100 Years.
A	£24,000	100	1	£24,000
B	10,000	50	2	20,000
C	8,000	25	4	32,000
D	1,100	3	33½	36,666
E	600	40	2½	1,500
F	3,000	50	2	6,000
G	10,000	40	2½	25,000
H	1,000	25	4	4,000
I	5,000	50	2	10,000
J	800	40	2½	2,000
K	4,500	33½	3	13,500
L	10,000	100	1	10,000
M	10,000	40	2½	25,000
N	2,000	50	2	4,000
O	40,000	40	2½	100,000
	130,000			313,666

Note.—The scrap value, for the purpose of this illustration, has not been taken into consideration.

cent. upon the total amount expended on the works at the end of each year be yearly taken out of the profits, and allowed to accumulate at compound interest at 3 per cent. per annum, it will at all times (assuming the length of life of each portion of the plant, buildings, and apparatus be taken as above) produce a fund sufficient for the renewal of the works in perpetuity (whatever their size or capacity) once during the average period of life, which for all practical purposes may be taken at from 37 to 40 years.

In all cases where a fund has been allowed to accumulate for the purpose of providing for renewals, that fund, and not the revenue account, must be debited with the cost of such renewals. But as gas companies are not, under the Acts of Parliament regulating their undertakings, authorized to create such a fund (which would certainly have the effect of equalizing the profits), it follows that they must debit the revenue account with the renewals as and when such renewals become necessary. This in some years may have the effect of reducing the profits below the sum required to pay the maximum or standard rate of dividend ; and in that case the reserve fund can be resorted to for the purpose of making up the deficiency.

Looking at the many varying and disturbing elements constantly in operation, such as the pulling down of old plant to make room for larger, or the substitution of new scientific appliances in the place of the old, it will be well even for local authorities to debit the revenue account with the renewals as and when such renewals become necessary, rather than create a fund, which, unless worked with the greatest care, must give rise to questions of such a complex nature as will lead to endless confusion and difficulty. In practice, however, renewals are made with some degree of care, foresight, and regularity.

It has now been clearly and conclusively demonstrated that, in providing for renewals out of revenue, a proper provision has been made for depreciation, even for that imperceptible depreciation or lessening in value which is going on day-by-day, and which can only be made good when the thing depreciated is renewed or restored to its first or original state. It therefore follows—whether (a) the works are renewed by charging the revenue with the renewals as and when such renewals become necessary, or (b) by charging the revenue with an annual sum to be set aside and allowed to accumulate at compound interest—that, if the revenue be charged with depreciation, in addition to repairs and renewals, such charge for depreciation will not only be wholly unnecessary, but will entail a burden upon gas consumers which ought not to be borne.

It may be stated that the General Acts do not anywhere specially authorize the creation of a depreciation fund, except for works on leasehold lands.

GAS SUPPLY OF PARIS.

Annual Report of the Gas Company.

The Directors of the Company formed to carry on the gas supply of Paris in association with the Municipality, presented their third report at a meeting of shareholders recently held. It covered the twelve months ended the 31st of December last ; and the following are its principal features.

The quantity of gas sent from the works in the period referred to was 450,487,995 cubic metres, or about 15,902½ million cubic feet ; being an increase of 4.95 per cent. on the output in 1909. The Directors point out that though in the early part of the year covered by the report the consumption of gas was checked by the disastrous floods in the valley of the Seine, the supply in the suburbs of Paris satisfied all requirements. The day consumption last year reached 202,182,160 cubic metres, or rather more than 7137 million cubic feet ; being an increase of 4.95 per cent. The revenue from the sale of gas was 83,825,576 frs. (£3,353,023), as compared with 79,917,411 frs. (£3,196,696) in 1909—a difference of 3,908,165 frs. (£156,327) in favour of last year. The number of consumers on the books at the close of 1910 was 653,540, compared with 631,027 on Dec. 31, 1909 ; being 22,513 more, or an increase of 3.57 per cent. Of the total, 358,468 were ordinary consumers and 295,072 on the free-fittings system, against 345,176 of the former and 285,851 of the latter in 1909 ; being increases respectively of 13,292 and 9221, or 3.85 and 3.23 per cent.

For the public lighting of the city there were in use on Dec. 31 last 53,850 gas-burners, compared with 53,644 at the corresponding date in 1909. They were divided as follows : Ordinary, 1239 ; incandescent,

52,611—a decrease of 5 of the former and an increase of 211 of the latter compared with the preceding year. The number of rising pipes for the supply of tenements, which at the close of 1909 was 54,193, increased in the course of the past year to 55,078; the consumers taking their supply from them being 524,520, or 80.26 per cent. of the entire number. At the end of 1909, there were 503,488, or 79.9 per cent.—an increase of 21,032. From the commencement of the Company's operations to the end of last year, the mains were extended by about 150,200 yards; bringing up the total length to 2,064,432 yards. In the twelve months just closed, 63,382 yards were added, or 27,302 yards more than in 1909.

During the past year, the Company, with the concurrence of the Municipality, carried out their first installations of high-pressure lighting; and they were so satisfactory that special reference is made to them in the report. The lamps in the Place de la Concorde, the Place de l'Opéra, and on the Boulevard Raspail,* have enabled the public to appreciate the superiority of the new system of gas lighting, which the Directors consider will be very greatly extended. The installations completed on the 31st of December comprised 104 lamps, having a light-giving power ranging from 1200 to 4000 Hefner candles per lamp. In the course of the current year, similar installations are to be put up in the Rue du Quatre Septembre and several of the other principal streets, as well as in the Place de la Bourse and the Place de la République.

As already mentioned, the revenue from the sale of gas last year amounted to 83,825,576 frs. (£3,353,023); and, in addition, residuals, meters, fittings, &c., produced 23,029,428 frs. (£921,177)—making together 106,855,004 frs. (£4,274,200). The expenses amounted to 82,878,554 frs. (£3,315,142); so that a sum of 23,976,450 frs. (£959,058) was available for the Municipality, compared with 23,913,146 frs. (£956,526) for 1909. In addition to the expenditure on the manufacture and distribution of gas, the sum of 82,878,554 frs. mentioned above includes interest and sinking-fund charges, taxes, the cost of new works, pensions and compensation for accidents, and the Company's remuneration for working the undertaking, amounting to 1,586,842 frs. (£63,474). The net profit for the year was 1,751,777 frs. (£70,071). Deducting 5 per cent. for the reserve, there was left a balance of 1,664,188 frs. (£66,567), which added to the 191,678 frs. (£7667) brought forward produced a total of 1,855,866 frs. (£74,234). Before distributing the year's profits, the reserve fund was credited with 177,193 frs. (£7088) and the Company's provident fund with 100,000 frs. (£4000). The Directors proposed a dividend of 13 frs. 75 c. per 250 fr. share, or at the rate of 5.50 per cent., for the year, after payment of which there would be a balance of 205,866 frs. (£8235) to be carried forward, compared with 191,678 frs. (£7667) this time last year.

The report concludes with some particulars of the extensions to the manufacturing, distributing, and storage plant carried out up to the close of the year and those proposed for early execution. At Le Landy, where, when the Company took possession, there were in all only six benches of retorts charged by hand, there are now 24 benches furnished with stoking machinery; and the productive capacity of the station has been raised from 6,180,000 to 24,722,000 cubic feet per day. Plans have been prepared and submitted to the Administration for new works of the latter capacity opposite those at Le Landy. At La Villette, the construction of new retort-houses has been pushed on with activity; and the intention is to equip this station with the most improved appliances. Concurrently with the extension and improvement of the manufacturing plant, the storage has been increased. At Clichy, a third gasholder is being telescoped; and when this work is finished, the holder capacity at this station will have been increased by nearly 3½ million cubic feet. At Le Landy, the two 5½ million cubic feet holders, which were in progress on the occasion of the visit of the members of the Société Technique to the works in June last year, are approaching completion; and a third, of like capacity, is to be put in hand. Some important changes have been made in connection with the distributing plant, principally in order to ensure regularity of pressure. A 40-inch main was laid to connect the station at Le Landy with the Place de la République; and subsequently one of similar size from the station named to the Place de la Concorde. Other extensions are in contemplation from this point to the Trocadéro, and thence to the Porte Maillot. The works carried out last year entailed the following expenditure: Improvements at Le Landy, 10,911,679 frs.; do. at other stations, 2,003,960 frs.; extensions of mains, 2,977,947 frs.; meters and stoves, 1,259,766 frs.—total, 17,153,352 frs. (£686,134).

ZÜRICH GAS UNDERTAKING.

Report and Accounts for the Year 1910.

A copy of the report and accounts of the gas undertaking of the Corporation of Zürich for the twelve months ended Nov. 30, 1910, has been sent by Herr A. Weiss, the Engineer and Manager. The following particulars of more general interest have been abstracted from the mass of information and diagrams given in the document.

The workmen's dwellings referred to in the previous report [see the "JOURNAL," Vol. CXI., p. 661] have been completed in the course of the year, and some necessary alterations of the roadways have been made. A store-place for petrol, &c., has been erected, in compliance with the local regulations, for the storage of the considerable amounts of such materials kept on the works. A photometric laboratory has been built above the existing chemical laboratory, and is in course of equipment. Iron gangways have been provided to give communication between the three gasholders at the level of the first gallery. A second washer, of about 2 million cubic feet capacity per diem, has been installed in the second apparatus house, and a boiler feed-water purifying plant has also been placed in the boiler-house. Plans and estimates have been got out for the conversion of a bench of inclined retorts into a bench of verticals, with the necessary coal and coke conveying plant.

* This installation was described and illustrated in the "JOURNAL" for the 28th of March last (p. 910).

Considerable extensions of the supply mains have been made in the course of the year. The No. 1 retort-house, containing 32 settings of nine inclined retorts has worked in the course of the year 6391 setting-days; while the No. 2 retort-house, which contains ten settings of ten vertical retorts has worked 3650 setting-days. In addition, an experimental setting of two horizontal retorts has been in continuous use. The labour employed in charging and discharging the retorts, clinking and charging the producers, cleaning ascension pipes and hydraulic mains, cleaning and luting the retort lids, and keeping the stages, &c., clean, comprised, in eight-hour shifts, a minimum of 15 men per diem, a maximum of 34 men per diem on the inclined retorts, and an average of 8.3 men per diem on the vertical retorts.

The total amount of coal carbonized in the year was 93,580 metric tons (about 92,105 tons) and of cannel 595 metric tons (about 585 tons). The total make of gas was 32,249,260 cubic metres (about 1140 million cubic feet). The average make of gas per ton of material carbonized was therefore 12,287 cubic feet, compared with 12,186 cubic feet per ton in 1909. The make of gas per ton of coal and cannel in the settings of inclined retorts was 11,375 cubic feet, compared with 13,546 cubic feet per ton of common coal only in the vertical retort settings. Both these figures show an improvement on the previous year's working. The average net calorific power of the gas made was 514 B.Th.U. per cubic foot at 60° Fahr., 30 inches, and saturated. The coal carbonized was entirely German. There was a brief interruption of the working of the mechanical conveying plant in the month of June, 1910, owing to the floods caused by the high water in the Limmat Valley. The cost of coal, including cannel, delivered into the retort-house, was 27s. 4d. per ton, as compared with 27s. 8d. per ton in 1909.

The make of gas for the year showed an increase of 5.01 per cent. as compared with 1909, and the make per shift of workmen also showed a slight increase. The make of gas per retort-day in the inclined retorts was 10,608 cubic feet, and in the vertical retorts 14,653 cubic feet. The make of gas per man per shift was, however, for the inclined retorts, 66,041 cubic feet, and for the vertical retorts 174,426 cubic feet. There was an increase of 6.55 per cent. in the gas supplied to private consumers. The gas sold expressly for cooking and heating purposes now amounts to 61.82 per cent. of the total production, as compared with 59.75 per cent. in 1909. On the other hand, the gas sold to private consumers for lighting purposes has fallen from 15.99 per cent. in the previous year to 15.16 per cent. The unaccounted-for gas is lower than hitherto; being now 3.53 per cent. of the make. The average consumption of gas per head of the population within the City boundary, exclusive of that used for public lighting and unaccounted for, amounted to 5004 cubic feet, as compared with 4955 cubic feet in 1909.

The report gives particulars of the effects on the production and output of gas of the flooding of the works in June, 1910, of which some particulars were given in the "JOURNAL" at the time [Vol. CXI., p. 98]. The gas supply was interrupted for 37 hours from this cause.

The coke consumed in the retort furnaces during the year amounted to 14 per cent. of the coal carbonized in the inclined retorts, and to 15 per cent. of the coal carbonized, with steaming, in the vertical retorts. A lower price was obtained for coke than in the previous year. The yields of bye-products were substantially the same as in 1909; but the returns from them generally were rather lower than in that year—ammonia being, however, an exception. The material used for purifying consisted chiefly of "Giulini" or Lux purifying material, although some Dutch bog ore was also employed. Owing to the cessation during the year of the use of English coal, the proportion of sulphur in the gas distributed fell to the normal figure of 15 grains per 100 cubic feet.

The experimental gas-making plant, which consists of a setting of two horizontal retorts, was in constant use; and 33 samples of coal were examined for the information of the gas-works' staff, while 57 samples were examined for the Swiss Coal Union and other bodies. A new method of determining the hardness or firmness of the coke produced was tried. The coke, after weighing, was discharged with a fall of 8.2 feet on to a cement floor, and then passed through screens of 1½-inch and 1¼-inch mesh. Coke, which gives 57 to 65 per cent. of lumps which will not pass through the 1½-inch screen, is regarded as up to the standard degree of hardness. Any excess above this proportion is considered to give a proportionately higher value to the coke. One investigation of interest was that of a solution for filling gas-meters known as "Frigorin," which consists of a 30 per cent. aqueous solution of calcium chloride. Eleven weeks' exposure to the open air showed that it volatilized at the same rate as 80 per cent. glycerine—that is to say, both liquids lost about 20 per cent. in weight. The frigorin, on the other hand, attacked metal rods more freely than the glycerine solution, though less freely than distilled water. It is concluded from these experiments that glycerine, notwithstanding its higher cost, is preferable to Frigorin for wet gas-meters. The number of public lamps in use was 6688, containing 8394 burners. Of these, 51 had flat-flame burners. The number of automatic igniting and extinguishing appliances in use was increased by 229 in the course of the year, and 1779 lanterns are now equipped with them. The average mantle consumption per street lamp was 6.96 per annum, and of chimneys 3.07 per annum, both of which figures are lower than those for the previous year. The accounts show a total net profit on the year's working of 1,375,148.65 francs (about £55,006).

Gas-Workers' Wages at Hereford.—In the report of the Gas Committee which was adopted at the monthly meeting of the Hereford Town Council, it was stated that the Committee had received an application for an increase of wages from the stokers and others at the works, and had decided: (1) That the wages of the stokers and coal-wheelers when working on two beds of retorts be increased as follows: Stokers, from 4s. 6d. to 5s.; coal-wheelers, from 4s. to 4s. 6d. per man per shift. That when working on three, four, or five beds of retorts, the work be re-arranged and the wages increased as follows: Stokers, from 4s. 6d. to 5s. 6d. per man per shift; assistant stokers, from 4s. 6d. to 5s.; coal-wheelers, from 4s. to 4s. 6d. (2) That the wages of the coal-men be increased from 4s. 6d. to 5s. per man per shift. The Gas Manager (Mr. W. W. Townsend) estimated the cost of the increase, with the re-arrangement of work, at £50 per annum.

SOUTH METROPOLITAN GAS COMPANY.

The Ordinary Half-Yearly General Meeting of this Company was held last Wednesday at De Keyser's Royal Hotel, Victoria Embankment, E.C.—Mr. CHARLES CARPENTER (the Chairman) presiding.

The SECRETARY (Mr. F. M'Leod) having read the notice convening the meeting and the minutes of the last ordinary and extraordinary general meetings, the seal of the Company was affixed to the Register of Proprietors, and the report and accounts, which were given in the "JOURNAL" for the 1st inst., were presented.

The CHAIRMAN: Ladies and gentlemen,—I think the opening paragraph of the report is sufficient to inform you that the past half-year's working has been satisfactory, inasmuch as, after meeting all our obligations, we have been able to carry forward £34,371 to the current account. When you remember that this result has been arrived at in face of greater competition, increased labour charges, and, most important of all, greater cost of our raw material—coal—you will naturally ask how it has been done.

FINANCIAL SUCCESS DUE TO TECHNICAL PROGRESS.

Well, success has been due to technical rather than to commercial reasons; and on this account, prominence has been given to them in the second paragraph of the report. For many years, the method by which coal gas was officially tested for its illuminating value was unfair and incorrect; and enormous loss was caused to the consumer by the wastage entailed in working to it. The substitution of the present scientific method is entirely due to the work done by this Company, first in the laboratory, and afterwards before Parliament. Released from the necessity of conforming to an obsolete standard, engineers were free to turn their attention to the important problem of the scientific carbonization of coal, with results such as those you have now before you. The cost of placing the coal into the retort where it is carbonized is not increased; but by more scientific treatment of it, we improve our gaseous yield, we avoid damaging our tar products by decomposed gas, and we produce a coke which is not so friable, and can therefore be handled and stored with less waste. Of course, we are not alone in reaping these advantages. They are shared by other undertakings both in London and throughout the country; and this Company may well be proud of the part it has played in placing the gas business of the kingdom upon a firmer basis than ever.

ITEM OF PURIFICATION.

Before I leave the item of manufacture, I ought to say a word upon the question of purification, the cost of which you will have noticed has increased from £13,300 to £25,800. Part of this increase arises from the extended use of lime, which has been adopted as a more or less temporary expedient, pending the search for more satisfactory methods. A good deal of experimental work on the subject has been carried out by our chemical and engineering staff; and we expect to have at work during the present year a large-scale plant in which will be embodied our latest knowledge of one aspect of the purification question.

GROWTH OF CONSUMPTION.

As regards the increase in our business, which, as the report states, is 2·62 per cent., it may be interesting to point out that the increase is equal to the entire consumption of a town such as Carlisle; so that, although the limits within which we supply gas are fixed, our business continues to expand. Shopkeepers have taken up with avidity the use of high-power gas-lamps; and we now have in use upwards of 900 of these, with an illuminating power of something like one million candles. I ought, perhaps, to say that the efficiency of high-power gas lies in the fact that either the gas or air—it does not much matter which—is supplied under increased pressure, which, by reducing the size of the flame, and allowing its heat to be developed within a smaller compass, greatly increases the efficiency of the mantle results, which is largely a function of temperature.

GAS FOR COOKING AND HEATING.

The prejudice against the use of gas for purposes other than lighting is rapidly dying out, as is proved by the continued growth of the number of cooking and heating appliances in use. Gaseous fuel is, indeed, continuously taking the place of coal; and I am afraid that to the purveyors of the latter competition is becoming unpleasantly acute. I am prompted to this remark by the fact that a circular has recently been widely distributed in South London suggesting that only coal-fires are cheap and healthy. With regard to the former suggestion, we are quite content to leave the matter with our consumers, who are answering it for themselves by the increased quantity of apparatus they are hiring and purchasing. In respect of the second, medical testimony continues to grow as to the boon to health of using properly-designed gas-fires.

COAL SUPPLY.

The one real cause for anxiety in our business is the supply of cheap coal. When the Eight-Hours Bill was receiving consideration, we were told by Mr. Herbert Gladstone that the adoption of the system would enable expensive mining plant and machinery to be employed continuously, and, by thus reducing standing charges, allow pits to be worked more economically, and thus cheapen coal, upon which every industry is more or less dependent, but few as greatly as our own. There is, however, this fundamental difference between gas producers and coal producers—that while we rely upon extending the use of gas, and thus reducing its cost, and at the same time increasing the earnings of our workpeople, the colliers profit, not by a larger output of coal, but by the higher prices that can be obtained for it. Under the present system of remuneration, therefore, they are not likely to view with favour any methods of working coal mines more economically, even though it would be to the benefit of every industry in the country. It is difficult to believe that any other than such an economic reason could inspire a threat to strike against the method of working which they sacrificed their independence to obtain. It would

certainly be for the benefit of industry generally if some other basis than the present one could be adopted for the regulation of miners' wages. It is difficult to avoid contrasting it with our own co-partnership, in which the interests of every employee lie in the direction of lower prices to consumers reducing costs by increasing consumption.

CO-PARTNERSHIP PRINCIPLES AND ACCIDENTS.

I have recently drawn attention to the great diminution in accidents resulting from the application of co-partnership principles. As you are aware, the machinery provided by the State for dealing with industrial accidents is two-fold. The Factory and Workshops Act provides a staff of doctors and technical inspectors, whose duties are to make suggestions for the prevention of accidents, and to see that they are carried out; and for the accidents which happen, the State, by the various Workmen's Compensation Acts, provides for the payment of monetary compensation to the sufferer. The Acts also contain "contracting-out" clauses, by which, if any mutual schemes are evolved better in the opinion of the Chief Registrar of Friendly Societies than the provisions made by Parliament, they may be substituted for them. With the help of our men, we formulated such a scheme some ten years ago; and one of its provisions is that a jury of workmen inquire into every accident, in order to find out whether similar ones could be obviated in future, and, if so, to recommend the means to be employed. A concurrent advantage arising out of the working of the scheme is that malingering is practically unknown, while the percentage of accidents has been greatly reduced by the elimination of preventable ones. And no one will dispute that it is better to avoid an accident than to pay liberally for its happening. The idea of "contracting-out" was, and still is, in many quarters an unpopular one applied to an Act of Parliament—legislators and the legislated-for alike seem to have so much belief in its infallibility. But in our case "contracting-out" has been an indisputable boon to many thousands of workers, since it rendered possible their joining hand in hand with the officials to their mutual benefit.

THE INSURANCE BILL.

The accounts we have been discussing will remind you that, not only is provision made for accidents, but also for sickness. For seventy years—since, the report tells you, 1842—a mutual fund to provide against sickness has been in operation among the employees of the Company. At one time it was obligatory upon all regular hands to belong to it; but the Legislature, in its wisdom, having decreed that provision for sickness should not be compulsory, this condition was withdrawn. The fund has been a great blessing to all employees. It has provided liberally for sickness and for death, and through it considerable donations have been made to hospitals, dispensaries, sanatoria, and convalescent homes. It has helped wisely exceptional cases of distress arising among its subscribers; and malingering has been a negligible quantity in its administrations. There can be small wonder then that the Company's workmen view with alarm the threatened destruction of the fund by the Government Insurance Bill, which will inevitably be the case if its present provisions are carried through. It will be a great pity if the exemption of local bodies from its operations cannot be extended to gas undertakings, even though the Bill may differ in this respect from the German model upon which it is based.

LABOUR SAVING IN GERMAN GAS-WORKS.

In this connection, I may say that I have had the opportunity of inspecting not a few of the latest examples of gas-works design in Germany, municipal and otherwise; and I have been very much impressed with one striking fact with regard to them, which may have been overlooked when material for the present Bill was being obtained. This was the remarkable extent to which expenditure has been carried in order to dispense with labour. Everything possible that could be done by machinery, and almost regardless of first cost, was done. From the moment coal came alongside the works until it entered the retorts, and from the time the coke left the retorts until it was screened and loaded into the buyers' waggons, it was untouched by hand; and when I asked the cause of this state of affairs, I was told: "We are so heavily handicapped in respect of labour obligations, that we strive our utmost to dispense with labour as much as ever we can." Well, that is a very different principle from the one adopted by this Company, where machinery is only used if the particular work cannot be performed so satisfactorily by hand. I for one should be very sorry to see the German system widely adopted over here; but it will inevitably come if an irksome attitude is substituted for the present relationship between employer and employed. For myself, I am a believer in labour tempered with such leisure as will keep the mind healthy in its healthy body.

COMPANY'S RELATIONS WITH THEIR WORKMEN.

I ought, perhaps, to apologize before I sit down for having detained you so long with labour matters. My excuse will be found in the balance-sheet, where you will see that we pay in wages in South London something like £560,000 a year; so that it is not a small matter in relation to our business. Having regard to the trouble which is taking place all around us—the disturbed condition of the labour world generally—it is a great satisfaction to me and my colleagues, and also to the officials of the Company, to be able to come here to-day and report to you that our relationship with our men in all departments and in all branches was never more satisfactory, never more harmonious, than it is at the present day.

MOTION FOR THE ADOPTION OF THE REPORT.

Now, ladies and gentlemen, I do not think I need detain you any more with regard to the report. It speaks for itself as to most of these items, and it would only weary you if I made a lot of comparisons, which, after all, you are just as able to do, with the corresponding half-year's accounts before you, as I am myself; but if there are any questions which any shareholder desires to ask, I shall be pleased to answer them. I have now to move: "That the report and accounts now presented be received and adopted, and the report entered on the minutes."

The DEPUTY-CHAIRMAN (Mr. Frank Bush) said: The Chairman has dealt exhaustively with the report and accounts; and when he has, so

to speak, gone over the field, it leaves very little for a gleaner. I heartily concur in the remarks he has made about the Company's sick fund. Why the fund should be superseded by the Government measure which gives diminished benefits, I really cannot understand. You have heard that the fund has stood the test of time for nearly seventy years. I was its Hon. Secretary and one of the Trustees for twenty-six years, and I know how much workmen appreciated it. It has pleased me very much to see the businesslike way in which the workmen have gone about this matter. They have appointed a Committee, and this Committee has interviewed a number of Members of Parliament, with, I hope, good result. This I can say for the members of the Board, that, individually and collectively, they will do the best they can to keep the fund intact. I have much pleasure in seconding the motion for the adoption of the report and accounts.

The CHAIRMAN, before putting the resolution, invited criticisms of the report.

There being no response, the motion was carried unanimously.

THE DIVIDEND.

The CHAIRMAN next moved: "That a dividend at the rate of £5 9s. 4d. per cent. per annum be now declared, and that the warrants be transmitted to the registered addresses of the proprietors by post." He said he need not remind the proprietors that the dividend was a statutory one, dependent upon the price of gas being 2s. 2d. per 1000 cubic feet. Although he was not there to prophesy, he hoped the day might not be far distant when the Company might see their way clear to making a reduction in price. It would not be this year; but he would be very disappointed if they were not in a position to make a reduction next year.

Mr. JAMES C. D. HUNTER (an Employee-Director) seconded the motion; and it was carried unanimously.

The CHAIRMAN announced that this concluded the business of the meeting.

VOTES OF THANKS.

Alderman HOWLETT said he did not think they would like to separate without doing the usual courteous thing in proposing a hearty vote of thanks to the Chairman and the Board of Directors for their excellent report. There was really nothing whatever in it to criticize—it was all congratulation; and probably the least said the better. The Company had had an extraordinarily successful half year; and the Chairman had expressed the hope that next year it would be better still. Taking one thing with another, he thought the shareholders were in a good thing. He had no doubt that a great deal of the success of the Company was directly attributable to the Chairman. He (the speaker) had known him a good many years, and knew the hard work he had done as a salaried officer of the Company. But now that he had retired from this position, he worked harder even than he did before in bringing the Company to the successful condition in which it now stood. One man, of course, could not do this by himself; and much was due to the adhesion and help of the other members of the Board. Taking all the circumstances into account, the report was an extraordinarily good one. He had the greatest pleasure in proposing the vote.

Mr. SPENCER seconded the resolution, which was carried unanimously.

The CHAIRMAN thanked Alderman Howlett for his eulogistic remarks, and said that gentleman could not better have voiced the state of affairs with regard to the Board. They all worked hard for the good of the Company; but as he had pointed out, this would be of little use unless the officers and the staff did their duty. The commercial branch also set a good example in this respect; and he could assure them that, both on the technical and the commercial side, they had an admirable staff. In his speech, he laid emphasis on the technical part, because, after all, this was the foundation of their business; and when this was assured—when it was all as it should be—then the commercial section came along and increased the business, as they had done in this Company. He would like to propose that their best thanks be given to the officers and staff of the Company.

Mr. ROBERT MORTON seconded the motion, which was carried unanimously.

The CHIEF ENGINEER (Mr. W. Doig Gibb) said it was quite a pleasant task to reply to a vote of thanks when they had had such an excellent half year; but their very success should remind them that probably at some future date, for they could not always be beating records, a half year might come when the technical staff—he hoped through himself—might have to face the ordeal of explaining away results which were not quite so good. In the meantime, he thanked them, in the name of the technical staff. He could only reiterate what had been said—that the technical staff and the commercial staff, together with the workmen, were working together with a long pull and a strong pull.

The SECRETARY also thanked the meeting most sincerely on behalf of himself and his colleagues. They had an excellent staff of technical men; and the commercial section did its best to follow the example set by these two wings of the undertaking. With regard to co-partnership, there was no feature of the Company's working that was more interesting to his colleagues and himself, and from which they gathered more hope of the future. Every week he got individual examples from men of all grades of the value attached to this feature of their employment; and he was quite sure that, while the spirit he had indicated obtained among the men, they would get no trouble such as was now agitating London and other parts of the country.

COMMERCIAL GAS COMPANY.

The Ordinary Meeting of the Company was held last Thursday, at the Cannon Street Hotel, E.C.—Mr. W. G. BRADSHAW in the chair.

The SECRETARY (Mr. F. J. Bradfield) read the notice convening the meeting; and the Directors' report and the accounts were taken as read.

DIRECTORIAL AND OFFICIAL CHANGES.

The CHAIRMAN, in moving the adoption of the report and accounts, said: I regret that I have to preface the few remarks I have to make to-day with an expression of deep regret at the loss the Company have sustained through the death of our esteemed colleague, Mr. John Giles Pilcher. Mr. Pilcher was, the report states, for twenty years, a member of the Board, a constant attendant at these gatherings, and rarely absent from the Board meetings. He took a very keen interest in the affairs of the Company; and we at the Board very much miss his genial and helpful presence. We passed a resolution of condolence and regret, and sent it to the family; and I am sure the proprietors generally would wish to be associated with the resolution. As to the vacancy caused by the lamented death of Mr. Pilcher, the Board were of one mind in making an offer of the vacant seat to the late Secretary, Mr. H. D. Ellis. Mr. Ellis had been for considerably more than thirty years the Secretary of the Company, and had done us valuable service. We felt it to be in the true interests of the Company that we should retain for its benefit his long experience, his great knowledge of gas administration, and his knowledge of affairs and men. I am sure we shall have your cordial approval in the step we have taken. I should like to express in your name and ours to-day, our hearty welcome to Mr. Ellis in his new capacity as a Director of the Company, and to voice the hope that he may have long life to serve the Company in the new office. I should also like to say that the Directors were equally unanimous in voting Mr. Ellis a retiring allowance on the scale and terms which are usual in such cases; and I am sure we shall also have your full approval in this matter. Regarding the vacancy caused by the retirement of Mr. Ellis from the position of Secretary, we have appointed as Secretary Mr. Frederick J. Bradfield who has been for the last nine or ten years the Accountant of the Company, and has discharged the duties of the office to the entire satisfaction of the Board and of Mr. Stanley Jones, the Engineer and General Manager. We have great confidence in asking Mr. Bradfield to undertake both the duties of Secretary and Accountant. We have done the very best we could do in the interests of the Company; and we feel equally confident that the duties will be most admirably performed. Under an old Act (which, I venture to think, is somewhat obsolete now), the determination of the remuneration of the Secretary can only be exercised at a general meeting of the Company; and therefore I shall have to submit a resolution presently for your approval, fixing Mr. Bradfield's remuneration.

A REDUCTION IN PRICE AND THE EFFECT.

When we had the pleasure of meeting you on the last occasion, I had the great privilege of announcing that we had decided to reduce the price of gas by 2d. per 1000 cubic feet. But at the time I felt it necessary to utter a word of warning—that it might be we should not be able to earn the dividend we were then paying. But in the result we have earned the dividend we shall be entitled to pay under the sliding-scale, and have during the past twelve months put a sum of £10,000 to the undivided balance that is carried forward. I think you will agree with me that this is very satisfactory. The 2d. per 1000 cubic feet reduction cost the Company £13,690 during the past half year; and for the year it would be about double this sum. During the half year we have made a good deal of it up. We have had an increase of nearly 3½ per cent. in the sales of gas, which represents 54½ million cubic feet, and in money about £6300. Then the rent we receive for the hire of stoves and meters has gone up by some £2200; so that you see we have made up more than half of the loss in these ways alone.

A BIRD'S EYE VIEW OF THE FINANCIAL RESULT.

Just to give you a bird's eye view of the operations of the half year. The balance of profit amounts to £66,587. This time last year it was, of course, more, because we were charging an additional 2d. for gas. It was then £74,451, which is £7864 more. But the balance of profit this year is quite sufficient to pay the interest on the debenture stock, and the interest on the money borrowed from time to time from the bank, which amount together to £8504. It is also sufficient to pay a dividend at the rate of £5 9s. 4d. per cent. on the 4 per cent. stock, and £5 6s. 8d. on the 3½ per cent. stock, which amount together to £56,296; and there is then a surplus of £1787, which will be added to the sum brought forward, £52,032, and make an amount of undivided profit of £53,819, which is very nearly equal to a half-year's dividend. I should like to see this sum grow larger, because it is the first line of defence between an increase in the price of gas and a reduction in dividend. At the same time, I think it is a satisfactory figure; and it has rarely been as large.

COAL AND OIL.

Now if you will turn to the revenue account, I will very shortly call your attention to the salient figures in it. On the expenditure side, the total expenditure was £12,382 more than it was in the corresponding half of 1910; and the principal items of increase are as follows: Coal and oil cost us £3591 more. I should like to say a few words about coal and oil. We have made our new contracts for the current twelve months at a considerable reduction—in fact, we have gone back to the prices of 1909. With regard to oil, our present oil contracts cover us to the end of the year; but then we shall have to pay a slightly higher price—not to a great extent. The outlook in the coal market is not altogether a very pleasant one at the present time. As you will have seen, there has been a disturbance in the North; and the Northumberland miners have passed a vote (I think nearly unanimously) calling upon the Miners' Federation to declare a national strike against the three-shift system. You probably remember that before the Mines' Eight-Hour Bill was passed, the two-shift system was

Rotherham Gas Undertaking.—In his annual report, Mr. Samuel Hall, jun., Burgess Auditor at Rotherham, points out that, comparing the results of this year's working with last, there is an increase in the net profit of all the trading departments. The Gas Department shows an increase in sales of £577, due to the sales by automatic meters. He thinks the time has arrived when these customers, who have to pay for their gas before they get it, should come in for consideration; and instead of the whole of the surplus being handed over to the relief of the rates, there should be a reduction in the price of gas to the automatic meter users.

worked up North; but when the Bill became an Act, they worked three eight-hour shifts a day, with the result that the output was considerably increased. In South Wales and the Midlands, the men have refused to work the three-shift system; and now, I am afraid, up North there is an agitation to give up the three-shift system there.

RATES AND TAXES AND OTHER ITEMS.

Then we have spent £2900 more on distribution, which is principally due to the fact that we had a larger number of stoves to handle. This is an item that will rise half year by half year; and it is satisfactory, because it is one of the means whereby we sell our gas. A more serious increase in the expenditure of the Company is rent, rates, and taxes, which amount to £14,577 for the half year. This time last year it was £12,757—so that it is now £1820 more, and is due principally to the higher assessment of the works. I think I told you last half year that it was the year of the quinquennial assessment; and we were unable to resist the putting up of the valuation of our works. The rates, however, now amount to no less than 2d. per 1000 cubic feet of gas sold, which is a very serious charge not only on the Company, but on our poor consumers in the East-end of London. I need hardly remind you that within the last few years we have had a great deal of increased taxation, in addition to the rates, put upon us. Not very long since there was the Workmen's Compensation Act; and this last year we have had the port dues under the Port of London Act. Now we have facing us the charges under the National Insurance Bill, which, I think, will cost us something like £800 to £1000 a year. I cannot say that I grudge this, because I think it will be of enormous benefit to our men. The Company have been in the habit of contributing to the men's sick clubs—not largely, but sums sufficient to keep them going; and they have been a great benefit to a certain proportion of the men. A large number of the men belong to outside clubs; and the Company, of course, have not contributed to them. Now I suppose all employers will come under the National Insurance Bill if it becomes law; and in the case of this Company, we shall have, as I have said, to make a contribution of £800 to £1000.

SOURCES OF INCOME.

As to the other side of the account. Residuals have given us £8658 more—coke £7006 more, and sulphate of ammonia £1844 more. Then, as I said, we have £2248 more for rental from stoves and meters. Gas gave us less by £6410. That is, you see, about half what the 2d. reduction cost us. Altogether our receipts are more by £4518; and deducting this from the expenditure (which was more by £12,383), we have our net revenue less by £7864. I am quite satisfied with this result; and I hope you are equally so. It shows we are in a flourishing condition, and that our business has in it the elements of expansion which are altogether gratifying.

CARBONIZING WAGES AND WORKING RESULTS.

There are two items to which I should like to call attention. Our carbonizing wages are down as compared with this time last year by no less than £2000. Ten years ago carbonizing wages cost us no less than 3½d. per 1000 cubic feet; to-day they are costing us 1½d. per 1000 cubic feet. I mention this because it reflects the greatest credit upon the management, and more especially upon our Engineer and General Manager. It means that he is keeping his works up to date with modern machinery, and that everything is being done to economize in working that it is possible to do. There are other records in the accounts which go to his credit and to that of the Managers of the works—Mr. Williams at Poplar, and Mr. Gill at Wapping. That is the gas made per ton of coal carbonized—12,455 cubic feet. It is certainly a record for the Company; and it is a high figure indeed. The coke made for sale per ton of coal has also come up to 10½ cwt.; and the ammoniacal liquor has gone up to 39½ gallons. These are all records for the Company; and they are all creditable figures indeed.

CO-PARTNERSHIP.

The other point to which I should like to draw attention is that of profit-sharing. We spent £3370 during the half year under this head. The bonus now amounts to 6 per cent. on the men's wages; and the total cost for the year is £6474. But I say, with the full concurrence of the Engineer and of the Managers of the works, that every penny of this is money well spent, and that it gives full benefit to the Company. I am glad to say our relationship with the men is altogether satisfactory. They respond well to the interest that one takes in their welfare; and I see signs that they are becoming more thrifty. During the past year, we had £3836 of savings deposited by the men and the staff of the Company. Altogether, the interest of the employees in the Company amounts to just about £50,000; and I think I can say that, without the profit-sharing scheme, they would not have had anything like this amount of money. I have here a return of the profit sharing from the time that it began in this Company ten years ago up to the present. The number of profit sharers the first year was 823; now the number is 1234. The amount of bonus the first year was £3123; and the rate was 4 per cent. The amount of the bonus is now £6474; and the rate is 6 per cent. The amount of the employees' interest in the Company was then £4000; now it is just under £50,000. Well, I look upon this as a very satisfactory record. We have had only to-day, just before coming into this room, an instance of the benefit it is to the men. There was a man aged 64. He had done 36 years' good service for the Company; and now his doctor has reported that, through heart trouble, he is no longer fit for work. We were enabled to grant him a small pension, which will help his declining days, and tend to make them comfortable. But beyond this, he had standing to his credit, in the profit-sharing scheme, a sum of £48. This is a very good thing for a man in his position; and it will, I am sure, help him a great deal, as he has to face declining years and perhaps ill-health.

CAPITAL AND CONFIDENCE.

There is very little more to say on the present occasion. You see we have not spent much on capital account. It is the smallest amount that has been spent in a half year since 1883, when nothing at all was expended. I am glad to say our capital account continues to go down;

and it is at a very satisfactory figure per million cubic feet of gas sold. I am able to assure you that our works are thoroughly up to date, and are most efficiently maintained. We are carrying out certain small improvements at some of the stations which will tend further to economize the cost of working. In fact, I do not know of anything which need cause us anxiety at the present time, except the disturbance in the labour market. We are at the moment suffering from a strike of carmen; but I have every hope it will soon be over, and that the Company will not suffer any considerable loss. I confidently believe that the next time we have the pleasure of meeting you we shall have a very good report to give of the Company's affairs.

The DEPUTY-CHAIRMAN (Mr. Walter Hunter), in seconding, said he would only venture to point out that the capital stood at £437 per million cubic feet of gas sold, as against £450 per million cubic feet this time last year. He might add that the Directors, as usual, recently paid a visit of inspection to the works, and found everything in perfect order. They had also a most satisfactory meeting with the Profit-Sharing Committee the previous week; and they could not help being struck by the fact that the members of the Committee (drawn as they were from the workmen) were thoroughly imbued with the spirit of thrift. This, the Directors hoped, the profit-sharing system would do much to stimulate. He thoroughly endorsed all the Chairman had said regarding the position of the Company.

Mr. ENNIS remarked that the proprietors would desire to associate themselves with the Chairman's expression of regret at the death of Mr. Pilcher, who bore an old City name. He was also sure the proprietors would desire to register their entire accord with the Board's disposition of the vacant seat by the election thereto of Mr. Ellis, the late Secretary. He might also convey to Mr. Ellis, as he was sure this was the feeling of the proprietors, their hearty thanks for his past services over a very long period, and their congratulations to him upon his elevation to the Board. They hoped to see him for many years occupying his present dignified position.

The motion was unanimously carried.

On the motion of the CHAIRMAN, seconded by the DEPUTY-CHAIRMAN, a dividend was declared for the half year at the rates per annum of £5 9s. 4d. per cent. on the 4 per cent. stock, and £5 6s. 8d. per cent. upon the 3½ per cent. stock, in both cases less income-tax.

The CHAIRMAN next moved—"That the remuneration of the Secretary, Mr. F. J. Bradfield, be and is hereby fixed at £700 per annum."

The DEPUTY-CHAIRMAN seconded the motion, which was heartily carried.

On the proposition of Mr. FRANK JONES, seconded by Mr. CHAMBERLAIN, a hearty vote of thanks was passed to the Chairman and Directors.

The CHAIRMAN expressing his acknowledgments, on behalf of himself and his colleagues, remarked "honour to whom honour is due." The proprietors would wish him to propose the usual vote of thanks to the officers of the Company, headed by Mr. Stanley Jones. While it was a "usual" vote of thanks, that did not mean it was to be performed in a perfunctory manner, because the proprietors owed a deep debt of gratitude for the enthusiastic interest the staff and men took in their work. The Directors could testify that the work could not be better done than it was. He was happy to say the whole of the Company was one happy family; and he was sure that everybody was contented and happy. Under such conditions, they obtained the best work out of the men. He believed there was thorough good feeling; and nothing but a hearty desire to see the Company prosper. He included among the officers not only Mr. Stanley Jones and Mr. Bradfield, but he should like to make special mention of the Managers of the stations who did most admirable work—viz., Mr. Williams and Mr. Gill. They were most enthusiastic, and men up-to-date in their knowledge and skill. That their work was admirably performed, any expert could see from the accounts. He likewise included the workmen, who he believed, with few exceptions, gave the Company of their very best service, and he was sure it must have been hot and perspiring service the last few weeks. [Hear, hear.]

The DEPUTY-CHAIRMAN, in seconding, endorsed the remarks of the Chairman.

The motion was unanimously carried.

Mr. JONES, on behalf of himself and his staff, thanked the proprietors, observing that the work of all departments of the Company was made easier by the hearty backing up and support that a sympathetic Board gave them. He cordially endorsed all the Chairman had said regarding the state of the Company's affairs. In these times of trouble in the fields of labour, he could say with confidence that the relations between the various ranks of the Company's employees and the management were as good as could be found anywhere. There was one little matter that would interest the proprietors, and that was the great change that was taking place in the form of the consumption of gas. He was much struck recently, in looking at the send-out on a Sunday, to see that, for three hours in the middle of the day, more gas was distributed than in any other similar period of the twenty-four hours. This was entirely due to the use of the gas-stove which the Chairman said cost much money, but which was money well spent. It helped to make a continuous load on the mains; and it assisted them to work economically. It was most satisfactory, as it was a field that could not be filled by rivals.

Mr. BRADFIELD remarked that these were rather early days for him to acknowledge this vote of thanks in the position of Secretary. But he did think that as a member, and on behalf, of the secretarial and clerical staff, he was qualified to do so. This vote of thanks was almost an institution; but if it were given up, it would be very much missed by the clerical staff. It was one of the opportunities they had of realizing that their services were appreciated. The Company had a young and keen clerical staff; and he confidently said that they were deserving of the vote of thanks that was accorded half year by half year.

A dividend at the rate of 5½ per cent. per annum on the preference shares, and one of 20 per cent. per annum on the ordinary shares (both less income-tax), have been declared by the National Gas-Engine Company, of Ashton-under-Lyne, for the half year ended June 30. These dividends relate, of course, to the shares in the old Company.

TOTTENHAM AND EDMONTON GAS COMPANY.

The Annual General Meeting of this Company was held on Saturday, the 5th inst., at the Gas-Works, Tottenham, Mr. CORBET WOODALL (the Chairman) presiding.

The SECRETARY (Mr. E. Topley) read the notice convening the meeting; and the minutes of the preceding meeting having been read and confirmed, the report of the Directors was presented.

FEATURES OF THE REPORT AND ACCOUNTS.

The CHAIRMAN said he was glad to meet the shareholders again, especially when the Directors had to present so satisfactory a report as that of which he now had to move the adoption. It was somewhat remarkable, looking at their accounts, that the total revenue for gas and residual products, regarded from the point of view of the charge per 1000 cubic feet of gas sold, was almost identical in the past half year with that received in the corresponding half of 1910—viz., 3s. 3'95d. against 3s. 4'08d. The loss, due to a reduction in the price of gas at the beginning of the year, had been balanced by better receipts from residuals—coke, tar, &c. On the other side, the expenditure had been less by only one-third of a penny per 1000 cubic feet. The increase in profit was thus due almost exclusively to the larger quantity of gas sold. There had been spent on capital account during the half year £15,869; but against this had to be set £3572 written off for depreciation of meters and stoves. The net addition was thus about £12,300. The relation of capital to business continued to improve—being now £419 per million cubic feet sold; and the charge for dividend and interest was 6d. per 1000 cubic feet. Though the capital raised had been overspent by £31,500, there was no immediate necessity to issue more. The balances of net revenue and other funds invested furnished sufficient working capital at a cheap rate, and further funds so employed suffered no depreciation, whereas they had had to write considerable sums off those invested in high-class securities outside. While there was little of an exceptional character in the figures on revenue account, they were all good. An increase of more than 6 per cent. in the quantity of gas sold was gratifying, and, as he had said, the foundation upon which the success of the half year was based. The low price at which the Company were now able to sell gas was a guarantee that the growth at which they had had to rejoice in the past would be continued in the future.

ELECTRICAL COMPETITION—GAS-ENGINES TO GENERATE CURRENT.

They had now for some time had experience of electrical competition. While it had meant the loss of some valued consumers, and had probably affected prejudicially the rate of growth, the prosperity of the Company was in no way menaced. The Wood Green District Council obtained an Electric Lighting Order nine years ago, but, he understood, had decided not to do anything with it. The Company were considerable ratepayers in the district, and might congratulate themselves on this fact, because, had the Order been proceeded with, it would have meant a considerable addition to the rates, as there was little chance of its ever being a profitable undertaking. The Company had incurred some expense by fitting up gas-engine plants for generating electricity on the premises of consumers. Where the quantity of current required was fairly large, the cost of generating compared favourably with a public supply in a district where great lengths of expensive cables would be required to serve the comparatively few people who wanted electricity.

POINTS FROM THE WORKING STATEMENTS.

At the last meeting, the Directors had to apologize for the large amount of unaccounted-for gas; and he ventured to promise them that the high proportion would be reduced. In the past half year, it had been down to the very satisfactory percentage of 2'33. Residuals were good, both in quantity and price. The cost of raw materials used was greater by £2000. But residuals had yielded more by £3900; so that the net cost was less by nearly £2000. It was gratifying to know that the consumption of gas per consumer was again greater; proving that the general applications of gas were growing in popularity. Although the price had been less by 1d. per 1000 cubic feet than it was last year, there was a larger revenue from gas by £3000. It was gratifying to know that, with one exception—that of Wandsworth—consumers in Tottenham were receiving the lowest priced gas of any suburban district around London.

FINANCIAL POSITION—FURTHER REDUCTION IN PRICE.

The financial result of the half-year's work was that they had a profit on revenue account of £26,217, after providing £2000 for the general purposes fund. This was on the renewal account. From this sum the Directors proposed to carry £1000 to the insurance fund, to pay full dividends, and then there would be £5000 to add to the balance carried forward. The coal contracts for the current year were concluded on slightly better terms than last year. The success of the current half year was thus made certain; and he need hardly say that a further reduction in the price of gas was consequently assured at Christmas next. The Company's accumulated reserves now stood at £71,416; so that if they did have an occasional lean half year they could look forward to it with some degree of confidence.

HIGH-PRESSURE GAS—NEW LOW-PRESSURE LAMP.

They had found the system of lighting by gas under high-pressure so popular in Green Lanes, Wood Green, and elsewhere, that they were laying special mains for this purpose in the principal roads of Tottenham also. Gas so supplied had a largely increased value for other uses than lighting; and these might have considerable development. In the meantime, they would shortly have available a low-pressure lamp giving results so good that they might get practically the same effect without the need of special mains. In any event, the prospect in this direction of high-power lighting was excellent.

VALUE OF SHOW-ROOMS.

The Company had been involved in rather heavy parliamentary costs by reason of having to oppose the Greater London Railway Bill, which as

originally drafted interfered with their interests in many ways. They settled their differences with the Company; but the Bill had been rejected by a Committee of the House of Lords. Many new factories were being built in the Company's area; and the development of building estates for those who worked in them must follow, to the continued advantage of the Company. The district of Southgate still grew in popularity as a residential quarter; and for the convenience of their numerous consumers there they had built some extensive show-rooms and a local service depot, which would be opened in September. In the meantime, they had opened a shop next door, and had received many appreciative remarks about its convenience. The largely increased sale of fittings, &c., in all their show-rooms testified that the public gladly took the opportunity of improving their households by introducing more decorative fittings than were once regarded as satisfactory.

SUCCESS OF CO-PARTNERSHIP.

With regard to co-partnership, it was prospering financially, as the following figures would show: As compared with the position at June, 1910, the number of co-partners had increased by 2'1 per cent., and the bonus for the year by 18½ per cent.; the total stock transferred to co-partners being 32 per cent. The trust balances now stood at 12'3 per cent. more this half year; while the withdrawable balance was 16½ per cent. The total bonus so far received by the co-partners had amounted to £12,177. The Chairman concluded by moving the adoption of the report and accounts.

Mr. HENRY BAILEY seconded the motion; and it was carried unanimously.

BENEFICIAL EFFECT OF CO-PARTNERSHIP.

Sir DANIEL F. GODDARD, M.P., the Deputy-Chairman, moved the declaration of dividends at the rates of 7½ per cent. per annum on the "A" consolidated stock, and 5½ per cent. per annum on the "B" consolidated stock, both less income-tax. In doing so, he pointed out that the resolution had undergone a great change of late years; but it was only in recent years that it had been proposed before the workmen of the Company. He supposed in the olden days the workmen used to regard the shareholders as "bloated capitalists," and think that they were worked a little extra hard to provide the dividends. Things had changed since then; and he did not think their workmen would ever regard the shareholders in that light again. This was very largely due to the efforts and good-will of their Chairman, who had made himself not only absolutely familiar with the details of the profit-sharing business, but had come to be acknowledged as an expert on this particular question. He (the speaker) was sure that their Chairman was gratified that the half-yearly meetings were attended by many of the men who formerly were excluded, but who now felt that their good work went to make up the full dividends of the concern, in which they shared. There was a little increase of dividend again this half year; and this did not need any words from him to commend it to the shareholders. It necessitated a few fractional figures; but nevertheless they meant more money to those who had invested money in the Company. He had been over the works again that morning, and there was every reason to feel that they were eminently satisfactory; and he would also like to say that the work of the workers was very satisfactory—two very different things. When he compared the works with what they were at the time he first became a Director, he could not help noticing the vast improvement in them. This was mainly due to two people—very largely to the Chairman, for his innate love of what was tasteful, orderly, and efficient; and also to their Engineer (Mr. A. E. Broadberry), for his hatred of mess and muddle and misuse of space. The result was that they had now works which were good to look at and well adapted for their business; and it helped the men to do their work in the best possible way.

Mr. JAMES CLOUDSLEY, J.P., seconded the motion.

The CHAIRMAN, in putting the motion, said the addition to the dividend was the full amount to which they were entitled for the reduction of 1d. per 1000 cubic feet in the price. All he hoped was that they might continue these reductions for a considerable time to come, and then the eighths would in due course become fairly important amounts. The shareholders would bear in mind that the capital of the Company, as with so many other gas companies, had been converted from what it was originally into stock of twice the nominal amount. Therefore the dividends they were declaring were equal to 14½ per cent. on the original stock, and 11¼ per cent. on the new stock as subscribed and paid for. These were considerable rates. But the phase of the undertaking of which he was most proud was that the present condition of the Company was that while they had these constantly increasing dividends they had a constantly reducing charge for gas supplied to the consumer in order to pay the dividend—the consumer could not complain of shareholders increased their dividend, if at the same time the Company continued to carry on the same policy of reducing the price of gas.

The motion was then put and carried unanimously.

CONCLUDING BUSINESS.

Mr. J. RANDALL, in proposing that Mr. Corbet Woodall, one of the retiring Directors, be re-elected, referred to the fact that since the Chairman had been on the Board of the Company the sale of gas had risen from 296,580,000 cubic feet in 1883 to 1,557,539,000 cubic feet last year, or an increase of 425'1 per cent.; while the price had been reduced from 3s. 8d. to 2s. 3d. per 1000 cubic feet. This increased sale meant, he said, that the Chairman had, with the assistance of the Engineer, undertaken the supervision of all the structural work. He might go so far as to say that the works had been constructed three times during Mr. Woodall's service in the Company, until to-day there was not one brick left to tell of the old works as they were when he joined the concern. Not only had he watched the progress of the business, but he had also looked after the interests of the workers, particularly in the matter of the co-partnership scheme.

Mr. J. EVE seconded the motion; and it was carried unanimously.

The CHAIRMAN, in returning thanks, said that when Mr. Randall pointed to the reconstruction of the works two or three times over as illustrating the work done by him, it gave him the opportunity of ex-

pressing the thanks he felt to Mr. Broadberry for the way in which he had carried out his work all the time he (the Chairman) had known him. The position of a technical chairman was a difficult one when working with a capable engineer. But he could say most sympathetically that he had never found any difficulty whatever in working with Mr. Broadberry. He had never met him without feelings of complete satisfaction, and had never made a suggestion that had not been considered by him as a brother engineer with a view to finding out what was best; so that their association had been one of unalloyed pleasure from the first. The Chairman concluded by proposing the re-election of Sir Daniel Goddard as a Director.

Mr. J. L. CHAPMAN seconded the motion; and it was carried.

Sir DANIEL having returned thanks, the retiring Auditor (Mr. Edmond Crowne) was re-elected.

On the motion of Mr. KEYS, seconded by Mr. W. BROWN, a vote of thanks was accorded to the Chairman, Directors, Auditors, officers, staff, and workmen for their services during the past year.

The CHAIRMAN, in acknowledging the vote, expressed his appreciation of the services rendered by the Secretary and his staff, as well as by the workmen in the undertaking.

The proceedings then closed.

CROYDON GAS COMPANY.

Half-Yearly Report and Accounts.

In the report to be presented at the meeting of the Croydon Gas Company next Friday, the Directors express their pleasure in saying that, no doubt partly as a result of the two recent reductions in the price of gas, the sales in the past six months show an increase over the corresponding period of 1910 of 8.36 per cent. The number of consumers has augmented by 799, and that of stoves on hire by 1587; while 231 stoves have been sold to consumers. Residuals yielded good results during the half year; and contracts on favourable terms for the purchase of coal and oil and the sale of coke and tar are in force for the current year. In view of the prospects for the immediate future, the Directors announce a further reduction of 1d. per 1000 cubic feet in the price of gas, to take effect as from the 1st of October. The system of high-pressure gas supply in the district has been further extended by laying a special main in North End, Croydon; enabling the owners of business premises there to secure the convenience and great economy of high-pressure lighting without the necessity of providing accommodation on their premises for the compressing plant. They hope that during the coming winter extensive use may be made of the facilities thus afforded.

The accounts accompanying the report show that the total revenue was £127,960, of which £87,589 was derived from sales of gas, £9873 from rental of meters, stoves, and house fittings, and £30,384 from the disposal of residuals. A sum of £58,089 was expended on manufacture, and £17,726 on distribution; rent, rates, and taxes came to £4786; management cost £4454; and the total expenses (inclusive of £1122 for the co-partnership scheme) were £91,791. The balance carried to the profit and loss account is £36,169; and the amount available for distribution is £40,815. The Directors recommend the payment of dividends at the rates of 15, 12, 10, and 5 per cent. per annum, all less income-tax, on the various classes of stock. This will absorb £23,524, and leave a balance of £17,291.

The statements relating to the working show that, under the supervision of Mr. J. W. Helps, the Engineer and General Manager, 43,702 tons of coal and 450,381 gallons of oil were used during the half year to manufacture 722,294,000 cubic feet of gas, of which 672,434,400 feet were sold and 681,306,100 feet accounted for. The estimated quantities of residuals produced were: Coke, 26,221 tons; breeze, 5557 tons; tar, 526,994 gallons; ammoniacal liquor, 1,291,109 gallons—the make of sulphate being 475 tons.

CAMBRIDGE GAS COMPANY.

The Half-Yearly General Meeting of this Company was held last Tuesday—Mr. W. B. REDFERN presiding, in the absence of Mr. E. H. Parker, the Chairman of the Company.

The SECRETARY (Mr. A. E. King) having read the notice convening the meeting, the report of the Directors, with the accounts for the six months ended the 30th of June, was presented. The accounts showed a sum of £22,544 available for distribution; and the Directors recommended the payment of dividends at the maximum rates.

On the motion of the CHAIRMAN, seconded by Mr. J. STANDLEY, the report was received and entered upon the minutes.

The CHAIRMAN next proposed the declaration of the maximum dividends. In doing so, he said there had been an increase of just over £2852 in the receipts; and though the expenditure had been higher, the Directors were able to pay the dividends recommended, and carry forward £160. Coal was rather dearer last year; but this year's contracts had been made at the same price as in 1909. This, together with the efficient working, had enabled the Directors to reduce the price of gas 1d. per 1000 cubic feet as from Midsummer last. This was the lowest price it had ever touched in Cambridge; and though it did not seem a great reduction, it meant £1570 to the consumers and £90 to the co-partners. It might be interesting to note that since 1902 these reductions had saved the consumers about £10,000. As he had mentioned the co-partners, he might say there were now 120 who were entitled to become shareholders; and the Directors believed the scheme would be a great success. It was exceedingly satisfactory to note that there was an increase in the make of gas for the half year of 11,159,000 cubic feet; showing an increase of 18,630,000 cubic feet for the year. They had sold 99 heating-stoves in the six months; making more than 200 sold in the year. The popularity of gas for cooking was, of course, well known; but it was worthy of remark that during the very hot weather the gas sent out between twelve and one o'clock in the day had been greater than at any other similar period, even when the public lamps, shops, &c., had been lit. This in itself spoke volumes. Prepayment meters were more popular than ever, and had proved a

real boon to the smaller householders. There had been an increase of 470 in the year; bringing up to 4852 the number at present in use. The up-to-date condition of the works and the efficiency of the appliances enabled 11,860 cubic feet of gas to be produced from each ton of coal carbonized—an increase of 662 cubic feet. Another reason for the increased income was the quantity of tar sold for use on roads, for which it was becoming more and more popular all over the country. The sale of coke had also been good.

Mr. J. FOSTER seconded the motion; and it was carried unanimously.

On the motion of the CHAIRMAN, seconded by Mr. STANDLEY, the salary of the Secretary was increased to £250 per annum.

The retiring Director and Auditor having been re-elected, a vote of thanks was accorded to the Chairman, Directors, and staff.

The CHAIRMAN, in acknowledging the vote, said the Directors would be able to do little without the staff. Both Mr. Auchterlonie (the Engineer and Manager) and Mr. Lawson (the Accountant) were worth their weight in gold for the way they worked and kept things going in their respective departments.

TUNBRIDGE WELLS GAS COMPANY.

The Half-Yearly Meeting of the Company was held last Wednesday—under the presidency of Mr. W. H. DELVES.

The CHAIRMAN, in moving the declaration of the usual interim dividends, remarked that the past half year had been exceedingly prosperous; and this was the experience of most companies. The gas made showed an increase of 11½ million cubic feet, which was 7½ per cent. increase on the total. This rather extraordinary gain was as much as they had been accustomed to expect on the whole year. They had reduced the price of gas 1d. per 1000 cubic feet; and this would mean about £650 decrease in rental. But instead of this, they had an actual increase of £882, which was beyond anything the Directors ventured to hope for. The cost of carbonizing material was £550 more, which was due, first, to more gas being manufactured; and, secondly, to a slight increase in the cost of coal. The residuals were all favourable. Coke produced £740 more, tar £380, and ammonia £136; the result being that residuals yielded about 1½d. per 1000 cubic feet more than the corresponding half of last year. The only decrease was in public lighting; but as this was now only 2 per cent. of their total sale, it was too small to be of material consequence. They hoped to have the new stoking apparatus in operation by October; but their working was now almost as economical as they could hope for. They were also constructing a storage tank for tar, which was now in large demand for road painting; and they found that in the summer months they could sell nearly as much as they could make in the year. The new apparatus for boiling tar was also giving very good results. He was glad to say that, on the half year, the Directors were fully justified in recommending the full statutory dividend, with the additional ¼ per cent. to which they were entitled on the reduction of the price of gas.

The motion was adopted; and the Chairman was thanked.

GLOUCESTER GAS COMPANY AND PROFIT SHARING.

The third annual meeting of the members of the profit-sharing and saving scheme in connection with the Gloucester Gas Company was held a few days ago—Mr. J. H. JONES (Chairman of the Committee) presiding. Among those present was Mr. W. E. Vinson, the Secretary of the Company.

The trust account showed a total of £608 4s. 9d.; the total amount of bonus in the withdrawal account was £501 7s. 8d.; and the savings account showed a balance of £494 2s. 4d. The grand total of the accounts thus amounted to £1603 14s. 9d.

The CHAIRMAN, in proposing the adoption of the accounts, said that at the end of the first year of the scheme the funds in hand amounted to £591 16s. 1d.; at the second annual meeting, they totalled £1121 11s. 6d.; and now they had gone up to £1603 14s. 9d. This, he thought, was very satisfactory growth; and there were several aspects of the scheme which gave cause for even greater satisfaction. According to the rules, part of what the members put by could not be withdrawn; but one-half of it might be taken out. He was very glad to find that out of a total of £586 available, only £85 had been withdrawn. This showed that all the members thought it was a good thing to have "a shot in the locker," and to have that "shot" as big as possible. The Directors were extremely pleased to notice that the members looked upon the scheme as being a help to them in this way; and they wished him to express their gratification in the manner in which the scheme had worked. Nothing could be better than that employers and employees should have a common object of mutual satisfaction; and he hoped that, as a result of the scheme, the Directors, the officials, and the men would always work together for their mutual advantage and for that of the shareholders and consumers. Under the scheme, each man had a personal interest in preventing the waste both of time and material; and he thought this was advantageous to all concerned.

Mr. J. L. GRANSMORE seconded the motion; and it was unanimously agreed to.

Mr. VINSON gave some figures showing the great increase of profit-sharing schemes among gas companies, and said that at the end of last year no fewer than 28 companies had adopted them. This affected 19,613 employees, among whom £88,812 had been divided last year. The total profit to employees since profit sharing was founded had been £686,237. The South Metropolitan Gas Company adopted it 21 years ago, and last year divided among its 5459 employees no less than £41,133. During the 21 years, it had divided £505,675 among the men. He was sure the system had satisfactory results all round. In respect to the consumer, when he first became Secretary to the Gloucester Gas Company the price of gas was 4s. per 1000 cubic feet. Now it was only 2s.; and they hoped it would be still cheaper.

GLASGOW CORPORATION GAS DEPARTMENT.

The Annual Accounts—Reduction in the Price of Gas.

The report of the Gas Committee of the Corporation of Glasgow, with the accounts for the year ending May 31 last, were submitted to the Town Council on Thursday last; the Lord Provost—Sir A. M'INNES SHAW—presiding.

The report of the Committee was as follows:

The gross revenue amounts to	£896,046 6 8
The gross expenditure to	£683,482 1 2
To this is added depreciation written off capital assets	66,047 8 3
	<u>749,529 9 5</u>

Balance carried to profit and loss account	£146,516 17 3
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The Committee had to meet the following requirements during the year:—

(1) Annuities on stocks	£21,556 18 3
(2) Contribution to Glasgow Corporation loans fund, in respect of Glasgow Corporation 3 per cent. stock redeemable in 1921, issued in lieu of converted gas annuities	7,764 12 7
(3) Interest on borrowed money, &c.	43,621 5 6
(4) Sinking fund	63,613 4 3
	<u>136,556 0 7</u>

Leaving a surplus on the year's operations of	£9,960 16 8
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which has been transferred to the credit of reserve fund account.

The balance at the credit of surplus revenue account, as carried forward last year, amounted to	£37,247 4 1
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Out of which was paid to the common good of the City, in terms of the special minute of the Corporation dated July 25, 1910, the sum of	20,000 0 0
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Leaving to be carried forward to the credit of next year's account the sum of	£17,247 4 1
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The rate of interest payable to the Corporation loan fund in respect of money borrowed was £3 4s. 9d. per cent., as compared with £3 4s. 6d. per cent. the preceding year. The Committee applied £6113 10s. 9d. of the amount at the credit of the sinking fund to the extinction of £895 of £9 per cent. and £2150 of £6 15s. per cent. gas annuity stocks; and the annuities formerly payable upon these stocks now cease to be a charge upon the revenue of the department. There has also been redeemed during the year, by the application of moneys at the credit of the same fund, a further amount of £18,175 of loans raised under the Glasgow Corporation (Tramways and General) Order Confirmation Act, 1901, and the Glasgow Corporation Order Confirmation Act, 1905. The amount added to sinking fund for redemption of loans and redemption or conversion of annuities was £67,681 14s. The sinking fund, with its accumulations, now stands at £926,327 8s. 4d., of which there has been already applied in the redemption of borrowed money, 3 per cent. stock and annuities, £774,490 16s. 5d.; leaving still available for either of these purposes the sum of £151,836 11s. 11d.

The Committee have pleasure in stating that the market for residuals has been more favourable to the Corporation during the past year. The consequent increase of income from this source amounts to £18,382 18s. 9d. The quantity of coal carbonized during the past year was 675,580 tons, as compared with 686,311 tons for the preceding twelve months—a decrease of 10,731 tons. The average price received per ton of coal carbonized this year was 4s. 6 129d., as compared with 3s. 10 717d. for the previous year—an increase of 7 412d. per ton. The net sum realized from the sale of coke this year amounts to £104,578 6s. 7d., being £3429 15s. 9d. more than that of the preceding year. The total quantity of coke sold last year was 289,476 tons, as compared with 305,120 tons for the previous year—a decrease of 15,644 tons. The average price received was 7s. 10 129d. per ton, as compared with 7s. 3 09d. for the previous year—an increase of 7 036d. per ton. The Committee again observe with pleasure a still greater quantity of gas made per ton of coal carbonized, which was 10,437 cubic feet, as compared with 10,167 cubic feet for the preceding year—an increase of 270 cubic feet per ton, equal to 182,406,600 cubic feet; 61,248,800 cubic feet of extra gas having been sold, with a decrease in the coal carbonized of 10,731 tons. The unaccounted-for gas this year is 8 721 per cent., as compared with 8 641 per cent. for the preceding year—an increase of 0 08 per cent.

Having regard to the favourable result of the year's operations recorded above, that the coal required next year has been contracted for on still more favourable terms, and notwithstanding that the scale of charges adopted last year resulted in a concession to the consumers of over £10,000, your Committee recommend that the scale of charges for next year be as follows:

TABLE OF RATES FOR 1911-12.

A.—Within the City Supply District.

I.—Lighting and Domestic Purposes—

	Per 1000 Cub. Ft.
	s. d.
For gas supplied in quantities of less than 500,000 cub. ft.	2 0
For the excess beyond 500,000 cub. ft. up to 2,000,000 „	1 11
„ 2,000,000 „ 6,000,000 „	* 1 10
„ 6,000,000 „ 10,000,000 „	* 1 9
„ 10,000,000 „	* 1 8

* A reduction of 1d. per 1000 cubic feet.

II.—For Power and Manufacturing Purposes—

	Per 1000 Cub. Ft.
	s. d.
For gas supplied in quantities of less than 20,000 cub. ft.	2 0
For the excess beyond 20,000 cub. ft. up to 500,000 „	† 1 6
„ 500,000 „ 6,000,000 „	† 1 5
„ 6,000,000 „	† 1 4

The following is an analysis of the sale of gas for the past year as compared with the sale for the previous year:—

	Rate per 1000 c.ft.	Consumption.
	s. d.	Cubic Feet.
I.—Within the city supply district.		
Lighting	2 0	4,232,081,100
Do.	1 11	362,944,100
Do.	1 10	36,063,000
Do.	1 9	22,866,700
		4,653,954,900
Gas-engines	2 0	16,945,300
Do.	1 8	225,038,600
Do.	1 7	106,670,200
		348,654,100
Manufacturing purposes	2 0	29,106,800
Do.	1 8	165,774,000
Do.	1 7	80,869,500
Do.	1 6	1,966,400
		277,716,700
Hotels, clubs, &c.,		
Lighting	2 0	14,500,000
Do.	1 11	33,224,800
Do.	1 10	5,086,500
Do.	1 9	1,375,000
		54,186,300
Manufacturing	2 0	3,700,000
Do.	1 8	9,804,000
Do.	1 7	8,196,500
		21,700,500
Contract gas	2 0	45,143,366
Do.	1 11	26,406,000
Do.	1 10	13,093,650
Do.	1 9	150,565,764
		235,208,780
Do.	1 8	320,198,270
II.—Within the supplementary supply district, outside the Parish of Old Kilpatrick.		
Lighting	3 0	5,771,000
Do.	2 11	28,600
		5,799,600
Gas-engines	3 0	40,000
Do.	2 8	112,200
		152,200
Manufacturing purposes	3 0	40,000
Do.	2 8	2,800
		42,800
Contract	2 8	390,300
Within the Parish of Old Kilpatrick.		
Lighting	2 2	16,684,000
Do.	2 1	345,000
		17,029,000
Gas-engines	2 2	60,400
Do.	1 10	519,400
Do.	1 9	176,400
		756,200
Manufacturing	2 2	20,000
Do.	1 10	64,300
		84,300
Contract	1 10	1,684,300
III.—Prepayment supply within the City supply district	2 7	417,381,600
Within the supplementary supply district	2 9	1,467,100
		418,848,700
Used at works		6,356,406,950
		79,791,700
		6,436,198,650
Increase, gas sold	—	59,502,900 cubic feet = 0 94 per cent.

III.—For Hotels, Clubs, and Institutions, other than for Lighting Purposes—

	Per 1000 Cub. Ft.
	s. d.
For gas supplied in quantities of less than 100,000 cub. ft.	2 0
For the excess beyond 100,000 cub. ft. up to 500,000 „	† 1 6
„ 500,000 „ 6,000,000 „	† 1 5
„ 6,000,000 „	† 1 4

† A reduction of 2d. per 1000 cubic feet under scales II. and III.

Under scales II. and III., consumers will be charged at these rates only from date of application therefor. Such supply to be consumed in one and the same premises and registered by separate meter.

IV.—Supply through prepayment meters.

† A reduction of 1d. per 1000 cubic feet.

V.—Public lamps

† A reduction of 2d. per 1000 cubic feet.

B.—Within the Supplementary Supply District.

I.—With the exception of the Parish of Old Kilpatrick, 50 per cent. extra per 1000 cubic feet on the above-mentioned rates.

II.—Within the Parish of Old Kilpatrick—

2d. per 1000 cubic feet extra on the above-mentioned rates.

The Committee advertised for tenders for coal to be supplied during the coming year, and have concluded contracts for the whole quantity required, at prices under those of last year. The works and mains have been maintained in an efficient condition during the year out of

revenue. The greatest quantity of gas sent out during the year in 24 hours was 35,585,000 cubic feet. The maximum daily make was 32,376,000 cubic feet. The number of ordinary meters in use on May 31 was 221,613, as compared with 223,889 for the preceding year—a decrease of 2276. The number of prepayment meters in use on May 31 was 57,068, compared with 49,957 for the preceding year—an increase of 7111. During the year, 34,430 meters were repaired. The number of gas-stoves on hire at May 31 was 56,493, as compared with 52,696 for the preceding year—an increase of 3797. At the same date, there were also 22,504 small stoves and grills let out free of charge, as compared with 15,106 for the previous year—an increase of 7398. The number of gas heating and cooking appliances sold during the year was 4228; and in addition to these, 1815 gas-fires were supplied on the hire-purchase system. The number of gas-engines in use and the total horse-power for this year and the preceding year were as follows:—

	Number.	Brake Horse Power.
May 31, 1910	1596	19,027
May 31, 1911	1523	19,206
Decrease	73	Increase 179

About 13 miles of new mains have been laid during the year, which brought the total up to 1028 miles. The Committee have pleasure in recording their appreciation of the efficient manner in which the work of the department has been carried out by the General Manager and the whole staff during the past year.

The accounts show that of the stock capital of the undertaking the £300,000 of the two old Gas Companies, entitled to annuities at the rate of 9 per cent., £69,152 has been converted into Corporation stock, and £45,340 redeemed out of sinking fund, leaving £185,507; and that of the £115,000 stock of the old Companies entitled to annuities at the rate of 6½ per cent., £28,805 has been converted into Corporation stock, and £16,340 redeemed out of sinking fund, leaving £69,855. The annuities payable have been reduced from £34,762 to £21,411. The total amount of loan capital authorized is stated at £4,200,000; but of this, £1,400,000 is sanctioned for the purposes of the electricity undertaking. The total sum borrowed for gas purposes has been £1,207,415. Of this, there has been redeemed £577,585. There has been borrowed for electricity purposes £1,158,185, and redeemed £241,814. There remains power to borrow to the amount of £967,303.

The year's capital expenditure amounted to £27,842. The principal items under this heading are: Pipes and cost of laying, £3708; meters, £12,728; gas-stoves, &c., £10,313. The capital account is stated at £2,335,920. Of this sum, there is applicable to the Temple station works £155,483; to the Provan station works, £700,537; to the Old Kilpatrick station and works, £1590; to Milngavie station and works, £923; to the workshops in Stirling Street, £17,948; to the chemical works at Dawsholm, £27,293; to the chemical works at Tradeston, £11,623; to the chemical works at Provan, £44,162; to the Dalmar-nock station and works, £54,048; to the Dawsholm station and works, £268,799; to workmen's dwellings at Dawsholm, £1199; to Tradeston station and works, £166,808; to pipes and cost of laying, £476,232; to gas-meters, £215,624; and to gas-stoves, £67,476. During the year, meters were purchased to the amount of £11,502. In the Gas-Stove Department, the capital expenditure was £18,662. Stoves, range fittings, &c., of the value of £8349, were sold during the year; making the total sales in the department £52,197.

In the revenue account, the income from the sale of gas is stated at £621,366—a decrease of £6698; from coke, £104,578—an increase of £3430; and from ammoniacal liquor and tar, £154,222—an increase of £18,383. Waste lime realized £869—an increase of £29; stove hires, £9465—an increase of £396; stand-by meter-rents, £106—an increase of £14; and incandescent stair lighting, £3564—an increase of £57. The total revenue was £896,046—an increase of £16,612. On the expenditure side, coal—675,579 tons, at an average cost of 10s. 3.178d. per ton—cost £346,736—an increase of £7059; purifying materials, &c., cost £27,757—a decrease of £1173; salaries of engineers, superintendents, and officers at works amounted to £4504—a decrease of £82; workmen's wages amounted to £73,603—an increase of £3163; repairs and maintenance of works and plant cost £64,001—a decrease of £1135; and the carting and stable account amounted to £2279—a decrease of £673. The total cost of the manufacture of gas was £518,880—an increase of £7159. Distribution cost £71,842—a decrease of £3496; there is charged to the stove and appliances account, £14,825—an increase of £1226; rents and feu-duties amounted to £8336—a decrease of £89; rates, assessments, and taxes, on a valuation of £158,277, amounted to £38,136—a decrease of £6581; management cost £19,641—an increase of £4155; law charges amounted to £245—an increase of £141; parliamentary charges amounted to £10,150—an increase of £9634; retiring allowances amounted to £1425—a decrease of £199; and there was written off for depreciation, £66,047—an increase of £1945. The depreciation was made up of: On works, at 1½ per cent., £22,105; on chemical works, at 3 per cent., £2884; on pipes, at 2 per cent., £10,591; on meters, at 6 per cent., £16,678; on stoves, at 10 per cent., £9431; and on premium, average £174,311, at 2½ per cent., £4358. The total expenditure amounted to £749,529, and left to be carried to profit and loss account £146,516.

The surplus revenue account is stated at £37,247; and the reserve fund account at £9961.

Debate in the Council.

Bailie PAXTON said: In presenting the annual accounts of the Gas Department, I need not say how satisfactory it is for all concerned to realize that this, the first year of the working of the gas undertaking under the new Act, has proved so beneficial. We have just finished the most successful year since the Corporation acquired the business in 1869. On inquiring how this has been brought about, I cannot conceal the fact that much of the progress made in gas manufacture has been in great measure due to the persistent scientific research of the Institution of Gas Engineers, headed as they were last year by Mr. Wilson, our outstanding and capable General Manager and Engineer. There were, no doubt, other factors, such as the somewhat higher prices received for the bye-products—viz., coke, ammoniacal liquor, and tar,

&c.; but we cannot overlook the fact that, during the year just closed, we have been able to show an increased make of gas of 270 cubic feet per ton of coal carbonized, or, in other words, Mr. Wilson and his Station Managers have been able to give to the Corporation 182 million cubic feet of gas free, when compared with the carbonization of coal last year. The quantity of gas sold during the year shows an increase of 61,248,800 cubic feet, and the amount of revenue an increase of £16,612 4s. 8d.; and after providing for all contingencies, there is a surplus of £9960 16s. 8d., which has been carried to the new reserve fund. The Gas Committee have very carefully considered their estimates for next year. You will find in the report what their proposals are. The Committee, in their wisdom, I think, have resolved to leave the price of gas for ordinary lighting at 2s., granting, however, reductions to those who consume 10 million cubic feet and over. You will see the wisdom of this proposal, as it is only by retaining and increasing the number of the very large consumers that the Gas Department will be able materially to reduce the price to ordinary consumers in the future. We have gone further; we also propose to reduce the price for gas used for power and manufacturing purposes, as we feel that in this direction there is a very large field for the employment of gas in preference to other fuels, if only we can supply it at low rates. Also, we propose to reduce the price to the prepayment consumer by 1d.; and, still further, the street lighting is being reduced by 2d., making a reduction to the Street Lighting Department during the year just closed, and the one upon which we have just entered, of no less than 25 per cent. of their gas bills. These reductions will, we hope, help materially in increasing our business, and so ensure still greater prosperity to the Gas Department, and, consequently more concessions to the consumers in the future. At this stage, it will not be out of place to say a word as to the future policy of the department. It must be patent to everyone that there is room for improvement in the commercial department of our vast undertaking. The methods of forty years ago are not suitable to present-day requirements; and in order to have matters put right, I have been successful in getting the Gas Committee to agree to the appointment of a Sub-Committee to inquire and report as to the desirability of appointing a Commercial Manager under the General Manager. The making of gas is one thing, and the selling of it is something very different. With the appointment of a suitable officer, I am strongly of opinion that the small additional cost to the department will be repaid many times over, and that very soon. A Committee have also been appointed to consider the desirability of supplying free cookers to the citizens—a question, in my opinion, long overdue. This matter also is one that will repay the Gas Department handsomely. The details of these two proposals will be submitted to the Corporation at an early date, when I hope they will give them unanimous support. There is no doubt that the time has arrived when very decisive steps must be taken to maintain the progress of our department, if the facilities for development at our disposal are to be fully taken advantage of for assisting the important work of the purification of the air of our city.

Mr. M. W. MONTGOMERY seconded.

Mr. J. WILLOCK moved that there be a reduction of 1d. per 1000 cubic feet for all classes of consumers. He pointed out that the estimates provided for a surplus of £30,339. The reductions he proposed on class A would amount to £26,484. There would, in addition, be £2496 derived from the reductions he proposed on gas supplied for power and manufacturing purposes, and for hotels, clubs, &c., and £1343 derived from the reduction he proposed for public lamps. These items together amounted to £30,323. He argued that the department could readily stand these reductions.

Mr. W. B. SMITH, in seconding, said he considered that the price of gas in Glasgow was still too high, when compared with the prices in other districts. They were all in agreement with the concession given to large consumers. This was a good thing, and had been a commercial success; and because it had been a commercial success, they wanted to give all the consumers a share of the success.

Mr. P. G. STEWART asked how it was that Coatbridge, with a comparatively small turnover, could sell gas at 1s. 5d. per 1000 cubic feet; while in Glasgow, with the latest works in Scotland, any amount of capital, and a Manager second to none in the opinion of the Convener, their gas bill was not coming down.

Mr. W. F. ANDERSON said that two-thirds of the gas supply was utilized by people who used the smaller quantity, and employed it as a necessity of life. The proposal in the minutes was that the one-third who used it for making a profit out of their manufactures were to have a reduction. Bailie Paxton might be generous and say that the great bulk of the consumers should not be compelled to pay 1d. more than those who used gas as a commercial commodity.

Bailie PAXTON said it was for the Corporation to relieve the Committee of the responsibility. The Committee believed their proposal was a safe one. What the Committee were aiming at was to increase the consumption and thereby be able to decrease the price in future.

By 42 votes to 13, the Corporation agreed to the general reduction of 1d. per 1000 cubic feet.

Wrexham and East Denbighshire Water-Works Company.—At the annual meeting of this Company, held last Tuesday under the presidency of Mr. J. Allington Hughes, J.P., the accounts presented showed that the total revenue amounted to £12,354, and the expenditure to £3550; leaving £8804 to go to the net revenue account. The receipts for water were £12,202, compared with £11,753 and £11,245 in the two preceding years. The amount available for distribution was £8660; and the Directors recommended the payment for the half year of the preference dividend free of income-tax, and also dividends at the rate of 7 per cent. per annum upon the consolidated stock, and 4 18s. per cent. per annum upon the ordinary stock, less income-tax. This was unanimously agreed to. The interim dividends for the six months ended Dec. 31 last were at the rates of 6½ per cent. upon the consolidated stock, and 4 11s. per cent. upon the ordinary stock. A very cordial vote of thanks was passed to the Engineer and Secretary (Mr. Frederick Storr), who, in acknowledging it, stated that he and the Cashier (Mr. R. Roberts) would in a short time complete their fortieth year in the service of the Company.

TORONTO GAS CONSUMERS' UNFOUNDED COMPLAINTS.

Satisfactory Result of a Public Inquiry.

A large portion of the issue of the "Intercolonial Gas Journal of Canada" just to hand is occupied by the text of a report presented by Mr. A. B. Lambe to the Chief Electrical and Gas Engineer (Mr. Ormond Higman), giving the results of an investigation carried out by him into complaints made by certain gas consumers and one of the newspapers in Toronto in regard to the quality of the gas supplied by the Toronto Gas Company. The prime mover in the agitation was a manufacturer; and the main features of complaint against the Company were the accuracy of the meters, the calorific and illuminating power of the gas, the composition of the gas in the mains, and the pressure at which it was supplied. The Government Inspector was called in by both the City Authorities and the Company; and a general invitation was extended to the citizens to place their cases in the hands of the Inspector. The result was that only 0.2 per cent. of the entire body of the users of gas responded.

According to our contemporary, the one striking feature of the investigation was the attitude of the two parties chiefly interested—the manufacturer referred to and the Gas Company. The latter, through their Solicitor and officers, placed their complete apparatus at the disposal of the Inspector for verification, and assisted him in every way possible; whereas the chief complainant refused absolutely to verify his calorimeter (which is one of his own manufacture, and not a standard) with that of the Government. It was on the readings of this instrument that most of his complaints as to the calorific power of the gas were based; and this is what the Inspector said about it: "Judging from the fact that it is equipped with thermometers that read 2° per division, whereas the standard is 1-10th of 1° per division, that the scales are readable only to ¼ lb. per division, the standard being readable to 1-100th of a pound, and that the water supply during a test is exceedingly variable, I would expect his readings to be very erratic, and therefore quite unreliable."

The investigation was a very thorough one, and lasted several weeks, with the result that the complaints were shown to be utterly without foundation, and the Gas Company to be complying with the Gas Inspection Act in all particulars, and even maintaining a higher illuminating power standard than that required by the Act under which they were incorporated.

GAS AT THE TURIN INTERNATIONAL EXHIBITION.

A correspondent of the "Illuminating Engineer" of New York gives an account of the illumination of the Turin International Exhibition, some extracts from which will be of interest.

He says: Something exceptional has been done in the matter of illumination. It is very rare that gas has played an important part in the lighting up of gardens since electricity became easily handled and reliable; but observers of illumination in the various principal towns of the world are now aware that compressed gas has been received with such favour on its individual merits as to revive the hopes of gas manufacturers that it may retain its position as a public illuminant for many decades to come. These hopes are strengthened by the well-known fact in London that there are complete localities where it has been put in place of electricity which had originally pressed it out of service.

In Turin, too, there is a strong disposition obvious to give compressed gas an opportunity to assert its alleged superiority to, or at all events its equality with, electric light. In the exhibition itself, the Illuminating Gas Consumers' Company of Turin have been entrusted with the lighting up of a large part of the grounds at night. For the purpose of illumination, the gardens have been divided into two parts—the dividing line having its origin in the Ponte Isabella. Above this bridge the gardens are lit up by compressed gas; below it the gardens and buildings are lit up by electricity—partly arc lamps, partly incandescent. It would be hard to tell which produces the finer effect. There must be advocates for both.

The beautiful, brilliant, yet soft, light of the compressed gas certainly strikes the eye as a thing of beauty, and it lights up all around it—showing off the details of the architecture in a manner that testifies to its value as a diffuser of light, which, of course, has long been admitted to be one of the advantages of gas over electricity which throws (to the disconcerting of architects and others) such strong shadows. The Company entrusted with the gas light have put up several hundred lamps, of powers varying from 1000 to 5000 candles each; and it must be stated that the effect of this lighting is to give the gardens above the Ponte Isabella an appearance of fairyland.

Down-stream it is a different light that strikes the eye. It is a soft, mellow light that is natural to the incandescent lamp, but which, of course, gets its softened quality, so far as the arc lamps are concerned, from the globe. The effect of the electric lighting is equally striking, though in a different way. It is not so bright; is more subdued; and, if anything, may be said to get better control of the senses of the onlooker. The number of electric lights is naturally much larger than that of the gas lights, because so much is done with the incandescent lamp, which lends itself so completely to architectural decoration. With the electric lamp the monumental bridge and the buildings both sides of the river to and from which it leads are brilliantly illuminated; the lines being revealed in long rows of lights.

It should be stated that the choice of the Executive has been to give the best parts of the gardens to electricity. Whether this has been done simply on the merits of the lights or whether they have been afraid to give too much play to compressed gas, which is comparatively new everywhere, and almost quite new in North Italy, one cannot say. But this can be averred without fear of contradiction—that in both sets of gardens the illumination is a brilliant success in every sense of the term.

GAS ENGINEERING WORKERS' WAGES.

Advances Conceded by Manchester and District Firms.

Several gas engineering firms in the Manchester district have been affected by the movement on the part of labourers and semi-skilled workers to secure an advance in wages.

In the case of Messrs. R. & J. Dempster, a settlement was arrived at after the men had been on strike a few days. The firm agreed that in future labourers employed by them shall receive a minimum wage of 20s. a week, and that the various grades of semi-skilled workers shall have an advance which averages about 2s. a week. West's Gas Improvement Company also came to terms with the strikers after a few days' stoppage. The advances granted represent 2s. a week to yard men, boiler-makers' helpers, fitters' labourers, drillers and sawyers, crane drivers, slingers, and benchmen; the minimum for ordinary adult labourers being £1 a week.

At Messrs. Crossley Bros.' works at Openshaw, the minimum for adult ordinary labourers has been fixed at £1 a week. Boiler makers' helpers receive a minimum of 21s. a week; crane drivers, 23s.; slingers, 22s.; and all other semi-skilled men now earning from 20s. to 24s. weekly will be granted an advance of 1s. The labourers engaged by the National Gas-Engine Company, of Ashton-under-Lyne, struck work for an all-round increase of 2s. a week; and the works were closed for several days. After interviews with the men's leaders, a settlement was arrived at between them and the Directors. The agreement follows closely the lines of the terms arranged at Crossley's. A minimum of 20s. a week has been established for adult labourers; and all those in receipt of 21s. to 24s. will get another 1s. per week.

The municipal employees of Manchester and Salford who are members of their respective Trade Unions have, as reported in the "JOURNAL" last week, decided that after the 31st inst. they will not work with a non-Unionist. Mr. J. T. Jones (Manchester), Secretary to the Municipal Employees' Association, in the course of an interview on the subject, said they would very likely be told that their resolution was a coercive one. But they were determined that every worker in the employ of the Manchester and Salford Corporations should stand on the same line. They had realized that it was utterly hopeless and futile for the men to fight in small sections, to be refused, and to be asked whether they were prepared to go to arbitration. They did not believe in arbitration. It might also be said that by their action the men would alienate the sympathy of the public. But the sympathy of the public would never feed their wives and children. It was not true, as stated by some chairmen, that a harmonious feeling existed between the committees and their employees. He produced statistics in support of his contention that the position of the municipal workers in Manchester and Salford is worse than is the case with their fellows in many large centres. The workmen in the gas, electricity, and water departments are taking part in the agitation.

Last Friday night, Mr. Jones addressed meetings of gas workers at the Bloom Street and Regent Street works of the Salford Corporation, and declared that if the men were loyal to each other they would get all they wanted from the Corporation. At each of these meetings, resolutions were adopted pledging the men to stand by the decision not to work with non-unionists after the 31st inst.

Colne Valley Water Company.

Presiding at the 75th half-yearly meeting of the Colne Valley Water Company, Mr. C. E. Keyser remarked that good and steady progress was being made, and in every way the undertaking was in a flourishing condition. The total amount of the water-rates for the six months to June 30 was £24,914, as compared with £23,381 for the corresponding period of 1910. There was thus the satisfactory increase of £1533. The number of new supplies connected during the past six months was 577, which were estimated to yield an annual water-rental of £1405. The total number of supplies now amounted to nearly 20,000, and the population to (say) 110,000. Bad debts amounted to only 4s. per cent. of the total receipts. The increase in the cost of maintenance and management for the past half year, as compared with the corresponding period of 1910, was £562. The profit for the period under review came to £15,239, of which the Directors had transferred £1000 to the contingency fund account, making the sum standing to the credit of this fund £8251. After paying interest on the debenture and preference stocks, and arranging for the full statutory dividends on the various classes of ordinary stock, in addition to 1 per cent. (actual) on account of back-dividends on the "A," "B," and "C" stocks, the substantial balance of £4219 was left to be carried forward. The water pumped had been about 26 million gallons more than in the corresponding period of 1910. The daily consumption had been unparalleled in the Company's history. The report was adopted; and the dividends recommended were declared. Thereafter it was agreed that the salary of the Secretary and General Manager (Mr. C. P. Sinclair), for the year ending June 24, 1912, be at the rate of £700, with annual increments for the succeeding two years of £50 to £800. In making the proposition, the Chairman spoke in terms of the highest praise of Mr. Sinclair's work, and said that he had obtained a marvellous grasp of their district. In connection with many important negotiations, Mr. Sinclair had been able to save them a great deal of money. Mr. Sinclair, in returning thanks, said he could not have done what he had, but for the loyal and able assistance of the staff.

Salford Corporation Gas-Coal Contract.—The Salford Gas Committee have placed orders for 116,000 tons of coal and 58,000 tons of cannel required at the gas-works during the coming ten months. Being relieved of the obligation to publish on the agenda the prices they pay, the Committee have been able to secure reductions which represent a saving amounting to several thousand pounds. The Council have confirmed the contracts, and they are entered into on the express understanding that the prices are not published. In a year the Salford Corporation purchase coal and cannel for the gas-works to the amount of upwards of £80,000.

NOTES FROM SCOTLAND.

From Our Own Correspondent.

Saturday.

We now have the accounts of the Glasgow Corporation Gas Department and their adoption by the Corporation on Thursday. The accounts disclose a business which is of vast dimensions, and, notwithstanding its vastness, is still growing. While in many places a decrease in the output of gas during the past year has had to be recorded, in Glasgow there was an increase of nearly 60 million cubic feet sold. The Gas Committee put forward a scheme of charges of gas for the current year, the feature of which was the retaining of the prices to small consumers at last year's figures, and the granting of reductions to the amount of 1d. in some instances, and of 2d. in others, including public lighting. The Corporation, however, on Thursday, led by the Convener of the Electricity Committee, declined to adopt the recommendations, and, by a majority of two to one, decided to give a reduction of 1d. to the small consumers, and further reductions of 1d. to all classes, in addition to the reductions proposed by the Committee. It may be, and no doubt is, regrettable that the Committee were not able to carry their proposals in the Town Council, because they are more familiar with the possibilities and the needs of the gas undertaking than anyone outside of their body; and the regret would be deepened if the notion were entertained that the movers of the motion which was adopted were actuated by hostile feelings towards the gas undertaking. The scheme which was adopted was dangled before the Town Council—and we may be sure not altogether without reference to the many eyes outside the Council chamber which were upon the Corporation—as a democratic measure intended for the benefit of the many. Whether the all-round reduction which has been agreed upon will be to the benefit of the many remains to be seen. The Gas Committee might have been trusted to know best what to do. We know that they are anxious to introduce more generous terms for the hiring out of gas-cookers. The reduced prices will have a hampering effect upon this policy, which, again, will retard the progressive demand for the gas, and thus, to use an expression which may be a little harsh, the result may be to “put a spoke in the wheel” of the Gas Committee. If this should be the outcome of Thursday's action in the Town Council, it is difficult to understand how anyone will benefit by the refusal to the Gas Committee of a policy which was doubtless well considered by them, unless there may be such a thing as a negative benefit derived by some in their being able to prevent another from doing better than they are doing themselves.

In the Hamilton Town Council on Tuesday, a petition was presented, signed by 46 persons, asking if the Council would entertain a proposal to supply the Blantyre district with gas on reasonable terms. The Council agreeably entertained the proposal, and remitted to a Committee to consider the subject and report. On Thursday evening, a crowded meeting of gas consumers in Blantyre was held in the Masonic Hall “to protest against the exorbitant price being charged in the district, and to consider what steps could be taken to get a cheaper supply of gas.” The Chairman of the meeting stated that, speaking on behalf of the Co-operative Society, their gas bill amounted last year to £150; and they knew that had they been situated a little nearer in the Hamilton direction, it would have been only half this amount. The Directors of the Blantyre Gas Company had refused to receive a deputation on the subject. Considerable discussion took place, chiefly condemnatory of the high price charged for gas in the Blantyre district; and a motion was adopted unanimously, to the effect that negotiations be continued, not with Blantyre, but with Hamilton, with a view to securing a supply of gas at a cheaper rate.

In the Grangemouth Town Council, the Burgh Chamberlain reported that it was satisfactory to find that the year's trading in the Gas Department had not only covered the sinking-fund payment of £870, but had left a substantial margin. It appeared as if the price of coal would be slightly easier than last year, and the cost of manufacturing gas would be less, in consequence of the saving effected by the new retorts. The accrued surplus was in itself sufficient to justify a reduction in the price of gas; and, taking everything into consideration, it was considered that a reduction of 5d. per 1000 cubic feet might safely be allowed as from May 15. At a meeting of the Town Council on Tuesday, the burgh accounts, including the gas accounts, were unanimously agreed to. There was not the same unanimity, however, when the Council applied themselves to the task of fixing the prices of gas for the current year. Dean of Guild Marshall moved that the difference in the price of gas charged to prepayment meter consumers, compared with the charge to ordinary consumers, be reduced from 25 to 15 per cent. Bailie Main, the Convener of the Gas Committee, expressed sympathy with the motion, but asked, as they were a young Corporation in this matter, that they might get a little more time. He was hopeful that, if they reduced the price of gas that day all round, they would be able to give another reduction, it might be in the course of six months; and the position of the prepayment meter consumer could be then considered. The motion was rejected by four votes to two. Bailie White moved that a discount be allowed on all amounts of £300 and upwards for gas supplied. The motion was directed against the charge for public lighting, which Bailie White said should be about £500 less than the Corporation charged. After discussion, the Council, by the casting vote of the Chairman, rejected the motion. Bailie Main then moved that the price of gas be reduced by 5d. per 1000 cubic feet all over; and this was agreed to.

The thirty-fifth annual meeting of the Penicuik and District Gas Company, Limited, was held yesterday, in Edinburgh—Mr. R. J. Henderson, the Chairman, presiding. The report showed that the surplus at the credit of the profit and loss account was £950, as compared with £619 the previous year. From this the dividend of 5 per cent. on the preference shares took £94; leaving at the disposal of the shareholders a balance of £856, which the Directors recommended should be applied: (1) In payment of a dividend of 8 per cent., free of income-tax; and (2) in applying £50 in redemption of the cost of piping for a mill supply; leaving a balance to be carried forward of £326, subject to Directors' and Auditors' fees. The report having been adopted, the Chairman stated that the Company had received

valuable assistance from Mr. O'Connor, both advisory and practical, and that the reforms in the Company's working recommended by Mr. O'Connor, and carried out under his supervision, had resulted in a great financial improvement in the Company's position. He therefore moved, and Provost Wilson seconded, that Mr. O'Connor be awarded a special fee of fifty guineas for his services. This was unanimously agreed to. It was mentioned that the Directors had appointed Mr. W. M. Williamson, late Manager of the Oban Gas-Works, to be Manager of the Company's works, in succession to Mr. W. Young, who had resigned his appointment. The Directors have resolved to abolish all meter-rents in future.

It was reported to the Gourock Town Council at the end of last week that there was a surplus of about £500 on the year's working of the Gas Department; and it was resolved to reduce the price of gas from 3s. to 2s. 9d. per 1000 cubic feet. This makes a total reduction of 5d. during the past three years.

The Directors of the Montrose Gaslight Company have resolved to reduce the price of gas to ordinary consumers from 4s. to 3s. 10d. per 1000 cubic feet, and for cooking purposes from 3s. 7d. to 3s. 5d. This is the lowest figure at which gas has ever been supplied in Montrose.

The annual meeting of the Wick and Pulteneytown Gaslight Company was held on Monday, when the usual dividend of 6 per cent. and a special bonus of 2½ per cent. were declared. The price of gas was reduced from 5s. 2½d. to 5s. per 1000 cubic feet. The salary of the Manager—Mr. W. M'Giffen—was advanced by £20.

In the Town Council of Newport, Fife, on Monday, it was reported that the gas accounts of the Corporation showed a steady and continuous improvement, the sum at the credit of the reserve fund accounts being £1910. The Council decided to substitute inverted for upright burners in the public lamps, and to fix controllers.

A statement is published to the effect that the claims lodged by the Kirkcaldy Gaslight Company, Limited, against the Corporation in respect of their expenses in the recent gas transfer have been finally adjusted by the Auditors. The Company's claims amounted to £7487 14s., and they have been reduced by the Auditors to £3576 15s. 2d. This is a cutting-down to the extent of about one-half. As the witnesses and others on whose behalf the claims were made have, in all probability, already been paid by the Company, the balance of £3911 will require to be made good out of the awarded price; thereby reducing the return to the shareholders.

The income for the past year of the Gas Department of the Helensburgh Corporation amounted to £15,368, and the expenditure to £12,972; leaving a balance of £2396, and a net gain on the year's working of £1132.

The Gas Committee of the Greenock Corporation have had before them the accounts of the Gas Department for the past year. These show a surplus on the year's working of over £6000—a magnificent result. The Committee decided to recommend to the Corporation at their next meeting that the price of gas be reduced from 2s. 9d. to 2s. 7d. per 1000 cubic feet; and that £1000 be added to the reserve fund and £2000 carried forward.

The Cowdenbeath Town Council have been considering the subject of the extension of the system of street lighting. The Burgh Surveyor reported upon the provision of an oil-engine and plant to generate electricity, the cost of which, with distribution, would be £2705. This is exclusive of the annual charge for upkeep, which, it was reported, amounted last year to £2 7s. 8d. per lamp. An offer by the Cowdenbeath Gas Company to light the streets with 100-candle power gas-lamps, at £1 11s. 6d. per lamp, was submitted; but the Corporation agreed to adopt the scheme of the Burgh Surveyor.

The Johnstone Town Council have reduced the price of gas from 2s. 2d. to 1s. 10d. per 1000 cubic feet to consumers within the burgh, with a further reduction to 1s. 9d. in the case of consumptions of over 100,000 cubic feet. To consumers outside the burgh, the reduction is from 2s. 2d. to 2s. There was a profit of over £600 on the working of the gas undertaking last year.

In the Glasgow Sheriff Court, Sheriff-Substitute Boyd has given his decision in an action in which William Scanlan, draper and tailor, of Dalmuir, sought damages against the Corporation of Glasgow for having cut off the gas supply to his premises at 4, Vesalius Street, Shettleston. The defence was that the pursuer was not tenant of the premises, but that his son David was. The Sheriff has sustained the defence, and given the Corporation absolver.

Gas and Water Finance at Bolton.—Messrs. Horrocks and Hanscomb, the Auditors to the Bolton Corporation, in their report to the Finance Committee as to the annual audit of the accounts, state that in their opinion the reserves for depreciation and renewals in all cases apart from the water-works, are at present adequate; but that the necessity for making a fixed yearly allocation to the gas-works renewals reserve account for its maintenance on commercial lines will require careful consideration. Provision has been made in the accounts for the ultimate extinction of all Corporation borrowings, with the exception of such as are represented by overdrafts from the bank.

Quality of the Gas at Shrewsbury.—The Lighting Committee reported to the Shrewsbury Town Council that, from tests made by Mr. Blunt, the quarterly average of the illuminating power of the gas was shown as 17.54 candles, and the average of the sulphur test was 19 grains per 100 cubic feet. The illuminating power on the average was about what it was with the old burner; allowance being made for the higher results given by the new one. The Committee drew attention to the high percentage of sulphur per 100 cubic feet compared with what it was prior to the removal of the restrictions, to which removal the Corporation objected. In former years, the average varied from 8 to 12 grains per 100 cubic feet only; the old statutory limit being 20 grains. Alderman Deakin said the percentage of sulphur in the gas appeared to be steadily rising, though when the Gas Company obtained their powers the Council were given clearly and distinctly to understand there would be no increase whatever in the quantity of sulphur. He trusted the Company would see their way to give attention to the matter, and diminish the quantity of sulphur, which was so objectionable in houses where gas was consumed.

CURRENT SALES OF GAS PRODUCTS.

[For Table of "Tar Products Prices," see p. 449.]

Sulphate of Ammonia.

LIVERPOOL, Aug. 12.

Prices during the week have been somewhat irregular, the outbreak of strikes rendering shipment difficult or impossible at some ports; but on the whole values have been rather more than maintained. The closing quotations are £14 per ton f.o.b. Hull, £14 1s. 3d. to £14 2s. 6d. per ton f.o.b. Liverpool, and £14 3s. 9d. per ton f.o.b. Leith. There has been good inquiry in the forward position, but the firmness of makers has not encouraged business. September-December is held for £14 5s. per ton f.o.b. Leith, and a further premium is required for January-April.

Nitrate of Soda.

This article on spot Liverpool is quiet, with quotations ruling at 9s. 10½d. per cwt. for 95 per cent., and 10s. for refined quality.

LONDON, Aug. 14.

Tar Products.

The markets for tar products are still very firm. In pitch, there has been a slight improvement during the past week, and contracts are reported to have been made with the Continent at better prices. Benzols are steady; and there is a good demand for 90's quality for prompt delivery. Solvent naphtha is very quiet. Heavy naphthas are steady. Creosote is firm. Crude carbolic is firm.

The average values during the week were: Tar, 20s. 9d. to 24s. 9d., ex works. Pitch, London, 40s. 6d. to 41s. 6d.; east coast, 40s. to 41s.; west coast, Manchester, 39s. 6d. to 40s., Liverpool, 40s. 6d. to 41s., Clyde, 40s. to 41s. Benzol, 90 per cent., casks included, London, 9½d. to 10d.; North, 9d. to 9½d.; 50-90 per cent., casks included, London, 8¾d. to 9¼d., North, 8½d. to 9d. Toluol, casks included, London, 9¾d. to 10d.; North, 9¼d. to 9½d. Crude naphtha, in bulk, London, 4d. to 4½d., North, 3½d. to 3¾d.; solvent naphtha, casks included, London, 11d. to 11¾d.; North, 10d. to 10½d.; heavy naphtha, casks included, London, 11½d. to 1s. 0½d.; North, 10d. to 10½d. Creosote, in bulk, London, 2¾d. to 2½d.; North, 2d. to 2½d. Heavy oils, in bulk, 2¾d. Carbolic acid, 60 per cent., casks included, east coast, 2s. to 2s. 3d.; west coast, 2s. to 2s. 2d. Naphthalene, £4 10s. to £8 10s.; salts, 40s. to 42s. 6d., bags included. Anthracene, "A" quality, 1½d. per unit, packages included and delivered.

Sulphate of Ammonia.

There is still considerable activity in this market, and there has been a further improvement in the value. A large amount of business has been done for delivery to March next. Actual Beckton make is quoted to-day at £13 15s. Outside London makes are quoted £13 12s. 6d., Leith £14 5s., Liverpool £14 2s. 6d., Hull £14, and Middlesbrough £14.

COAL TRADE REPORTS.

Northern Coal Trade.

There has been some interruption in the coal shipments to the south through the difficulty in unloading at some wharves. On the whole, however, the trade has been full; the foreign demand being strong. Best Northumbrian steam coals are firm at from 11s. 4d. per ton f.o.b., second-class steams are 9s. 6d. to 9s. 9d., and steam smalls from 5s. to 6s. The output is tolerably full, and it appears to be well taken up. In the gas coal trade, there is a demand which is very full for this season; and for some foreign ports, it seems to be pressing. Durham gas coal is quoted from 9s. 6d. per ton f.o.b. for second-class kinds; and best Durhams are firm and rather scarce at from 10s. 9d. to 10s. 10½d. For "Wear specials," up to 11s. 6d. per ton f.o.b. is now quoted; and there is a full all-round demand. Some sales continue to be made for Genoa for gas coals at prices which are similar to those now quoted for coals with the current freights, but are rather higher for far-forward delivery. For the latter, there are steady inquiries, so that there is evidently a good consumptive demand. Coke is firmer. For good gas coke, there is a better export request, with prices from 14s. 3d. to 14s. 9d. per ton f.o.b. in the Tyne or Wear.

Scotch Coal Trade.

Trade appears to be improving, particularly the foreign trade. The trouble in the shipping trade may have a prejudicial effect, temporarily, on supplies, and prices may rise. Meantime, they remain practically unchanged, and may be quoted at: Ell, 9s. to 10s. 3d. per ton f.o.b. Glasgow; splint, 9s. 6d. to 9s. 9d.; and steam, 9s. to 9s. 3d. The shipments for the week amounted to 331,048 tons—an increase upon the previous week of 22,758 tons, but a decrease upon the corresponding week of 2493 tons. For the year to date, the total shipments have been 9,497,494 tons—an increase upon the corresponding period of 42,480 tons.

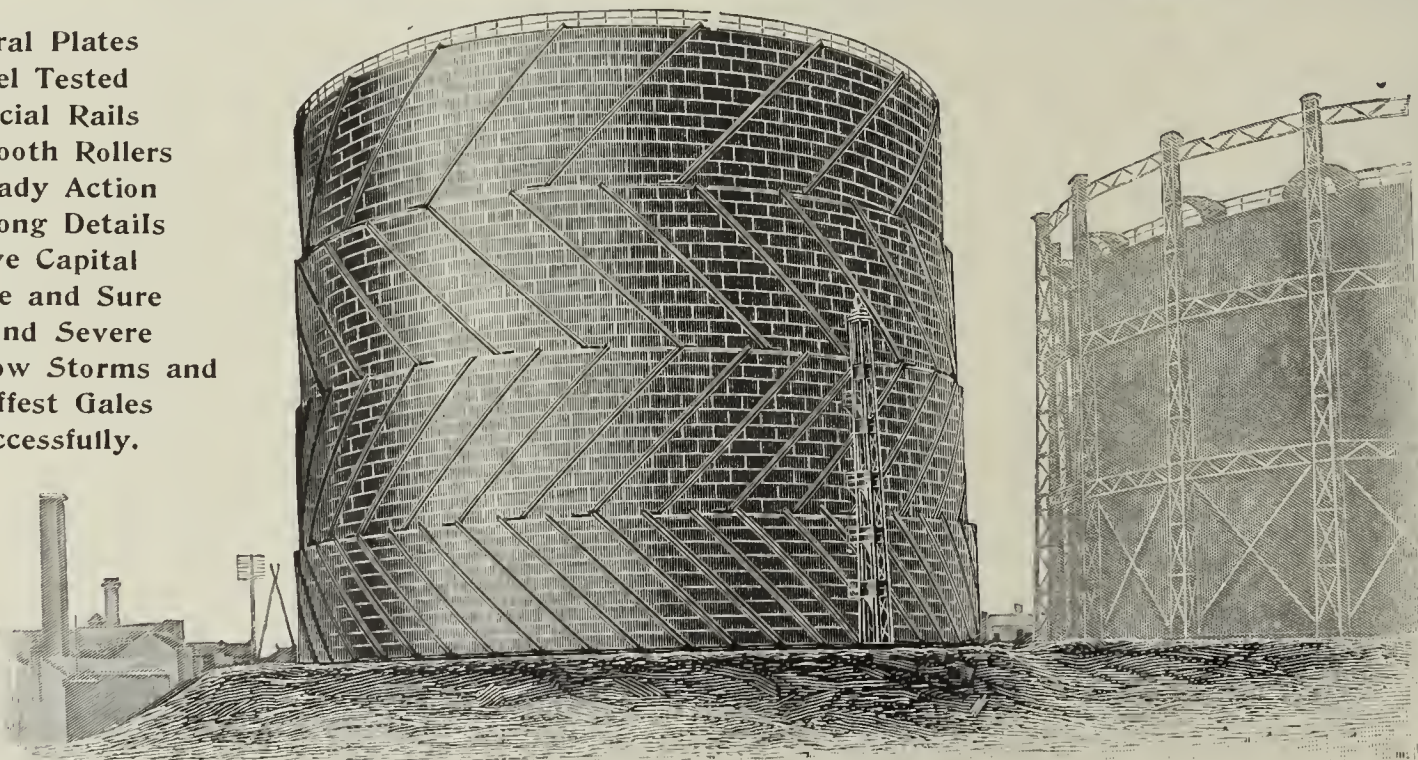
It has been decided by a mass meeting of the Oldham branch of the National Union of Gas Workers and General Labourers to demand that the minimum wage of labourers be raised from 18s. to 20s. a week, and that a corresponding advance be made to other workmen not represented by Trades Unions. Mr. J. R. Clynes, M.P., addressed the meeting, and said it was to be hoped that the force of the men's appeal and the example of other towns would secure a recognition of the demands. He added that the position of the labourer in the workshop was a tragedy that would have to be remedied. If the labourer had any grievance, he was not listened to, and was treated little better than a brute beast. He did not altogether blame the foremen and managers. They, too, were the victims of the present system, and were engaged, not only to buy labour, but to bully it if necessary.

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Corporation Officials as Arbitrators.

A rather long discussion took place at the meeting of the Sheffield City Council last Wednesday on a matter which raised the question of the advisability of officials acting as arbitrators in disputes in which the Corporation are concerned, and receiving fees therefor. The arbitration related to a purchase of land in the Langsell Valley for the purposes of the water undertaking; and as the result the Corporation paid £1353, instead of the £1450 claimed. The General Manager of the Water Department (Mr. William Terrey) was one of the Arbitrators; and he received 60 guineas for his services. It seemed to be the opinion of some members of the Council that the circumstances connected with this payment had not been properly put before them, as they were not set forth in a report presented on the matter. It was stated, however, that Mr. Terrey had expressed a desire that the Water Committee should consider as to whether the fee was to go to the credit of the Corporation, or whether he should retain it. An explanation was given as to why no mention was made of this in the report. The Chairman of the Water Committee (Alderman Styring) defended the payment, on the ground that it was not fair to put upon a man the strain and worry of an arbitration, in addition to his routine duties, without paying him for it. The Committee had had the whole of the details before them, from beginning to end; and they had taken the steps which seemed to be wise. As to the advisability of appointing officials as arbitrators, to which reference had been made in the course of the discussion, he said nothing would induce him to agree to the practice again.

Shanklin Water Supply.—Though the public ceremony of opening the new water-works at Chillerton, Isle of Wight, to which reference was made a week or two ago, remains in abeyance, there was general satisfaction expressed among the members of the Shanklin Parish Council at the improved supply provided for the district. The skill and discernment of the Engineer were freely acknowledged; and the fact of having two reservoirs for storage at this period of the dry season was mentioned as an additional source of gratification.

Torpoint Water Supply.—The question of the water supply was again under consideration at the last meeting of the Torpoint District Council. Several members complained of the inefficiency of the supply in the higher part of the town; and it was pointed out that, under the Insurance Bill, if it could be proved that sickness was due to an insufficient supply of pure water, the Council would be liable. Mr. Greet said the supply was good. In spite of the drought, they had 13 feet of water in the reservoir; and this was considerably above the normal quantity. Mr. Procter remarked that this was satisfactory for the people who got the water, but there were ratepayers who did not get any. Dr. Samuel thought the supply was not satisfactory, and at his suggestion it was decided that a special meeting of the Council should be held to consider the matter.

Unlawfully Disconnecting a Gas-Meter.

At the Cheshunt Petty Sessions, a few days ago, Frederick Pallett, a greengrocer, of Hoddesdon, was summoned for disconnecting the gas-meter in his house without giving 24 hours' notice in writing to the Hoddesdon Gas Company. It was stated that the defendant had had a prepayment meter in use since 1906, and during the past year it was noticed that the amount in the box had decreased. On the 28th of June, a collector called at the defendant's house and found that the meter had been disconnected, and a piece of flexible tubing attached to the service-pipe. The defendant, who was formerly in the Company's employment, pleaded guilty. Mr. J. S. T. Godsell, who prosecuted, said the Company had no wish to be vindictive, and had only taken action as a warning to others. A fine of 40s. or a month's imprisonment was imposed.

Coal Gas for Train Lighting.—In the "JOURNAL" for the 1st inst. (p. 316), reference was made to the above-named subject, in connection with a question asked by a correspondent to "The Times." Figures had been given by the author of an article in a previous issue, and the correspondent referred to wished to know whether or not the cost of compressing the gas had been included in them. In the Engineering Supplement last Wednesday, the author replied that it had. He said: "Where gas is taken in large quantities or for industrial purposes, it is usual to get it at a reduced rate. Say, for instance, the ordinary price were 2s. 6d. per 1000 cubic feet, the reduced price might very well be 2s. As for the cost of compression, I am assured that this would not exceed 1s. per 1000 cubic feet; and if large quantities are taken into account, it might drop down as low as 4d. to 6d., allowing proper charges for interest on capital employed and depreciation. Indeed, I have before me the offer of a certain corporation to supply compressed gas at increases over the usual industrial rate of from 6d. to 2d., in accordance with the quantity taken."

Northampton Gas Company.—In the report which was adopted at the 54th annual meeting, the Directors of the Northampton Gas Company stated that the total profits for the year available for distribution were £16,724, out of which an interim half-year's dividend at the rate of 5 per cent. per annum had been paid, leaving a balance of £10,740. They recommended the payment thereof of a dividend for the past half year on the consolidated stock at the same rate as before (being the maximum allowed); the two dividends amounting, less income-tax, to £11,968, and leaving a balance of £4756 to be carried forward. Arrangements for the supply of coal for the ensuing year had been made at a slight decrease on last year's prices; and the Directors had reduced the price of gas by 1d. per 1000 cubic feet as from Midsummer. The business of the Company still continued satisfactory; and further extensions of mains had been made in various parts of the district. The Directors alluded to the death of Mr. John Eunson, J.P., their Engineer and Manager, who occupied this position for 55 years. Mr. George Somes Eunson had been appointed in his place.

THE THINGS THAT MATTER.



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Leatherhead Gas Company and the Supply of Cobham.

At the close of the proceedings at the meeting of the Leatherhead Gas Company last Tuesday, at which a dividend of 2½ per cent. for the past half year (making with the interim dividend 5 per cent. for the year) was declared, the shareholders were asked to consider a proposal authorizing the Directors to apply to Parliament for a Bill to enable them to acquire the undertaking of the Cobham Gas Company. The Chairman (Mr. F. Hue Williams) explained the position of the Company and the circumstances which had led to the negotiations for the acquisition of their undertaking. He said the Company was at present composed of 1636 £10 shareholders; there were also debenture holders for £5450; and the concern was in debt something like £4000. Against this, it had, at the end of 1910, some £1300 owing to it, and a cash balance of £200. Under the terms of the agreement, the Leatherhead Company were undertaking to pay the shareholders £4090 in shares or cash, the debenture holders £5450 (or, at their option, to give them fresh debentures), and to pay the debts which at December last amounted to £4072, including overdue debenture interest. Besides this, the Board would require perhaps £1000 for expenses relating to the transfer, as well as a considerable sum for the purpose of putting the undertaking on a satisfactory basis. The Secretary (Mr. J. Young) then read the provisional agreement, and the Chairman moved a resolution sanctioning the purchase on the terms stated in it. Dr. Potts, in seconding the motion, said the transfer would be for the mutual advantage of the shareholders of both Companies, and for the benefit of the consumers of gas in the Cobham district. The motion was carried unanimously; and the Directors were subsequently authorized to promote a Bill next session to carry the agreement into effect.

Dublin Electricity Undertaking.—In sanctioning the borrowing of £100,000 by the Corporation of Dublin for the purpose of carrying out extensions in connection with their electric light undertaking, the Local Government Board for Ireland, referring to the extended public inquiry on the matter which took place last April and May, say they "note with satisfaction that the evidence went to show that the yearly receipts have increased uniformly from 1905 to 1911 (year ended March)—that in the latter financial year, for the first time, a substantial profit has been made on the undertaking, while now, as regards extensions, a guarantee is required, where necessary, before the laying down of new mains. A gratifying measure of success has therefore, it appears, attended the efforts of the Committee, notwithstanding that the undertaking is disadvantageously circumstanced owing to the low 'load factor' in Dublin." The Board, however, while sanctioning this borrowing power, point out that contracts have been arranged for important works in a somewhat loose manner. The Corporation asked originally for the sanctioning of a larger loan; but the Board say it is desirable that, before sanction to borrowing beyond the £100,000 is given, a clear statement of expenditure and definite proposals, supported by plans, specifications, and estimates, for any further works, should be submitted.

Improved Public Lighting in the Kew District.

At the last meeting of the Richmond Town Council, the Works Committee reported that certain of the street-lamps in the Kew district are lighted by the Brentford Gas Company; the charge per lamp, including gas, maintenance, repair, lighting, and extinguishing, being as follows: Lamps consuming 3½ cubic feet per hour, £2 17s. 1d.; lamps consuming 7 cubic feet per hour, £4 13s. 2d. The Company offered to convert the present lamps to take inverted burners of the latest pattern, to fix automatic lighting and extinguishing apparatus free of all initial cost to the Council, and from the 1st of October next to charge the following rates per lamp: Lamps consuming 3½ cubic feet per hour, £2 9s. 10d.; lamps consuming 7 cubic feet per hour, £4 1s. 9d.—subject to the Council entering into an agreement to continue the use of gas in as many lamps at Kew as are now in operation for a period of ten years; the agreement to be terminable at the end of seven years upon either party giving to the other six months' previous notice. It was provided that in the event of the agreement being terminated by the Council, they were to repay to the Company three-tenths of the capital cost of making the alterations above mentioned, this being estimated at about £3 per lamp. The Committee recommended that the terms should be accepted; and this was agreed to.

Wandsworth and Putney Gas Company.—At the meeting of this Company next Tuesday, the Directors will submit the accounts for the six months ended the 30th of June, which show a profit of £16,208 on the revenue account, and a sum of £25,754 available for distribution. The Directors recommend the declaration of dividends at the following rates per cent. per annum: £8 7s. 6d. and £6 17s. 6d. on the "A" and "B" consolidated stocks, and £5 17s. 3d. on the ordinary "C" stock—being increases of 2s. 6d. and 1s. 9d. per cent. respectively in consequence of the reduction in the price of gas. The quantity of gas sold in the half year was 592,797,000 cubic feet—an increase of 8·3 per cent.

Swansea Water Undertaking.—A few days ago, the members of the Swansea Corporation made an inspection of the Cray reservoir. At the subsequent luncheon, Alderman T. T. Corker, the Chairman of the Water and Sewers Committee, who presided, stated that during the dry weather of the past few weeks the consumption of water at Swansea had been 50 per cent. more than at ordinary times. The new reservoir had cost altogether £660,000, including service reservoirs and two lines of pipes; and the ultimate success of the undertaking was assured from the fact that while in 1906 they had a deficit in the water supply account of £38,000, last year it was only £26,000. It was probable that this year the saving would be £5000, and there were hopes that by 1920—perhaps by 1915—they would have paid off everything. They were in the proud position of not only being able to supply their own wants for quite a hundred years, but could also supply their neighbours, who were now becoming customers, to their own infinite advantage.

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Breakage of Street-Lamps at Pendleton.—During the hearing of a case at the Salford Police Court last week, in which six boys were charged with breaking street gas-lamps belonging to the Corporation, Mr. Hamblett, the Superintendent of the Lighting and Cleansing Department, stated that in the Pendleton district during the past twelve months 722 lamps had been broken by persons throwing stones—a total of 1576 squares of glass. The boys were fined a small sum, and ordered to pay for the damage.

Price of Gas at Crowborough.—Addressing the shareholders at the annual meeting of the Crowborough Gas Company, the Chairman (Mr. A. Dougall) said the past twelve months had been a period of progress; there having been an increase of 9½ per cent. in the consumption. In the last five years, the consumption had increased by a little over 56 per cent. This had been brought about by adding to the number of consumers, which had risen from 454 to 755. He was sorry to find, however, that the average amount of gas used per consumer had fallen off. This ought not to be the case; for gas was so convenient and handy that it should be increasingly employed. The Directors had done all in their power to foster the use of gas in the district; and just lately they had reduced the price by 3d. per 1000 cubic feet, and offered substantial discounts, ranging from 2½ to 15 per cent., according to the quantity used per quarter. Improvements had been made, so that they had now a good modern carbonizing plant. Five years ago, they were making 8611 cubic feet per ton of coal; while to-day they were getting about 11,000 cubic feet, and this figure would be increased later on. The Board had decided to close the works at Mayfield, and to concentrate manufacturing operations at Crowborough. The necessary gas would be pumped to the Mayfield district. It had also been determined to remove the offices from Tunbridge Wells to Crowborough. It was decided to pay a dividend at the rate of 2½ per cent. per annum; and the Chairman, Directors, Manager (Mr. I. A. Cook), and Secretary (Mr. J. F. Horne) were thanked for their services.

"Suicide while of unsound mind through excessive drinking," was the verdict of a Coroner's Jury who inquired into the circumstances attending the death of James Attack, a grocer at Dewsbury Moor. Deceased was found with an india-rubber tube in his mouth; the other end being attached to the gas-bracket, the tap of which was turned full on.

A Special Commission of the British Fire Prevention Committee has been visiting Paris under the chairmanship of Mr. Edwin O. Sachs. Among other places inspected were the works at Gennevilliers of the Société d'Eclairage, Chauffage, et Force Motrice, whose fire brigade was personally shown by the Prefect of Police (M. Lépine). On the occasion of the visit of the members of the Société Technique to the works in June last year, there was a turnout by the brigade which called forth the plaudits of the visitors for the smartness with which it was executed.

The village of Rowlands Castle (Hants) will shortly receive its initial supply of gas for public and private use; the Havant Gas Company having resolved to extend their mains to the district.

On the occasion of the visit of the Junior Institution of Engineers to Cambridge at the conclusion of their recent summer meeting in East Anglia, the members dined together in the University Arms Hotel. One of the toasts proposed embraced the University and town and the various bodies who had accorded the Institution hospitality. The toast was acknowledged by, among others, Mr. Thomas Glover, of Norwich, who paid a well-deserved compliment to the Cambridge Scientific Instrument Company, who, he said, were of great service to the country for the accurate instruments which they produced. The day following the dinner, the works of the Company were visited by the members.

Three of the four Finchley Overseers are members of the District Council, with the Clerk of the Council acting as Assistant-Overseer. Recently the Overseers called in an expert to value the Council's electricity undertaking, and as a result of his valuation the assessment was raised by no less than £1400. The Council decided to appeal against this; and it fell to the lot of the Chairman of the Electricity Committee, who is one of the Overseers, to recommend the Council to engage the necessary legal assistance in prosecuting the appeal. The resolution was agreed to; one member pointing out that as Councillors the Overseers were recommending the spending of money to fight themselves as Overseers—a truly Gilbertian situation.

In connection with the High Court of the Ancient Order of Foresters which was held at Burton-on-Trent last week, there was a grand procession on the 7th inst., an interesting feature of which was a large decorated dray, bearing a number of gas cooking-stoves, sent by the Gas Committee of the Corporation. There were dummy joints; and a supply of gas from a cylinder under high pressure was burning on one of the stoves for boiling potatoes, &c. The whole was under the direction of a smart young *chef* in spotless white. In further recognition of the event of the week, the Town Hall was illuminated every night as at Coronation time, an illustrated description of which was given in the "JOURNAL" for the 4th ult. (p. 30); and the Gas Committee further assisted in making the Bank Holiday festivities a success by erecting and supplying with gas, free of charge, high-power inverted incandescent gas-lamps temporarily for the gala held on the Hay (one of the public recreation grounds) during the afternoon and evening. The gas arrangements were under the supervision of Mr. R. S. Ramsden, the Assistant Gas Manager to the Corporation. It appears, from a statement made at the meeting of the Town Council last Thursday by Alderman Lowe, the Chairman of the Gas and Electricity Committee, that the illumination of the Town Hall has attracted attention in Bombay, as a letter has been received from the Gas Engineer there referring in congratulatory terms to the illumination, and asking for advice, which he (Alderman Lowe) presumed was required for guidance on the occasion of His Majesty's visit at the Durbar.



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LEST YE FORGET.

In connection with the International Gas Exhibition to be held at the Agricultural Hall, Islington, from Nov. 11 to 24 next, it is proposed to have an "Inventors Section," for the exhibition of new patents and models. The section will, it is thought, prove of the "utmost interest to the trade at large, and promises to be well supported."

At the meeting of the Burton-on-Trent Town Council last Thursday, the Chairman of the Gas and Electricity Committee (Alderman Lowe) mentioned that the Committee had engaged a lady to demonstrate to consumers having gas-stoves the best way to use them, and expressed the hope that they would avail themselves of her services. Referring to the matter, a writer in a local paper said: "The way for a lady to get at the best side of a man is said to be to feed him; and, therefore, housewives whose excursions into the culinary art have not been altogether happy, will learn with pleasure that the Corporation are now in a position to send a lady cook to give experiments in methods to satisfy the epicure. This is an excellent idea in popularizing the use of gas."

APPLICATIONS FOR LETTERS PATENT.

- 17,436.—SOCIETA PER L'UTILIZZAZIONE DEI COMBUSTIBILI ITALIANI and CIVITA, D., "Gas-producers." July 31.
17,451.—LINNEY, A. M., "Mantles." Aug. 1.
17,454.—HARDY, J. T., "Automatic gas lighter and extinguisher." Aug. 1.
17,469.—CLIMIE, W., "Gas-producers." Aug. 1.
17,472.—WHEATLY, S. W., SHELDON, F. S., and TOMLINSON, J. A., "Packing means for Gay Lussac, Glover, and like towers." Aug. 1.
17,492.—MATHYS, A. W., "Mantles." A communication from Herren Front G. M. B. H. Aug. 1.
17,507.—ALSTON, C. H. T., and HOUSTON, P. T., "Gas-producers." Aug. 1.
17,516.—MEHNE, J. G., "Clockwork lighting." Aug. 1.
17,536.—O'LOGHLEN, B., "Gas signs." Aug. 1.
17,539.—HANSFORD, J. & J. B., "Prepayment meters." Aug. 1.
17,542.—CARPENTER, A. H., and BROWN, H. W., "Cocks and the like." Aug. 1.
17,543.—ZÖLLER, K., "Gas-governors." Aug. 1.
17,561.—GODELMANN, N., "Making mantles." Aug. 2.
17,588.—FREYLIGHT G. M. B. H., "Mantles." Aug. 2.
17,657.—HILL, S. F., "Renewable burner." Aug. 3.
17,673.—MAWDSLEY, P., "Gas cooking-stoves." Aug. 3.
17,684.—STILL, W. M., AND SONS, LIMITED, ADAMSON, A. G., and KITSON, A. J. D., "Vapour lamps." Aug. 3.
17,685.—STILL, W. M., AND SONS, LIMITED, ADAMSON, A. G., and KITSON, A. J. D., "Incandescent lamps." Aug. 3.
17,740.—PEARSON, C., "Punching gas-tanks, &c." Aug. 4.
17,766.—HOFF, P. E. F., "Gas-cock." Aug. 4.
17,770.—FRÄMBS, H., and BENDER AND FRÄMBS G. M. B. H., "Gas-generators." Aug. 4.
17,809.—LANKIN, A. E., and MEAD, F., "Gas-supply control." Aug. 4.
17,852.—GROVE, E. P., and COULSON, W. T., "Automatically registering the index of a meter." Aug. 5.
17,858.—KEITH, J. & G., "Gas-lamps." Aug. 5.
17,893.—SILBERSTEIN, E., "Cleaning gas-pipes, &c." Aug. 5.

The annual exhibition of flowers and vegetables grown by employees of the South Metropolitan Gas Company at the East and West Greenwich stations was held at the institute in Thames Street, Greenwich, on the 5th inst. The entries numbered 139—an increase of two on last year; and considering that the weather has been so adverse to gardening operations, there was a very creditable display. The feature of the exhibition was provided by the collections of vegetables particularly that staged by Mr. E. E. Barton from his allotment at East Greenwich. An interesting show of garden flowers was made by the children of the employees. Mr. J. F. Braidwood, the Engineer-in-Charge of the West Greenwich station, performed the opening ceremony, and said that, considering the weather, he only expected to see a potato and a turnip; but the exhibits which he had inspected showed that they had been well nourished and well looked after, and were a credit to all concerned. During the afternoon, the Company's band (under the direction of Mr. Sydney Herbert) played a selection of music, and a concert was given in the evening. The show was managed by a Committee, with Messrs. A. Showell and H. P. Hollis as Hon. Secretary and Hon. Assistant-Secretary respectively.

A Handsome F'Cap Volume giving a complete account of the

GRANTON GAS-WORKS

OF THE EDINBURGH AND LEITH CORPORATIONS' GAS COMMISSIONERS,
Their DESIGN, CONSTRUCTION, and EQUIPMENT,

with Illustrations, Plates, and Details of Costs,

BY W. R. HERRING, M.Inst.C.E., &c.

The volume consists of 300 pages, embellished with 228 Photographic and other Illustrations, and 28 large folding Plates. In addition, the Appendices give (in full) the Specifications and Detailed Schedule of Quantities of the Brick and Puddle Gasholder Tank and of the Four-Lift Telescopic Holder at Granton.

Bound in Cloth, price 16s., net cash, free delivery in United Kingdom.

WALTER KING, 11, BOLT COURT, FLEET ST., LONDON, E.C.

GAS COMPANIES' STOCK AND SHARE LIST.

Referred to on p. 408.

Issue.	Share.	When ex- Dividend.	Dividend or Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Invest- ment.	Issue.	Share.	When ex- Dividend.	Dividend or Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Invest- ment.
£	Stk.	Apl. 12	p.c.	Alliance & Dublin Ord.	82-85	..	5 17 8	£	Stk.	May 12	p.c.	Imperial Continental	180-183	..	£ s. d.
1,551,868	Stk.	July 14	4	Do. 4 p.c. Deb.	93-95	..	4 4 3	4,940,000	Stk.	Feb. 10	3½	Do. 3½ p.c. Deb. Red.	92-94	..	4 18 4
374,000	Stk.	May 12	7	Bombay, Ltd.	64-65	..	5 3 8	1,235,000	Stk.	Feb. 24	10	Liverpool United A.	215-217	..	4 12 2
250,000	5	Feb. 24	15	Bourne-) 10 p.c. . .	28½-29½	..	5 1 8	561,000	Stk.	" "	7	Do. B.	163-165	..	4 4 10
50,000	10	" "	7	mouth Gas) B 7 p.c. .	16½-16½	..	4 3 0	718,100	" "	" "	4	Do. Deb. Stk.	102-104	..	3 16 11
311,810	10	" "	6	and Water) Pref. 6 p.c.	14½-15	..	4 0 0	306,083	" "	June 30	4	Malta & Mediterranean	4½-4½	..	6 3 1
75,000	10	" "	13½	Brentford Consolidated	260-265	..	4 18 1	75,000	" "	June 15	6	Met. of) 5 p.c. Deb.	100-102	..	4 18 0
380,000	Stk.	" "	10½	Do. New	203-208	..	4 16 2	560,000	100	Apl. 1	5	Melbourne) 4½ p.c. Deb.	100-102	..	4 8 3
330,000	" "	" "	5	Do. 5 p.c. Pref. . .	122-124	..	4 0 8	250,000	100	" "	4½	Monte Video, Ltd. . .	12½-13½	..	5 5 8
50,000	" "	June 15	4	Do. 4 p.c. Deb. . .	97-99	..	4 0 10	541,920	20	May 31	3½	Newcastle & Gt. Tesh'd Con.	101-103	..	4 5 0
206,250	" "	Mar. 10	11	Brighton & Hove Orig.	217-220	..	5 0 0	1,775,892	Stk.	July 28	4½	Do. 3½ p.c. Deb.	87-89	..	3 18 8
220,000	Stk.	" "	8	Do. A Ord. Stk. . .	157-160	..	5 0 0	529,705	Stk.	June 30	3½	North Middlesex 7 p.c.	15-16	..	4 7 6
246,320	" "	Apl. 12	11½	British	44½-45½	..	5 3 5	55,940	10	Mar. 10	7	Ottoman, Ltd.	138-140	..	5 14 4
490,000	Stk.	June 30	4	Do. 4 p.c. Deb. Stk.	94-96	..	4 3 4	300,000	Stk.	Apl. 27	8	Portsea Island A . . .	6½-7½	..	5 10 4
120,000	Stk.	Feb. 10	6	Bromley, A 5 p.c. . .	116-118	..	5 1 8	60,000	5	Apl. 12	8	Do. C	135-140	..	4 18 4
109,000	" "	" "	4½	Do. B 3½ p.c. . . .	87-89	..	5 1 2	31,800	53	Feb. 24	13	Do.	120-125	..	4 16 0
165,700	" "	" "	5½	Do. C 5 p.c.	106-108	..	5 1 10	100,000	50	" "	12	Primitiva Ord.	7½-7½	..	5 6 8
82,278	" "	June 30	3½	Do. 3½ p.c. Deb. . .	82-84	..	4 3 4	398,490	5	May 31	8	Do. 5 p.c. Pref. . . .	5½-5½	..	4 10 11
55,000	" "	" "	4	Buenos Ayres 4 p.c. Deb.	95-97	..	4 2 6	796,980	5	June 30	5	Do. 4 p.c. Deb. . . .	97-99	..	4 0 10
250,000	Stk.	" "	—	Cape Town & Dis., Ltd.	2-3	..	—	488,900	100	June 1	4	River Plate 4 p.c. Deb.	95-97	..	4 2 6
100,000	10	" "	—	Do. 4½ p.c. Pref. . .	4-5	..	—	312,650	Stk.	June 30	4	Sau Paulo, Ltd.	21½-22½	..	4 0 0
100,000	10	" "	—	Do. 4½ p.c. Deb. Stk.	80-83	..	5 8 5	250,000	10	Mar. 24	9	Do. 6 p.c. Pref. . . .	12-12½	..	4 16 0
100,000	Stk.	June 30	4½	Chester 5 p.c. Ord. . .	109-111	..	4 10 1	115,000	10	" "	6	Do. 5 p.c. Deb. . . .	49½-50½	..	4 19 0
157,150	Stk.	Feb. 24	5	Commercial 4 p.c. Stk.	114-116	..	4 14 3	125,000	50	July 1	5	Sheffield A	236-238	..	4 4 0
1,513,280	Stk.	" "	5/9/4	Do. 3½ p.c. do. . . .	108-110	..	4 16 11	135,000	Stk.	Mar. 24	10	Do. B	236-238	..	4 4 0
560,000	" "	June 15	3	Do. 3 p.c. Deb. Stk.	75½-77½	..	3 17 5	209,984	" "	" "	10	Do. C	236-238	..	4 4 0
475,000	" "	May 31	7	Continental Union, Ltd.	90-93	..	4 6 0	523,500	" "	June 15	7	South African	8½-9½	..	7 7 4
800,000	Stk.	" "	4	Do. 7 p.c. Pref. . . .	135-137	..	5 2 2	70,000	10	Feb. 10	5/9/4	South Met., 4 p.c. Ord.	119-121	..	4 10 3
200,000	" "	" "	5½	Derby Con. Stk. . . .	122-124	..	4 8 9	6,429,895	Stk.	July 14	3	Do. 3 p.c. Deb. . . .	78½-80½	..	3 14 6
492,270	Stk.	" "	4	Do. Deb. Stk.	104-105	..	5 2 7	1,895,445	" "	Mar. 10	8	South Shields Con. Stk.	154-156	..	5 2 7
55,000	" "	July 28	10	European, Ltd.	18½-19½	..	4 7 0	605,000	Stk.	Feb. 24	5½	S'th Suburb'n Ord. 5 p.c.	120-122	..	4 12 9
840,150	10	Feb. 24	4/14/8	Gas-) 4 p.c. Ord. . . .	107½-108½	..	4 7 0	60,000	" "	" "	5	Do. 5 p.c. Pref. . . .	118-120	..	4 3 4
2,600,000	" "	" "	3½	light) 3½ p.c. max. . .	85-87	..	4 0 6	117,058	" "	July 14	5	Do. 5 p.c. Deb. Stk.	121-123	..	4 1 4
4,062,235	" "	" "	2	and) 4 p.c. Con. Pref.	103-105	..	3 16 2	502,310	Stk.	May 12	5	Southampton Ord. . .	108-110	..	4 10 11
4,531,705	" "	June 15	3	Coke) 3 p.c. Con. Deb.	78½-80½	..	3 14 6	120,000	Stk.	Feb. 10	7½	Tottenham A 5 p.c. . .	147-150	..	4 15 0
258,740	Stk.	Mar. 10	5	Hastings & St. L. 3½ p.c.	95-97	..	5 3 1	483,940	" "	June 15	4	Do. B 3½ p.c. . . .	116½-118½	..	4 15 0
82,500	" "	" "	6½	Do. do. 5 p.c. . . .	—	..	—	149,470	" "	June 15	4	Edmonton) 4 p.c. Deb.	96-98	..	4 1 8
70,000	10	Apl. 27	11	Hongkong & China, Ltd.	17½-18	..	6 2 2	182,380	10	June 15	8	Tuscan, Ltd.	8½-9½	..	8 13 0
131,000	Stk.	Mar. 10	7½	Ilford A and C	147-150	..	4 18 4	149,900	10	July 1	5	Do. 5 p.c. Deb. Red.	96-98	..	5 2 0
65,780	" "	" "	5½	Do. B	119-122	..	4 16 3	236,476	Stk.	Feb. 24	5	Tynemouth, 5 p.c. max.	115-117	..	4 5 6
65,500	" "	June 30	4	Do. 4 p.c. Deb. . . .	94-96	..	4 3 4	255,636	Stk.	Feb. 24	6½	Wands-) B 3½ p.c. .	141-143	..	4 14 5
200,242	Stk.	Mar. 10	6	Lea Bridge Ord. 5 p.c. .	120-122	..	4 18 4	85,766	" "	June 30	3	worth) 3 p.c. Deb. Stk.	71-73	..	4 2 2

Prices marked * are "Ex. div."

† Next dividend will be at this rate.

TAR PRODUCTS PRICES.

Representative manufacturers give the following as fair current values for the week ending Aug. 12. Prices are net, and they include the usual packages and delivery f.o.b., f.a.s., or f.o.r., as customary.

Article.	Basis.	London.	North-East Coast.	East Coast, Yorks.	West Coast.		Glasgow.
					Liverpool.	Manchester.	
Tar, crude	per ton	28/- 30/-	20/- 25/-	20/6 24/6	—	19/6 22/6	—
Pitch	"	42/6	39/- 39/6	40/-	40/-	39/-	—
Benzol, 90%	per gallon	-/11	-/9½ -/9¾	-/9	-/9¼	-/9¾	—
Benzol, 50-90%	"	—	-/10	-/9½	—	-/8½	—
Toluol, 90%	"	—	-/10	-/10	-/10	-/10	—
Crude naphtha, 30%	"	—	-/4¼	-/4	-/3¾	-/3¾	—
Light oil, 50%	"	—	-/3½	-/3¾ -/4	-/3½	-/3½	—
Solvent naphtha, 90-160	"	—	-/10	-/10	-/10	-/10	—
Heavy naphtha, 90-190	"	—	-/11	-/11½	-/11¼	-/11¼	—
Creosote in bulk	"	-/2¾	-/2 1/16	-/2	-/2¾	-/2 1/16	—
Heavy oils.	"	—	-/2½ -/2 5/8	-/2¼	-/2¾	-/2 3/4	—
Carbolic acid, 60's.	"	—	2/0½	2/3	1/11	1/11	—
Naphthalene, crude drained salts	per ton	—	43/9	41/3	47/6	47/6 50/-	—
" pressed	"	—	60/-	63/-	60/-	60/- 72/6	—
" whizzed.	"	—	—	—	70/- 72/6	65/- 75/-	—
Anthracene	per unit	-/2	-/1½	-/1½	-/1¼	-/1¼	—

WANTED, FOR SALE, CONTRACTS, &c., ADVERTISEMENTS IN THIS WEEK'S "JOURNAL."

Appointments Vacant.
FOREMAN (TAR-WORKS). 5438.
MAINTENANCE DEPARTMENT. No. 5439.
STOKER, Halesowen Gas-Works.

Plant, &c. (Second-Hand), for Sale.
METERS. No. 5424.
PIPES, MOUTHPIECES, &c. J. Adams and Sons, Newcastle-on-Tyne.

Patents, Licences, &c.
HIGH-PRESSURE LIGHTING AND HEATING BURNERS.
Marks and Clerk, 57 and 58, Lincoln's Inn Fields, W.C.

Manufacturers' Wants.
PREPAYMENT PADLOCKS. 5437.

Meetings.
BARNET GAS AND WATER COMPANY. Holborn Restaurant. Aug. 29. One o'clock.
CHICHESTER GAS COMPANY. Gas-Works. Aug. 29. One o'clock.
HARROW AND STANMORE GAS COMPANY. Holborn Restaurant. Sept. 4. Twelve o'clock.
MITCHAM AND WIMBLEDON GAS COMPANY. Offices. Aug. 29. Three o'clock.

TENDERS FOR
Coal.
BROADSTAIRS GAS COMPANY. Tenders by Sept. 5.
General Stores (Castings, Iron and Steel, Shovels, Oils, Lime, Brass Cocks, Glass, &c., &c.).
BRADFORD GAS DEPARTMENT. Tenders by Sept. 14.

Lamps, &c.
BRADFORD GAS DEPARTMENT. Tenders by Sept. 14.

Meters, &c.
BRADFORD GAS DEPARTMENT. Tenders by Sept. 14.

Pipes, &c.
BRADFORD GAS DEPARTMENT. Tenders by Sept. 14.

Sulphate Plant.
LEVEN AND METHIL GAS COMPANY, Tenders by Aug. 23.

Tar.
BRADFORD GAS DEPARTMENT. Tenders by Sept. 14.

NOTICES TO CORRESPONDENTS, ADVERTISERS, AND SUBSCRIBERS.

No notice can be taken of anonymous communications. Whatever is intended for insertion in the "JOURNAL" must be authenticated by the name and address of the writer; not necessarily for publication, but as a proof of good faith.

COPY FOR ADVERTISEMENTS for the "JOURNAL" should be received at the Office NOT LATER than TWELVE O'CLOCK NOON ON MONDAY, to ensure insertion in the following day's issue.
Orders for Alterations in, or stoppages of, PERMANENT ADVERTISEMENTS should be received by the FIRST POST on SATURDAY.
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O'NEILL'S OXIDE
For GAS PURIFICATION.
LARGEST SALE OF ANY OXIDE.
SPENT OXIDE PURCHASED IN ANY DISTRICT.
GAS PURIFICATION & CHEMICAL CO., LD.,
PALMERSTON HOUSE,
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"VOLCANIC" FIRE CEMENT.
Resists 4500° Fahr. Best for GAS-WORKS.
ANDREW STEPHENSON, 182, Palmerston House, Old Broad Street, LONDON, E.C. "Volcanism, London."

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THOMAS HORROCKS & SONS, LTD.,
Albert Chemical Works, BRADFORD,
MANCHESTER.
Pitch, Creosote, Brick and Fuel Oils, Benzol, Solvent Naphtha, Carbolic, Sulphate of Ammonia.

"GAZINE" (Registered in England and
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It is also used for the enrichment of Gas.
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Telegrams: "DORIO," Newcastle-on-Tyne. National Telephone No. 2497.

J. & J. BRADDOCK (Branch of Meters
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WET AND DRY GAS-METERS, PREPAYMENT METERS, STATION METERS, AND GOVERNORS.
REPAIRS RECEIVE PROMPT ATTENTION.
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General Manager (for Scotland)—
J. B. MACDERMOTT, 11 Bothwell St., GLASGOW.

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GAS LIGHTING ENGINEERS AND CONTRACTORS,
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Telephone: 2336 HOLBORN.

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BALE'S FIRE CEMENT.
PAINT FOR GAS-WORKS.
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SPECIALLY prepared for the Manufacture of SULPHATE OF AMMONIA.
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ENQUIRIES SOLICITED.
FOR Gas-Works Plant of Every Description; also SULPHATE OF AMMONIA and SULPHUR RECOVERY PLANTS,
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GAS PLANT for Sale—We can always
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FIRTH BLAKELEY, SONS, AND COMPANY, LIMITED,
Church Fenton, near LEEDS.

ROBERT DEMPSTER & SONS, Ltd.,
Contractors for Complete CARBONIZING PLANTS and every description of GAS APPARATUS, ELEVATING, CONVEYING, and TELPHERAGE PLANTS, also STOKING MACHINERY, ROSE MOUNT IRON-WORKS, ELLAND.

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SPECIALLY prepared for Sulphate of AMMONIA Makers by

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Telegrams: "CHEMICALS, OLDBURY."

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THE very best Patent Grids for Holding Oxide Lightly.

See Illustrated Advertisement, Aug. 1. p. 325.

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PREPARED from Pure Iron.

Twice as rich as Bog Ore.

Gives no back Pressure.

The Cheapest in the Market.

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AMMONIA Waste Liquor Disposal.
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Results Guaranteed. No Working Costs.

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MEADE-KING, ROBINSON, & CO., Represent the Strongest Independent Refineries in America; also Petroleum Spirit for Gas Enrichment. 18, EXCHANGE STREET, MANCHESTER, and TOWER BUILDING, 22, WATER STREET, LIVERPOOL.

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Correspondence invited.

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SULPHURIC ACID for Sale, specially suitable for making Sulphate of Ammonia. BROTHERTON AND CO., LTD., Chemical Manufacturers. Works: BIRMINGHAM, LEEDS, SUNDERLAND, and WAKEFIELD.

AMMONIA.

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AMMONIACAL Liquor wanted.

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Telegrams: "CHEMICALS."

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MEWBURN, ELLIS, & PRYOR, Chartered Patent Agents, 70 & 72, Chancery Lane, London, W.C. Telegrams: "Patent London." Telephone: No. 243 Holborn.

"GUIDE to Patents, Trade Marks and DESIGNS," 1910. 4th Edition. Contains concise information on British, Colonial, and Foreign Patents, &c. All Inventors and those interested should send for free copy to J. S. WITHERS & SPOONER, Chartered Patent Agents, 323, High Holborn, London. Phone. 480 HOLBORN. Telegrams: "Improvably, London."

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THE Work of these Departments is carried on in separate Blocks of Buildings specially equipped for Systematic Instruction.

Prospectus may be had Free on Application from the Registrar.

The next Session begins on Oct. 3, on which day the Entrance Examination will be held at Ten a.m. and Two p.m.

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BROTHERTON AND CO., LTD., Tar Distillers.

Works: BIRMINGHAM, GLASGOW, LEEDS, LIVERPOOL, SUNDERLAND, AND WAKEFIELD.

SULPHURIC ACID—Specially prepared for Sulphate of AMMONIA and BENZOL Recovery Plants. JOHN NICHOLSON & SONS, LTD., Hunstlet Chemical Works, LEEDS. Tele.: "NICHOLSON, LEEDS." Telephone: (Two lines), Nos. 2420 and 2421.

WANTED—Tar and Ammoniacal Liquor. Any Quantity.

GRINDLEY AND COMPANY, LIMITED, Rawcliffe, near Goole, YORKSHIRE.

AMMONIACAL Liquor wanted.

BROTHERTON AND CO., LTD., Ammonia Distillers.

Works: BIRMINGHAM, GLASGOW, LEEDS, LIVERPOOL, SUNDERLAND, AND WAKEFIELD.

FOR Instructions on Polishing and Cleaning Gas-Cookers and Gas-Fittings, read Canning Handbook on Polishing, Electro-Plating, and Lacquering. Fully illustrated. Price 2s. 3d., post free; abroad, 2s. 6d.

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WELL-KNOWN Meter Makers want MONOPOLY FOR SALE of Special Padlocks for Prepayment Meters.

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WANTED, a Foreman for a Small Tar-Works.

Apply, by letter, stating Experience and Wages required, to No. 5438, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

WANTED, by a Gas Company in the West of England, a Smart Intelligent Young Man, of Good Address, for the MAINTENANCE of INCANDESCENT Gas Burners. Wages, 24s. per week.

Applications, by letter, with copies of Testimonials, to No. 5439, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

STOKER WANTED.—Particulars from the MANAGER, Gas-Works, Halesowen, BIRMINGHAM.

WHAT offers for One 50-Light and Three 100-Light Dry Tin-Cased GAS-METERS? Thoroughly overhauled, and equal to new.

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FOR SALE—6-inch Bridge Pipes, MOUTHPIECES, 21 in. by 15 in.; ASCENSION PIPES, BRANCH PIPES, and all Accessories for Gas-Making Plant. Cheap to quick purchaser.

Apply, JOHN ADAMS & SONS, Engineers and Merchants, South Street Works, NEWCASTLE-ON-TYNE. Every kind of Dismantling Work Executed.

BROADSTAIRS GAS COMPANY.

THE Directors of the above Company invite TENDERS for the Supply of about 7000 Tons of best Durham or Yorkshire GAS COALS, to be Delivered between the 1st of October, 1911, and the 30th of September, 1912, either at Broadstairs Railway Station or Broadstairs Harbour.

Sealed Tenders, endorsed "Gas Coal," addressed to the Chairman of the Company, Gas Offices, Broadstairs, to be sent in not later than Tuesday, Sept. 5, 1911.

The Directors do not bind themselves to accept the lowest or any Tender.

Further Particulars and Form of Tender may be obtained from

F. HIGGINSON,

Engineer, Manager, and Secretary.

Gas Offices, Broadstairs,

Aug. 2, 1911.

TO TAR DISTILLERS AND OTHERS.

THE Gas Committee of the Bradford Corporation are prepared to receive TENDERS for the Purchase of their Surplus TAR for One Year ending Sept. 30, 1912.

Form of Tender, with any further Information required, may be had on Application to Mr. Chas. Wood, Gas Engineer, Town Hall.

Sealed Tenders, endorsed "Tender for Tar," to be sent to me on or before Thursday, Sept. 14, 1911.

The highest or any Tender will not necessarily be accepted.

FREDERICK STEVENS,

Town Clerk.

Town Hall, Bradford,

Aug. 12, 1911.

CITY OF BRADFORD.

TENDERS FOR STORES.

THE Gas Committee of the Bradford Corporation are prepared to receive TENDERS for the Supply of the following STORES required in their several Departments during a period of One Year ending Sept. 30, 1912:—Wet and Dry GAS METERS; PIPES and CASTINGS; Wrought-Iron STEAM TUBING; Best Merchant IRON and STEEL; CHARGING SHOVELS; OXIDE WISKEYS; COTTON WASTE; Best ENGINE OIL; Common ENGINE OIL; CYLINDER OIL; TARRED GASKIN; Brass Main GAS COCKS; WEED BROOMS; Best LIME; Copper LAMPS; LAMP IRONS; SHEET GLASS, and OPAL GLASS for Street Lamps.

Form of Tender, with any further Information required, may be had on Application to Mr. Chas. Wood, Gas Engineer, Town Hall, and Samples may be seen at Mill Street Gas-Works.

The Contracts will be let subject to the Fair Contracts Clauses of the Corporation, which may be seen at the Town Clerk's Office, and which the accepted Contractors will be required to sign.

Tenders, endorsed "Tender for Stores," to be sent to me not later than Thursday, Sept. 14.

The lowest or any Tender will not necessarily be accepted.

FREDERICK STEVENS,

Town Clerk.

Town Hall, Bradford,

Aug. 12, 1911.

THE Leven and Methil Gas Company, Limited, are prepared to receive OFFERS for the Supply and Erection of SULPHATE of AMMONIA PLANT capable of producing 1½ Tons of Salt per Twenty-Four Hours.

Offers, with Detailed Drawings and Specifications of Plant, to be lodged with the undersigned, from whom further Particulars may be obtained.

Tenders, suitably endorsed, to be sent in not later than Wednesday, the 23rd inst.

The lowest or any Tender not necessarily accepted.

P. L. READDIE,

Manager and Secretary.

Gas Office, Leven, Fife,

Aug. 5, 1911.

CITY OF CHICHESTER GAS COMPANY.

NOTICE is Hereby Given, that the ORDINARY HALF-YEARLY MEETING of the Proprietors of the above Company will be held at the Offices of the Company, at the Gas-Works, Chichester, on Tuesday, the 29th day of August, 1911, at One o'clock in the Afternoon precisely, to receive the Report of the Directors and the Accounts for the Half-Year ended the 30th of June, 1911; to declare a Dividend; and to Transact the General Business of the Company.

THE TRANSFER BOOKS OF THE COMPANY WILL BE CLOSED from the 16th to the 29th inst. inclusive.

By order of the Board,

VICTOR V. VICK,

Secretary.

Offices: Gas-Works, Chichester,

Aug. 1, 1911.

MITCHAM AND WIMBLEDON DISTRICT GASLIGHT COMPANY.

(INCORPORATED BY ACTS OF PARLIAMENT, 1867 AND 1907.)

NOTICE is Hereby Given, that a HALF-YEARLY ORDINARY GENERAL MEETING of the Proprietors of this Company will be held at the Offices of the Company, Western Road, Mitcham, in the County of Surrey, on Tuesday, the 29th day of August, 1911, at Three o'clock in the Afternoon precisely, to receive the Report of the Directors and a Statement of Accounts for the Half-Year ended the 30th day of June last; to declare a Dividend; and for General Business.

THE REGISTER OF TRANSFERS OF CONSOLIDATED ORDINARY STOCK WILL BE CLOSED from the 15th of August, 1911, until after the Meeting.

By order of the Directors,

BENJAMIN GREEN,

Secretary.

Offices and Works,
Western Road, Mitcham,
July 21, 1911.

HARROW AND STANMORE GAS COMPANY.

NOTICE is Hereby Given, that the ORDINARY HALF-YEARLY MEETING of the Proprietors will be held at the Holborn Restaurant, 218, High Holborn, London, on Monday, the 4th day of September, 1911, at Twelve o'clock precisely, to receive the Directors' and Auditors' Reports; to declare a Dividend; and to transact any Ordinary Business of the Company.

THE REGISTER OF TRANSFER BOOKS WILL BE CLOSED from Aug. 28 until Sept. 4, both inclusive.

By order of the Board,

J. L. CHAPMAN,

Secretary.

Gas Office, Roxeth, Harrow,

Aug. 15, 1911.

BARNET DISTRICT GAS AND WATER COMPANY.

NOTICE is Hereby Given, that the ORDINARY HALF-YEARLY GENERAL MEETING of the Proprietors of the above Company will be held at the Holborn Restaurant, 218, High Holborn, W.C., on Tuesday, the 29th day of August, 1911, at One o'clock in the Afternoon precisely, to receive the Report of the Directors and the Accounts for the Half Year ended the 30th day of June last; to declare a Dividend; and to Transact the General Business of the Company.

THE TRANSFER BOOKS WILL BE CLOSED from the 16th to the 29th of August, both inclusive.

By order of the Board,

ERNEST W. DREW,

Secretary.

Offices: 6 & 7, Queen Street,
Cheapside, London, Aug. 4, 1911.

THE Owners of British Patents Nos. 20,643, of 1906, entitled "IMPROVEMENTS IN AND CONNECTED WITH HIGH PRESSURE AND OTHER BUNSEN BURNERS," and 21,158, of 1906, entitled "IMPROVEMENTS IN BUNSEN BURNERS FOR ILLUMINATING AND HEATING PURPOSES" are desirous of Disposing of the Patents or entering into a Working Arrangement under LICENSE with Firms likely to be interested in the same. In the alternative, the Owners would be open to consider Proposals to Manufacture the Inventions to fill any Requirements of the market in Great Britain on Terms to be arranged.

The Patents cover Inventions interesting to Gas-Burner Makers, especially those suitable for High Pressure Gas for heating purposes.

Detailed information as to the Inventions will be found in the Patent Specifications, of which Copies will be supplied to any interested party on request.

Full Particulars can be obtained from, and offers made (for transmission to the owners) to, MARKS AND CLERK, 57 and 58, Lincoln's Inn Fields, LONDON, W.C.

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MESSRS. A. & W. RICHARDS beg to notify that their SALES BY AUCTION OF NEW CAPITAL ISSUED UNDER PARLIAMENTARY POWERS, and of STOCKS and SHARES belonging to EXECUTORS and other PRIVATE OWNERS in LONDON, SUBURBAN, and PROVINCIAL GAS and WATER COMPANIES, take place PERIODICALLY at the Mart, TOKENHOUSE YARD, E.C.

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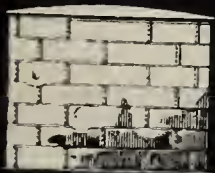
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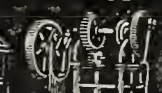
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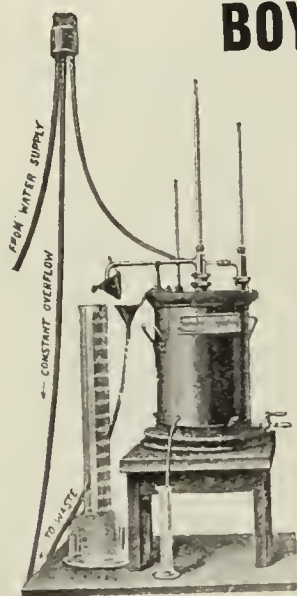
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[See Illustrated Advertisement, Aug. 8, p. 336.]



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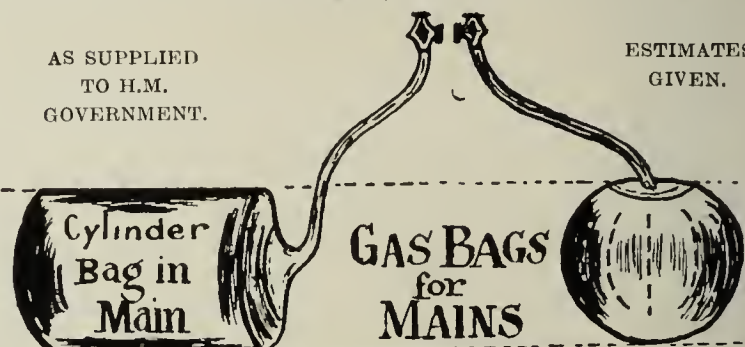
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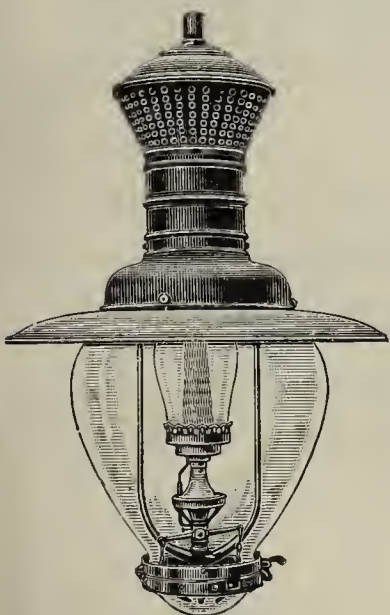
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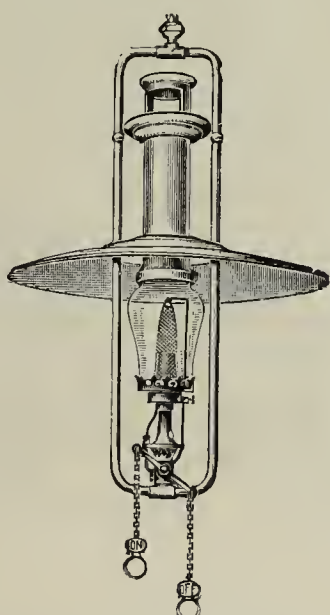
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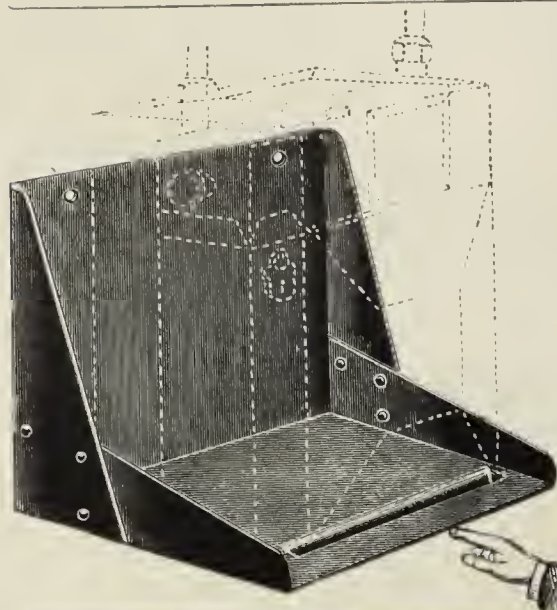
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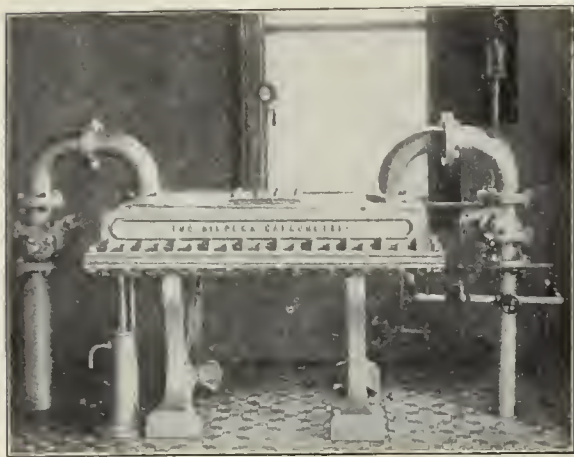
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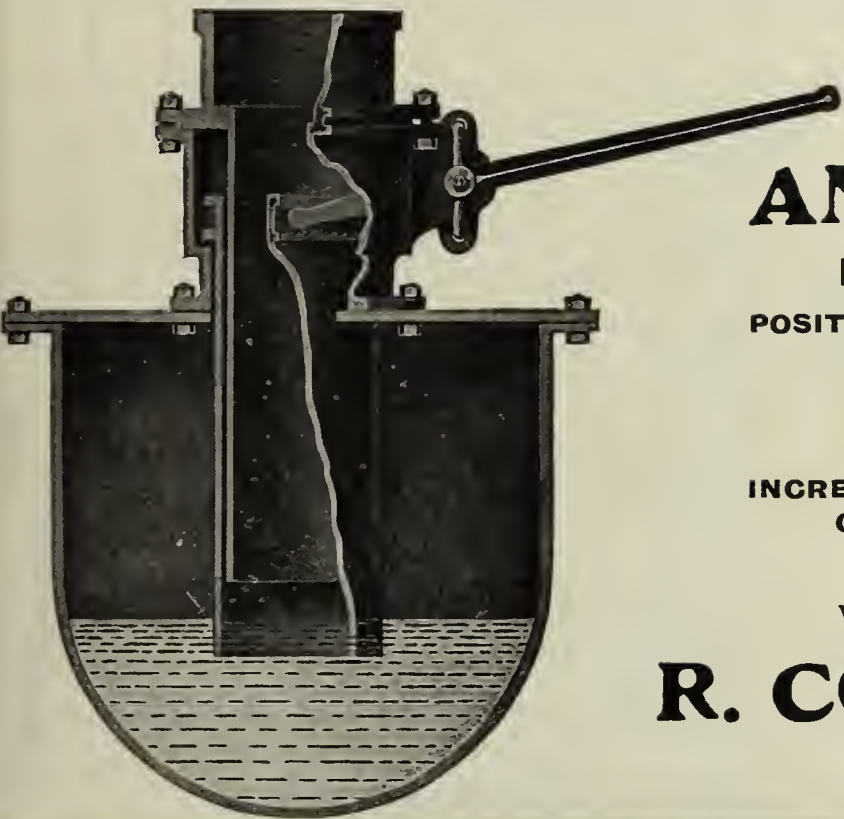
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POSITIVE IN ACTION,
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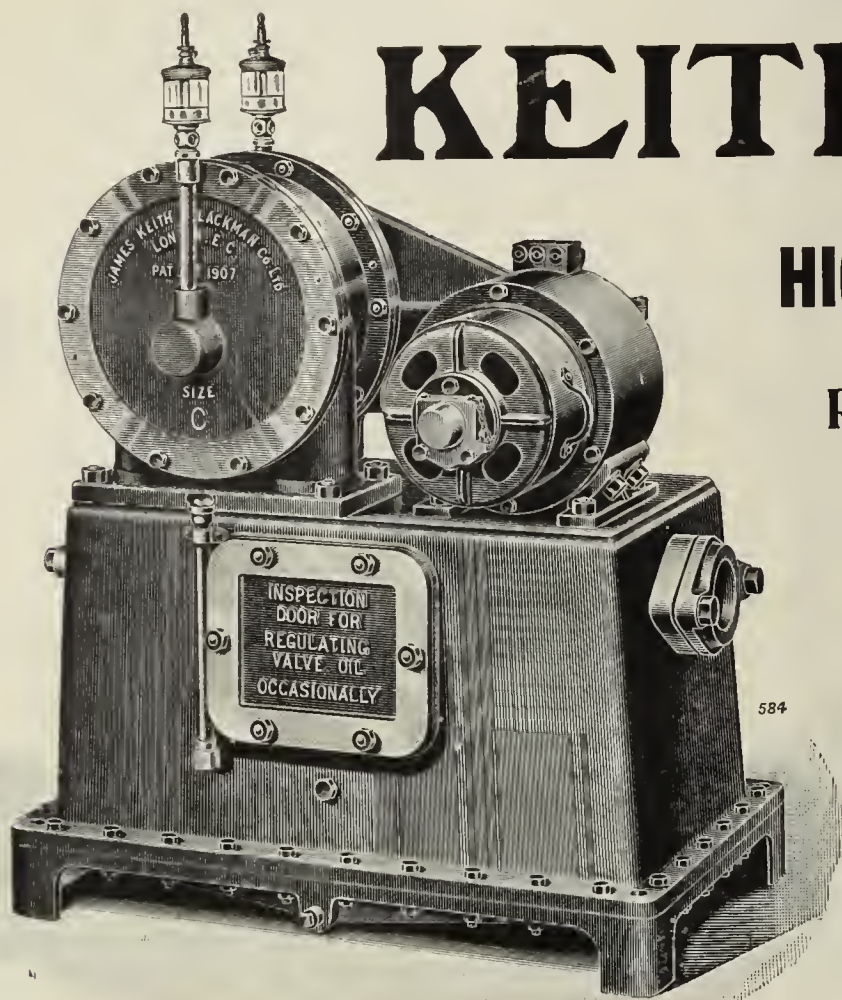
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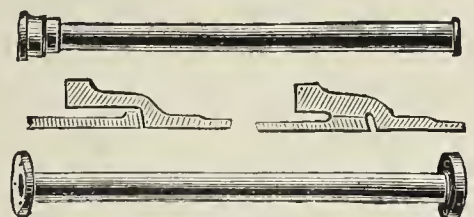
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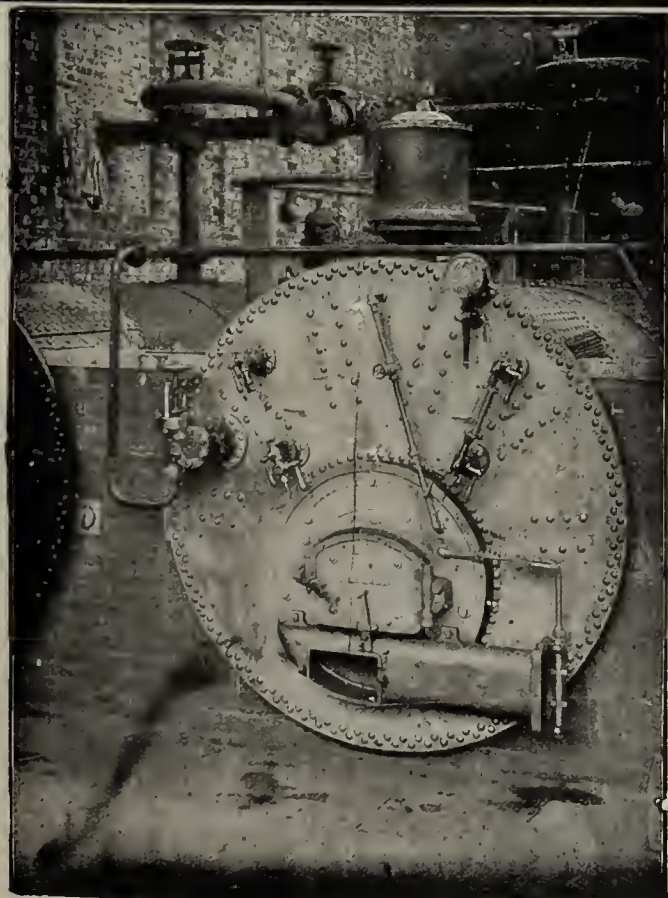
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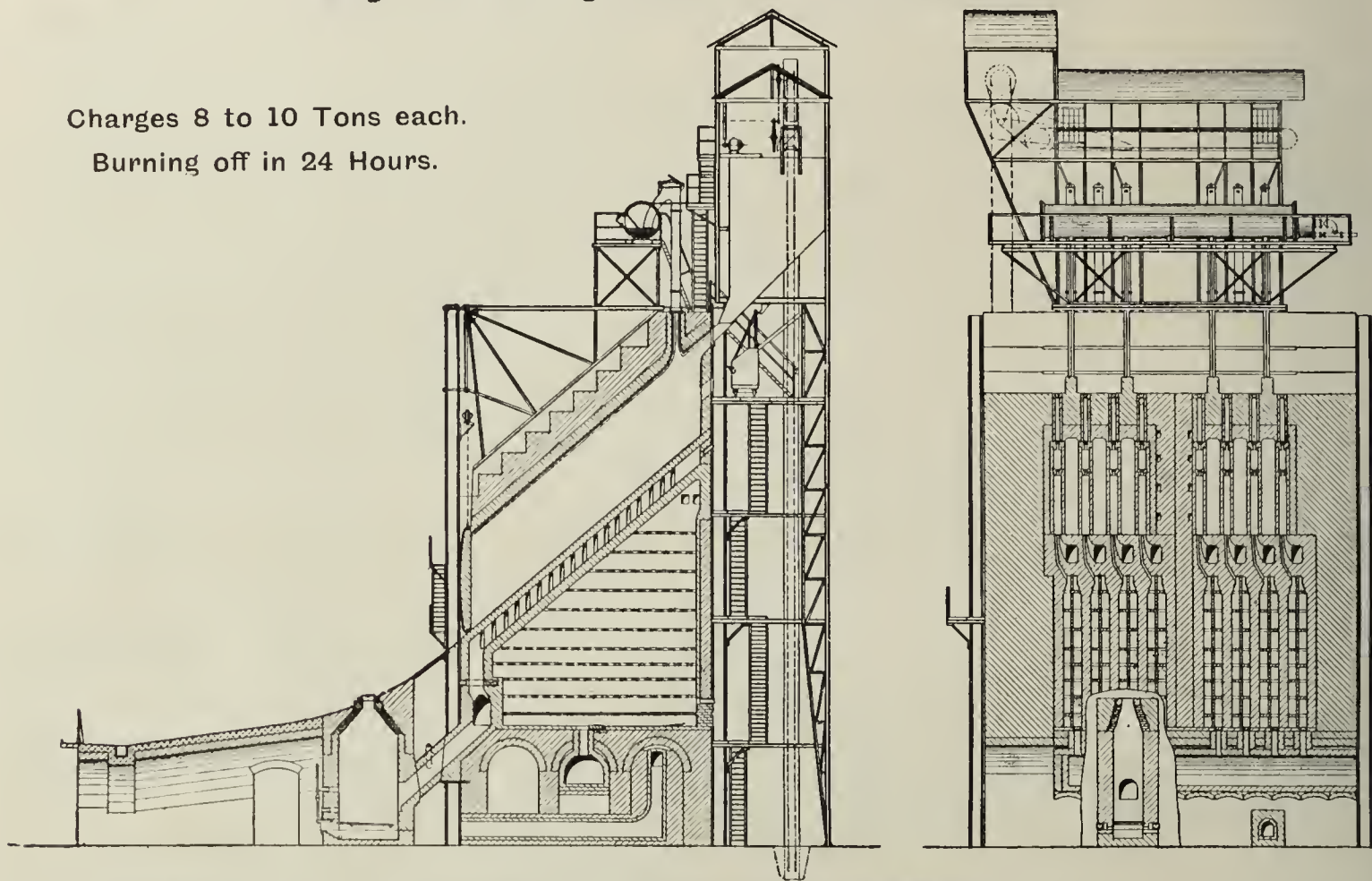
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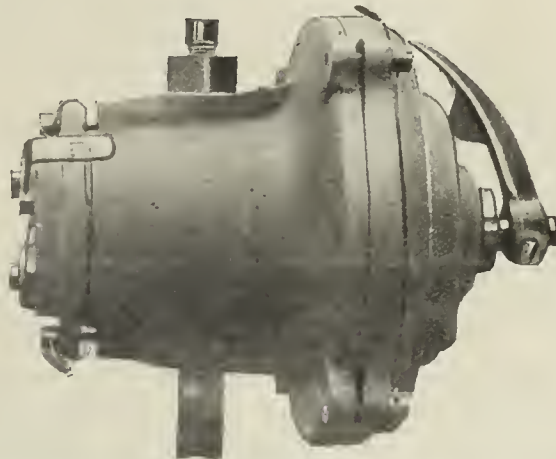
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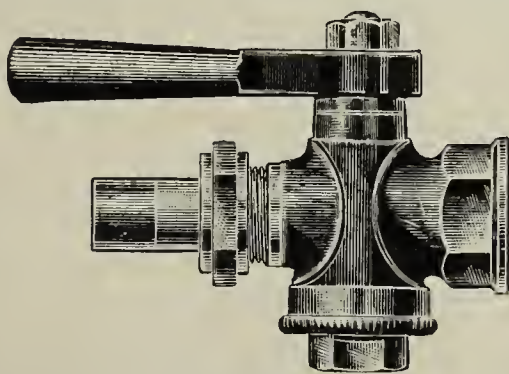


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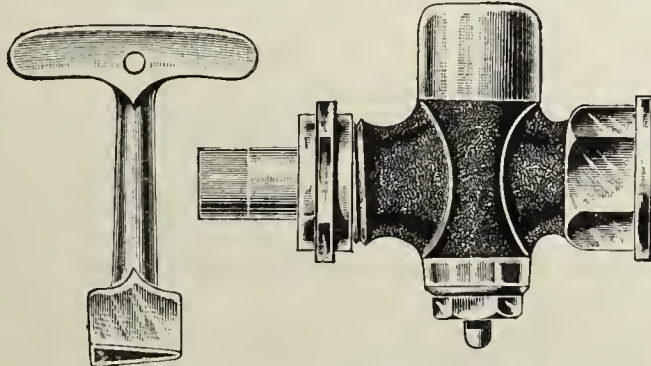
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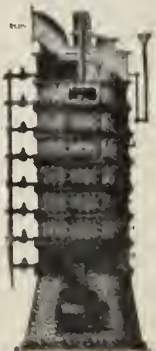


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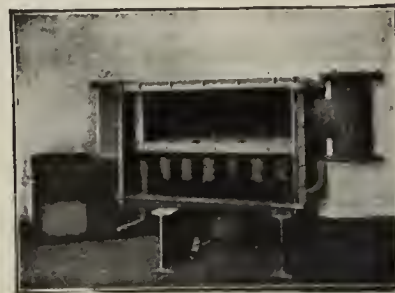
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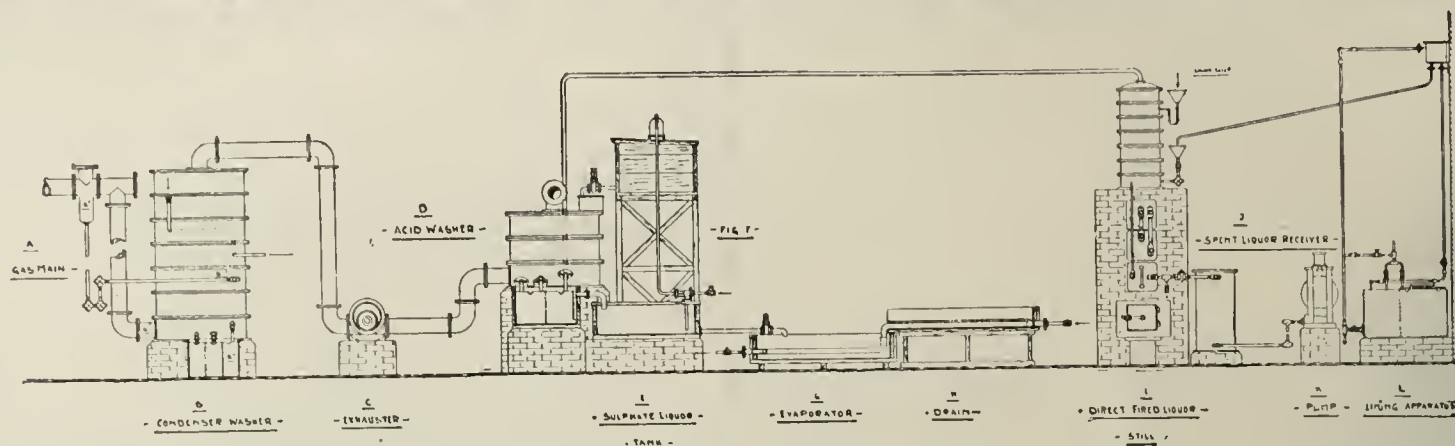
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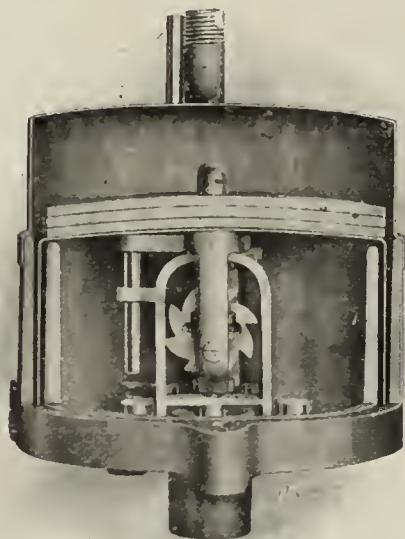
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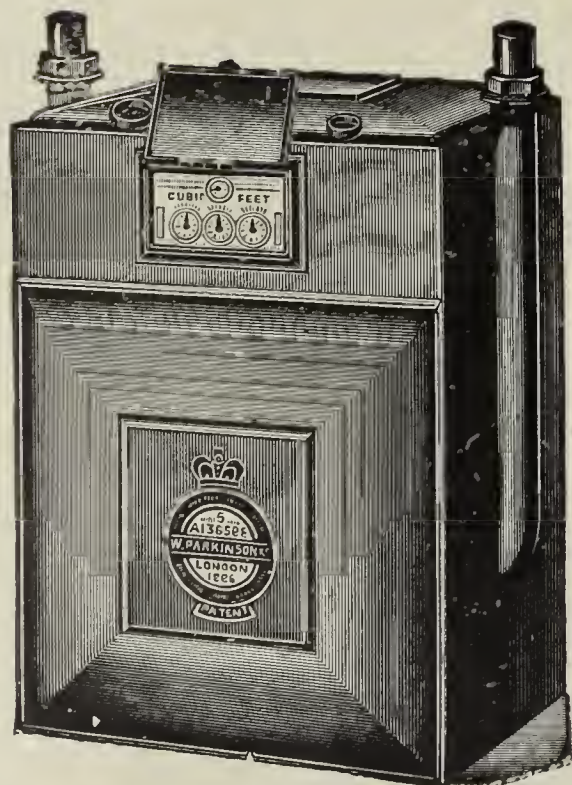
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EDITORIAL NOTES—GAS, &c.

Some Reflections on the Legislative Work of the Gas Industry.

WITH the country in a condition of turmoil politically, industrially, and commercially, Parliament temporarily suspended its business last Friday, and will assemble again to-day with the hope strongly pervading the chamber that the conditions of the country will then be such that the long-looked-for vacation may commence. But feelings among the members are not the most pleasant that the conditions of public business are such this session that it will be necessary to have recourse to an autumn sitting, which will demand their return to the benches during October. It has been a remarkable session, and it will add a sensational chapter to our legislative history. What the recent events are all leading to, it is not our business to inquire into here; but it would be idle on the part of anyone who examines these events with more than superficial interest to assert that they will germinate and ultimately flourish to the benefit of the industries of the country. While in the large matters of political importance and significance the session has been a remarkable one, the same adjective will apply to the diametrically opposite conditions that have ruled in connection with Private Bill Legislation. In this we have had a succession of several lean years; but the worst of them all is the one the end of the work of which we have about reached. Regarding the session from the standpoint supplied by a long experience of the Committee rooms, it is about the most void in feature that there has been within memory; and, from the point of view of those whose talents are devoted to parliamentary work of this kind, there is no desire to see its repetition. It has been weak, practically empty, and colourless; and an inspection of the prospects does not engender any great hopefulness for a sensible amount of improvement in the more immediate future.

That is speaking generally; and if we look particularly to the gas industry, there is not much in view to encourage the expectation of a spurt in business, and of the contentious kind. This is merely a reflection of current circumstances. Though business is extending, though the opportunities for business are rapidly expanding, though on every side are seen possible openings for new and remunerative business, at the present time the conditions are such that no large supplement of productive plant is required, nor the addition of area to the works' ground. The economies of the incandescent burner, which are greater to-day than they have ever been through the inverted burner, have put gas in hand for other business. The growth of the business by the spreading of the demand over a greater number of the hours of the day—both in winter and summer—has yielded its several economies. The increased yield of gas per ton of coal has curtailed the necessity for works extensions to meet new business; and the fact that newer forms of carbonizing plant take up for a given productive capacity much less space than the old plant, will render unnecessary for a time in many places any imperative seeking for new statutory powers over land for manufacturing purposes. The replacing of inefficiency by efficiency out of revenue also enables the husbanding of capital. So that current conditions appear temporarily non-contributive in assisting to the promotion of greater activity in parliamentary applications in connection with those matters that are most provocative of local opposition, and therefore of contest in Parliament. There are, however, modern powers in association with the gas industry the possession of which lends a hand in well-doing for both consumers and concern that, being accepted and approved by Parliament, can be secured without much trouble and expense, as this session shows—for example, the procuring of the right to use the "Metropolitan" No. 2 burner, and the reduction of useless

illuminating power standards of gas, and some not only useless, but, by their excess, absolutely invalidating the interests of the consumers in realizing the best possible from the gas appliances at command. Therefore, while there is this settling down by the gas industry on the foundations provided by the modern conditions of gas manufacture and supply, we may be confident of seeing its effect upon parliamentary business.

But there is necessity for warning. Provision in the matter of legislative power should have an eye not only to the present, but to the future. If there had been (we are conscious of the ease with which one can talk with experience in these matters spread before him, or, to use a colloquialism, "after the event") greater prevision in matters legislative in the past, there would have been less combative work in the Committee Rooms in past sessions than there has been. The oversights of one period produce future loss to some and benefits to others; and the remedy is often harder to secure than would have been the right thing in the original instance. We see this more especially in respect of territorial matters connected with works and in association with areas of supply. While the ruling powers of gas undertakings are resting thankful that modern conditions have tended to increase the capacity of their works for larger business, that modern conditions have tended to consolidate and enlarge the business by the growing day applications of gas, and that they have opened up hitherto dormant means to fresh economies, it would be as well to look round and ascertain where this is all leading to. Business, except in the "Sleepy Hollows" of the country, where local development is quiescent or very slow, must develop. With this condition obtaining, certain it is that there must be limits, with all the advantages of the present, to many works' sites being sufficient for the future; and year by year in many places, land in juxtaposition to gas-works will be more difficult and more expensive to secure. There is yet another land question—affecting the territory in which the business is carried on. Within many a supply area, there is plenty of work to be done in developing business on modern lines; but there again every existing supply area has its limits. The outlook to be taken in this regard must be a wide one. There comes in the question of the supply of the out-districts. Electrical suppliers—electric power companies, for instance—are looking out for these rural areas; but modern development has put into the hands of gas suppliers the means of embracing in their areas such districts upon the most economical terms. High-pressure transmission of the lower illuminating quality of gas now supplied can be carried out more profitably than when larger pipe-lines had to be laid and gasholders constructed with the view of affording protection and compensation between the periods of high and low demand. These outer districts want bringing in as quickly as possible. The prospect, as well as an immediate 10 per cent. return on the capital, has to be examined. The first arrival there, whether it be gas or electricity, will be the one to get the larger hold of the cream of the business. The great difficulty of one concern following another in establishing itself is known best to those who have tried it. It often means many dreary years of hard and non-dividend or non-interest paying work. The modern conditions of gas supply mean much for the time ahead; and preparation has to be made. Then legislate betimes for the morrow.

One other point crosses the mind. Two salient and important matters there are upon which it may be taken Parliament has at length made up its mind in connection with the gas industry, though it took a vast amount of power to drive the facts home. The first one is that the conditions of the industry in the matter of the uses to which gas is put are not what they were, and that consequently, the legislation applying to other days and circumstances will not apply with the same inflexibility that was then considered correct. Secondly, that the gas industry has now to go out for business and meet competition even after the manner of all commerce that is not subject to statutory control or territorial limitations. Parliamentary

authorities now recognize this; but we doubt whether they have assembled these competitive conditions and set them in orderly array for inspection, so as to be fully cognizant of their active existence and power. In lighting, the gas industry has as competitors electricity and a larger supply of oil than in former days. The incandescent burner having rendered almost *nil* in value the luminosity of gas-flames, has opened up large opportunities for development in cooking and heating generally—both domestic and industrial; but there again solid fuels and electricity are active competitors, and try to bar the way. The development of the gas industry, technically and commercially, is bringing down the price of gas all round; and the cheaper gas can be sold the stronger its stand among other agents for motive power purposes. Here steam, electricity, suction or pressure gas plants, producer gas plants, and oil engines are in competition with town gas. All the competitors, with the single exception of electricity, are without any statutory control; and in the case of electricity, the purveyors of the energy have no statutory restriction as to the price at which they offer it for this purpose, even though the price be lower than the average generating cost per unit, without considering capital and other charges. The parliamentary authorities will see from this that the gas industry requires as much reasonable freedom as possible, and not to be manacled in their work of meeting the competition and of rendering the utmost service, in the most economical way, to the community. In the case of gas companies, there are the safeguards furnished by the sliding-scale. We perceive the growth among the parliamentary authorities of a proper recognition of all this; and the quicker it is fully appreciated by them, the better for the body-politic and for the industry. And any man who steps in and advises the parliamentary authorities to the contrary, any man who attempts to curtail by any means the maximum liberty that Parliament will allow, is an enemy to the gas industry.

The Revolt of the Railway Workers.

EVENTS march quickly in these days. The one topic for the country last week was the great revolution of railway labour against authority, contract, and honour, and the consequent plunging of the whole country into a state of chaos, general inconvenience, and incalculable loss. The beginning of this week finds the men, with the exception of a few thousand at Manchester, Newcastle, and Hull, back again at work, and the railway services for the most part proceeding as though there had been no attempt to bring about their general stoppage last week. The settlement that effected this sudden metamorphosis is due to the unflagging determination of the Government to bring into existence understanding and machinery whereby the differences between the parties to the dispute could be hereafter composed; and the news of the success of the negotiations came, at the end of the week, as a refreshing draught to the country at large.

There is no necessity to go into the details of the whole story here. They have been told in their every phase with a fulness in the ordinary channels of intelligence that have made the entire matter common knowledge throughout the land. The Railway Companies, it is generally acknowledged, did right in standing firm; while the railway men, it is commonly agreed, violated all the canons of propriety and fair dealing as between master and man, in view of the agreement and settlement of 1907. There is not a shred of justification for the action of the men; and the settlement actually arrived at emphasizes this, inasmuch as, at its very foundation, is the offer made by the Government, and accepted by the Companies before the men left work, to have a special inquiry into the grounds of the grievances of the latter. At the bottom of all the trouble are the revolt of the Unions against the principles of conciliation and arbitration, and the refusal of the Railway Companies to recognize the officials of the men's Unions. While we all hope for the best, these facts raise gloomy doubts as to perpetual peace being established, as the result of the inquiry, and the endeavour to produce satisfaction among all ranks of the men. What has happened proves again that conciliation schemes such as the one that has been in existence since 1907 in connection with the greater number of the railway systems of the country, are ineffectual modes of maintaining industrial peace. It was asserted by Sir George Livesey several years since that all such machinery for settling labour troubles was defective and inadequate, and could have no lasting effect. Events have since proved the truth of the assertion and

prediction. But vivid as was Sir George's imagination, keen as was his penetrative powers, he could hardly have expected that his words would have been sealed and endorsed in such a calamitous, and, we will add, discreditable and despotic, manner as was the case last week. The late leader of the gas industry was convinced that "the only way" to effect a lasting peace in the labour world was to radically change the conditions of the worker; and this he did in a manner that makes it impossible for London to suffer the terrors and the inconveniences of any deprivation of its gas supply. In short, co-partnership is a public benefactor of inestimable value.

The other sides of this revolution of the railway workers in which the gas industry is concerned are found among the gigantic effects that would have followed any lengthened continuance of the strike. Some of the railways for hours each day towards the end of last week appeared to be practically derelict; no signs of life whatever were to be found upon them in many districts for considerable spaces of time. The great interruption of the means of transport would have had, had the strike continued, grave effects upon coal stocks at those gas-works depending upon the railways for supplies, as well as upon the fulfilment of contracts for secondary products. A further effect is to be found in the paralyzation of trade and manufacture; and in the evil consequences of this, the gas industry would certainly have had to share.

In the settlement, there is one point that has an ominous ring about it for those who have large traffic dealings with the companies; and that is that it has been arranged by the latter (and who can blame them?) that any increased charge for labour that may be, in the result, imposed upon them shall be met by an increase of charges. "The Government" have given an assurance to the railway companies that "they will propose to Parliament next session legislation providing that an increase in the cost of labour due to the improvement of conditions of the staff would be a valid justification for a reasonable general increase of charges within the legal maxima, if challenged, under the Act of 1894." From this it may be deduced that whatever costs are involved as the result of the settlement will later on find their way to the shoulders of the public. But the public will be content to have had, at any reasonable price, order restored where chaos, rapine (in places), and the sharpest of animosities reigned during the end days of the past week.

Gas-Workers and Labour Unrest.

THE gas industry would have been fortunate indeed if, in the general upheaval of labour, all gas undertakings had escaped. The thought was, however, encouraged that they would, considering that employment in the gas industry stands in good repute among the workers of the country on account of the excellent wages, the permanence of employment for most of the men, and the general conditions and benefits that surround the employment. But it was not to be in the case of certain important undertakings, though now we indulge the hope that reasonableness will prevail, and that these concerns will escape from being plunged into a vortex of difficulty with their men. The gas undertakings principally involved are Manchester and Salford and Sheffield. But the case of Manchester and Salford is totally different from that at Sheffield. This is not the time to say anything that will aggravate relationships, or in any way increase tension. But we do think the Trade Unions concerned at Manchester and Salford have taken a very high-handed proceeding in giving (according to newspaper reports) notice that unionists in the employ of the Corporations will not, after the 31st inst., continue to work with non-unionists. There can only be one meaning attached to this notice—that the non-unionists must either join the Unions, or, in the alternative, out they must go, or out will go the unionists. In other words, the Unions have decided that they, and not the Corporations, are to be masters in this matter of employment.

If we understand the position correctly, the Municipal Employees' Association is the organization from which this particular storm-cloud has sprung; and Mr. J. T. Jones, the Secretary (as reported in our columns last week), has been speaking very plainly as to the intentions of this body. "We have determined that every worker of the Manchester and Salford Corporations shall stand on the same line." This is pretty strong. "We have determined." The employee has turned dictator! It would be most interesting to

know who gave this particular organization the right to dictate to the citizens of Manchester and the burgesses of Salford who they shall, and who they shall not, employ; and who gave them the right to say that the man who is a non-unionist is not to have a place in employment under either Corporation. Things are coming to a pretty pass when unionists arrogate to themselves such rights, and attempt to intimidate such powerful local governing bodies as the Manchester City Council and the Salford Town Council. And where this is happening is in Free Trade Manchester. Free trade in commodities of all kinds, but not free trade in labour! Unionism rules otherwise. Unionism is therefore unreasonable. With a vast mount of interest, the gas industry will wait to learn whether or not the matter will be allowed to fizzle out, or whether, if carried further, the Manchester and Salford Corporations—representatives of a composite body of ratepayers and of opinions—will submit to the ruling and dictation of the unionists, or will refuse to condemn to unemployment any non-unionist servants at the behest of the Unions. The resolution of the unionists is sheer tyranny; and there are hints as to enforcing demands. Bearing on this, Trade Unionists have adopted a revised creed; and the Unions concerned in this matter have subscribed to it. They do not believe in arbitration; they do not believe now in striking in small sections; but they do believe, in order to make a clean job of a conflict, in the potency of numbers. That is the position at Manchester and Salford. The development of affairs will be awaited with interest.

The position is altogether different at Sheffield. The men there are claiming, according to the newspaper reports, that they (labourers excepted) ought to have an increase of 2s. a week in wages, and that the time has come for certain grievances to be redressed. Beyond this bare announcement, we will not go at present; seeing that, at the time of the publication, the Gas Company had not received any notice of the intention of the men to demand an increase in their wages. As a matter of fact, the Sheffield gas-workers are among the best paid outside London; so we cannot see what case the men can put forward in support of an increase. It can only be imagined that the state of general unrest which has arisen in the locality at the present time has prompted the Union leaders to endeavour to raise a spirit of discontent among the Company's men. Whatever the claims may be, whatever the fancied grievances, the men know that upon Mr. Hanbury Thomas, the Managing-Director, and the Engineer (Mr. J. W. Morrison) they can rely for giving to the matter thorough and earnest consideration, and that the Board of Directors will treat it in the same spirit. We hope for the best at Manchester, Salford, and Sheffield; and that, in the former places, the unionist gas-workers will not be so foolish as to plunge into a senseless struggle because some of their fellow workers claim the liberty of being non-unionists, just as the unionists claim the liberty of being members of their respective organizations.

From other quarters, too, came last week the intelligence of the infection of the hour spreading into, and causing a little ruffling of the surface of affairs at, other gas-works—a comparatively few of the men apparently regarding the occasion as a fair one for trying to incite to a request for more money. The Gas Workers' Union are taking hold of the opportunity, as will be seen by a communication in our news columns, for attempting to get the gas workers at Beckton again into the fold. And this is at the bottom of the paragraphs that have recently appeared in certain newspapers suggesting discontent at Beckton. But the fact that the Union have lost their hold upon the men speaks volumes; and the good sense of the men themselves in appreciating their new conditions, is quite sufficient to preserve good-feeling between them and their employers, notwithstanding that among them there may be a few who are susceptible to unionist intrigue, design, and blandishment. The City of Liverpool have been having, as the whole country knows, most unhappy experiences through the attempt of mob law to gain the mastery over all other rights. In such an atmosphere, all sorts of ominous reports were bound to obtain currency. One report was true, that the men at the electricity station left work. In consequence, the tramway system was stopped, the lighting of between six and seven miles of streets out of 460 odd miles was for a time affected; those theatres, music halls, and hotels which had not retained their gas supply, had to close; and private consumers in similar predicament had to find solace in oil-lamps and candles. The loss of their power supply also caused several manufacturers to close-down.

Some of the newspapers, quite in conformity with the spirit of the times, spoke of Liverpool being "in darkness"—a condition which, if true, would have brought in its train, in the fever and delirium of the hour, unspeakable horrors. Fortunately, between worse horrors than already obtained and the citizens stood the Gas Company. Following this, rumours were soon afloat as to a possible insurrection of the gas-workers; but we are glad to learn there is no truth whatever in the report, and that the men are perfectly loyal and trustworthy. Paris on two or three occasions has been shown how electricity supply can be made one of the sharp weapons employed in the enforcing of demands at the time of a strike; and Liverpool has again illustrated how readily it can be brought to subserve the rabble with hands raised against law and order. Gas supply is inherently in a stronger position; and, moreover, those employed in gas-works come under the Conspiracy and Protection of Property Act, 1875.

Gas Workers and National Insurance.

THE case of the gas workers, as represented by those companies who have sick funds that demand less contribution from men and employers, and confer greater material benefits than are proposed by the National Insurance Bill, has been mentioned in Parliament. The matter was raised by Sir Henry Kimber, Bart., the representative of the Wandsworth Division of London; and he took, as was seen by the report that appeared in our "Parliamentary Intelligence" last week, the position of the South Metropolitan Gas Company as an illustration. The reply of the Chancellor of the Exchequer is the interesting part of the report; but we are not altogether satisfied by it. If the Bill itself is so obscure that we have all been misinterpreting it, then it may be that we are misunderstanding what appears to be the meaning of the reply of Mr. Lloyd George to Sir Henry, that, under the national scheme, the men who are actually receiving more under their existing funds than is suggested under the Bill will be still better off when the national scheme commences working. In order that there may be no subsequent error, we shall be glad to see this condition of affairs made certain by express and plain terms in the measure itself. To this there can be no objection, seeing that the Chancellor has made the pronouncement. These are his words:

As every penny contributed by employers and workmen under the National Health Insurance will be applied exclusively for the benefit of the workmen under their own administration, it follows that they cannot lose through being brought under the Bill; and since they will have the State grant in addition to their own contributions, it further follows that they must gain. If they can so manage the fund as to provide larger benefits than the minimum indicated in the Bill, they will be in a position to enjoy those larger benefits. I am not prepared to penalize all the best-managed provident funds by withdrawing State aid from them.

No gas worker will want to deprive himself of benefits equal to those, or superior to those, secured by other classes of workers; but every gas worker will be pleased to be shown where there has been misinterpretation of the Bill, and have proper assurance that, after the Bill becomes law, the position will be that pictured by the Chancellor.

The magnanimous and philanthropic spirit underlying the final sentence of his answer: "I am not prepared to penalize 'all the best-managed provident funds by withdrawing 'State aid from them,'" indicates that Mr. Lloyd George desires to be regarded as a protector of those who are asking for exemption. This being so, why are "exceptions" made in the case of "Crown or any local or other public authority" where the Insurance Commissioners certify that the terms "of the employment are such as to secure provision in "respect of sickness and disablement on the whole not less "favourable than the corresponding benefits conferred by "Part I of the Act?" Surely, the Chancellor is not prepared to penalize the employees under the Crown and any local or public body whose present funds comply with the cited condition by "withdrawing State aid from them" through permitting "exception." There is something that is a little mysterious between the terms of the Bill and the Chancellor's answer. One other point occurs to us. As the gas workers who have raised this matter are well satisfied with their present funds, and as the Chancellor cannot bring himself to withhold State aid from them, he might consider the question as to exemption in respect of the prescribed amount of the contribution on the part of the employers and employed where the benefits under existing funds are superior to those proposed by the Act. In this way, the present benefits could be secured, and through the amount received

by way of State aid, the present contributions of both men and employers could be reduced. Many employers and employed would be very thankful for such assistance. We marvel at the Chancellor not having thought of this before; but we freely make him a present of the idea. At the same time, it may be suggested that he might do worse than inquire how it is that these large gas companies can give, under their voluntary schemes, greater benefits at less expense than the State with all its machinery and resources. Perhaps the machinery and the resources have something to do with the difference.

The Persistent Tale.

The same tale runs all round regarding the past half-year's prosperity of gas undertakings. The Croydon Gas Company, representing one of the remoter Suburban gas concerns, have registered an advance in consumption of 8.36 per cent. The Chairman (Mr. Charles Hussey, J.P.), it will be seen from the proceedings at the meeting of proprietors last Friday, gives a large amount of credit for this good result to the day business; for the growth of consumption is out of all proportion to the increment of new consumers. Additional connections and fresh uses among old consumers have a large part in the present gas boom; and the result during the hot weather has been that at Croydon there has been a substantial improvement in the daily output. The common tale runs in other directions. Greater makes per ton, increased receipts from residuals, lower net cost of coal—all contributing to solidity and an excellent financial issue. The Company, though in the midst of keen competition, never stood stronger than to-day in all the attributes that are essential to offering effective attack and resistance in the commercial campaign. Within twelve months, they have been able to give the consumers three reductions in price, the proprietors are on this occasion receiving an increased dividend at the rate of $\frac{1}{2}$ per cent. per annum; and the employee co-partners are enlarging their interest in the Company as fast as possible, by adding savings to bonuses for investment. Not only are cookers and gas-fires increasing rapidly, but the high-pressure system of shop lighting is greatly gaining in favour among the tradesmen in the main shopping area; and the Directors are confidently looking to a considerable expansion of this system. Mr. Hussey had some philosophic remarks to offer on the use of tar for road purposes. The Company have made a small advance in the price of tar; but they are not prepared to prejudice a young application, and a growing and profitable trade, by holding out for the last farthing per gallon. All this means that the Board have a good adviser in their Engineer and General Manager (Mr. James W. Helps), and that the numerous activities of the undertaking are conducted with vigour and intelligence by the right men in the right places as heads of the various departments.

A Public Lighting Contract at Northallerton.

The Northallerton District Council cannot be complimented on their business methods or their courtesy. The question of a new public lighting contract has been under consideration; and in this matter (though most of the councillors use gas in their homes) the Gas Company have been treated with scant courtesy and in an unbusiness-like fashion. The streets at the present time are lighted electrically. Invitations were sent to both the Gas Company and the Electricity Company to tender for a new contract, but the specification was of a kind that, considering what would have to be done by the Gas Company, did not give them much latitude in making a competitive offer. The Council required that tenders should be for the lighting of the whole town, and also for partial lighting, reserving to themselves the right to accept a tender for part of the town or the whole as they determined. What is more, the Council asked for tenders for only two years. This did not give much chance to a Company who, if successful, would have had to convert the street lamps back to gas-lighting. But though the contract period as defined in the invitation to tender was only two years, on the casting-vote of the Chairman a contract for five years was granted to the Electric Company. This was also unfair. Beyond this, the Gas Company made two suggestions to the Council: (1) That lower illuminating power lamps than 800 candles set closer together would be preferable for the main streets; and (2) that the Council should allocate portions of the

town to both competitors for a demonstration of effect and cost. The officers of the Gas Company (Mr. T. Harrison, the Secretary, and Mr. B. Calvert, the Manager) would, we are sure, have given a good account of modern gas lighting. We should not, however, like the Council to think gas lighting incapable of going to the higher powers, if suitable. There are gas-lamps, inverted and otherwise, of all sorts of powers, ranging between 90 and 4500 candles, in the streets of London to-day. But Northallerton is not London; and it would be wasteful and uneconomical for Northallerton to do what is being done in London. The suggestions of the Gas Company were ignored by the Council, as, it appears, have been tenders from them on former occasions. Under the circumstances, the Council cannot be congratulated on their courtesy, fairness, or business methods in this matter. Nor do we think the best interests of the ratepayers have been studied.

Road Board and Road Surfaces.

There are some people who expect great things to be accomplished quickly, and innovations to settle down immediately to a condition that suggests long establishment. Such people may expect, but they will rarely realize. Everything must have time to develop itself, and to take its proper place in the world's organism and equipment. This applies even to the Road Improvement Board, over whose work in the short span of their existence complaint has already arisen. The complaint has found its way into Parliament; and the grievances have been aired there. There seems to be a large amount of dissatisfaction without much cause. The initial work of the Board has been to consider applications for grants for urgent road improvement; and with a revenue of about 1 million to deal with, applications were made for grants to the total of $7\frac{1}{2}$ millions. Result, dissatisfaction in many parts of the country. Then motorists are not altogether pleased with the way some of the money is being expended. The first work they consider should be effectively taken in hand is the improvement of the road surfaces, and not such improvements as the easing of sharp corners and so forth. When motorists originally agreed to the tax that furnishes the funds, they were actuated by a desire to wipe away the feelings of indignation and resentment caused by the clouds of dust created by their ears. This undoubtedly is the direction in which the money should be first expended—in making the highways such that cars can be used without creating nuisance. As Mr. Hobhouse indicated, when the matter was before the House of Commons, what is generally first wanted is the improvement of the crusts of existing roads; other work, such as new roads and making straight any crooked but much-patronized ways, should come afterwards. The original trouble that gave birth to the Road Board is what has to be first encountered and dealt with.

A Good Surface an Essential Condition.

Another complaint came from those who consider that the fish in the streams of the country require protection as well as human beings. We agree; but we place the claims of the latter before the former. It is alleged—the evidence is not very widespread or striking—that fish are being poisoned by the washings of tarred roads. This is a matter that is susceptible of remedy in the neighbourhood of streams by the use of tar complying with one of the specifications of the Board's advisers. It has come to this that (as pointed out in the House by Sir C. Rose, one of the members of the Board) the question of binding the surfaces of roads has got beyond the experimental stage. Now it is a necessity that has grown with the modern means of locomotion. It is essential for the protection of the community; and highway authorities are agreed that the more they can keep road surfaces united by the employment of a binding substance such as tar, the less liable are the roads to wear and break-up. Therefore what is being done is an economy in road maintenance. It is all too early yet to criticize the Road Board. The time to adversely do this will be after they have had sufficient opportunity to get into proper running order, and when, if ever, they show incompetence under the settled conditions. At the moment, we are prepared to say that the Board are working quite up to most people's expectations; and what is important is that tar has been selling well for road purposes, at very decent prices. This year, and its dust lessons, should assist in the principal primary work of the Board—that of hastening forward with all speed the improvement of the surfaces of roads.

GAS STOCK AND SHARE MARKET.

(For Stock and Share List, see p. 499.)

IN such a general upheaval of social and commercial relations as disturbed the whole country last week, it was only to be expected that business on the Stock Exchange should suffer. Very great depression prevailed in most markets, though Consols fortunately met with some support from influential quarters. Railways were naturally in a very bad way. Added to our home troubles, Americans had a severe set-back. To cap all, the settlement of a long nineteen-day account had to be faced—an insuperable task for some, which resulted in four or five failures. The disastrous week closed on Friday; the Exchange being shut on Saturday. The opening day was heavy and depressed, with little found anywhere that was calculated to mitigate the gloom. Government issues were weak, and Consols fell $\frac{1}{16}$. Rails were, of course, the worst, in view of the aggressive attitude of those who figured as the strike leaders. Americans showed fresh weakness. On Tuesday, the strike news received up till closing time being more favourable, a better feeling prevailed. Consols sprang up $\frac{5}{16}$; and Rails made a nice improvement. But on Wednesday morning, the outlook was quite bad again; and down went prices, although not very seriously. Thursday opened in somewhat hopeful mood, but business kept very quiet. Gilt-edged things were steady, and Rails were rather stronger; the critical situation not being known at the closing hour. Friday was very heavy and dull. There was little disposition to deal at all with public affairs in such a state; and the usual move to realize tended to help to depress markets. In the Money Market, the tendency was stronger; rates both for short loans and for discount ruling firm. Business in the Gas Market was on a very fair scale, considering the holiday season and the short week, and the market was very strong. A large number of issues varied their quotations either on advanced values or on *ex div.* adjustments; and, with one exception (influenced by special circumstances), all changes were in the upward direction. In Gaslight and Coke issues, the ordinary was in good request. Transactions *cum div.* ranged from 108 $\frac{1}{2}$ to 108 $\frac{3}{4}$, and *ex div.* from 106 to 106 $\frac{3}{4}$ —equivalent to an advance of $\frac{3}{8}$. The secured issues were quiet; the maximum marking 84 $\frac{1}{2}$ *ex div.*, and the preference 102 $\frac{3}{8}$ *ex div.* South Metropolitan was very quiet, and changed hands at 119 $\frac{1}{4}$ free and 120 *cum div.* and 117 $\frac{3}{8}$ *ex div.*—a rise of $\frac{1}{4}$. In Commercial, only the 3 $\frac{1}{2}$ per cent. was dealt in, marking 108 $\frac{1}{2}$ and 109 *cum div.* and 106 $\frac{3}{4}$ *ex div.* Among the Suburban and Provincial group, British was done at 45 and 45 $\frac{3}{16}$, and no other was dealt in. But a large number rose in price, including Bournemouth, Brentford, Chester, Newcastle, Sheffield, Tottenham, Tynemouth, and Wandsworth. In the Continental companies there was little business done. Imperial marked from 181 to 182, European from 191 $\frac{1}{16}$ to 19 $\frac{1}{2}$, and Union preference 136 $\frac{3}{4}$. Among the undertakings of the remoter world, business was confined to South American adventures. Primitiva realized 71 $\frac{7}{16}$ and 73 $\frac{1}{4}$, ditto preference from 51 to 55 $\frac{3}{8}$, San Paulo 21 $\frac{1}{4}$ and 21 $\frac{1}{8}$, and ditto preference 12 $\frac{1}{8}$ and 12 $\frac{3}{8}$.

ELECTRICITY SUPPLY MEMORANDA.

Pigmy Efforts against a Mountain of Facts—Seabrook on the Wholesale Poisoning of Inmates of Dwelling-Houses and the Tainting of Food—Gas-Fires and Impure Air—The "Electrician" on the Struggles, Dread, and Extremity of the Gas Industry.

A FEW words with Mr. A. Hugh Seabrook, the Engineer and Manager of the Marylebone Electricity Supply Department. An article has appeared in the "Electrical Review" with his name at the head, and bearing the title of "The Coming Electrical Exhibition." But the article is practically from beginning to end an abusive attack on cooking by gas, and a fulsome laudation of cooking by electricity. Mr. Seabrook is one of those electricians who believes in attempting to develop business in his own particular commodity, by adopting the fulminatory process in regard to his competitors. We are not going to particularly criticize his article on this occasion; but, in view of its publication, he will not object to going a little farther, by putting us in possession of the proofs on which he founds his assertions. It is only fair that he should do so; and that he should disclose the real substance on which he relies for his ambiguous and dogmatic assertions. His colleagues and the Editors of the "Electrical Review" will, by his reply, and by the criticism it will receive, be able to judge of the strength of his case. A very few questions will suffice to put us in possession of all we desire to know, in order to follow the matter up with Mr. Seabrook. He is dealing with the gas-cooker; and he puts this question: "Are not the products of the combustion of gas—permeating as they do the whole house, and poisoning its inmates—far more harmful than a little more smoke coming from the domestic chimney?" Mr. Seabrook uses the words "poisoning the inmates." Considering the millions of gas-heating appliances that are in use in the country, what wholesale poisoning there must be going on—if he is correct! We want his evidence as to the poisoning. This is the first information that is required. Then to poison the inmates of houses, poison must exist. Given a gas-cooker properly used, what are the

"poisons" that are given off, and what are the amounts? These are the next points on which information is needed.

A little further on there is the suggestion that food cooked in a gas-oven is tainted. The exact words are: "Now what do we offer the public? A cooker which will cook as cheaply, better, and more quickly than gas, and which will not taint the food cooked or poison the air of the place where cooking is carried on." Mr. Seabrook will oblige by telling us in what manner the food is tainted. He will, of course, also kindly produce evidence as to the tainting, and give an opportunity for someone to be present to ascertain the conditions under which the tainting is produced. It is observed that Mr. Seabrook is "profoundly disgusted that arrangements have not been made for the Exhibition caterers [at Olympia] to use electricity for all their cooking during the show." This suggests that gas will be used; so that there will be plenty of opportunity to test the tainting of which Mr. Seabrook speaks. We have sat down with electricians to several dinners cooked by gas, and never a murmur from them as to gas-tainted food. Representatives—representatives in high place—of the "Electrical Review" have occasionally been among the guests. The proof of the pudding is in the eating. There has never been noticed any failure of our friends' gastronomic powers through the tainting of the food. At the last Electrical Exhibition at Olympia, the caterers used gas for their culinary operations; we heard no complaint, nor had we or any of our friends who visited the exhibition any complaint to make as to gas-tainted food. Mr. Seabrook has enjoyed many a meal cooked by gas. Apparently he has even used gas in his own house for cooking, seeing that he says: "I suppose most of us have used gas for cooking at some time or other." We have seen this gentleman on many occasions, and really he looks healthy enough, though, if we interpret his words properly, he has been stupid enough at some time or other to submit himself to the poisoning process of which he speaks. "Are not the products of combustion of gas—permeating as they do the whole house, and poisoning the inmates—far more harmful, &c." Would it not be well for electricians to stick to facts; and not adopt such foolish and crude arguments that their own palates have disproved many times, and are doing day by day. As to the cost of cooking by gas and electricity, Mr. Seabrook is a little less assertive in his remark that "we know now that electricity can equal and sometimes beat gas in cost of cooking." That is admirable; and it is certainly tame considering its source.

There is a further question; and as this is a positive statement, Mr. Seabrook will do us the favour of expatiating on it a bit, in order to explain in what way gas-fires affect the purity of the air of rooms. He says: "When we get to gas-fires for warming, the position is far worse as regards impure air in rooms." If we accept his dictum, then there is nothing at all wrong with the use of gas for cooking. It may be presumed that Mr. Seabrook has personally conducted some scientific tests with gas-fires before penning such a statement as that—tests equal in the precision of method to the scientific ones that have been conducted at the Leeds University and at Glasgow, though we cannot admit that Mr. Seabrook's capacity for carrying out such experiments is on the same level as that of the men who conducted the researches to which we refer, and whose *bona fides* we do think Mr. Seabrook will be prepared to question. However, we ask him to produce a description of the character of his tests, and the results, to set alongside those of Leeds University and Glasgow. There is one further gem in the article that must be reproduced. It is worthy of a wider circulation than has been accorded it by the "Electrical Review." Here it is: "I sometimes tell my consumers [Mr. Seabrook evidently weighs the intelligence of the person with whom he is speaking before he gives vent to this], when advocating electricity for everything, 'it is barbarous to permit a crude chemical operation, such as combustion, to be carried on in your house. Such things should be done under proper supervision and control, in properly constructed apparatus, as in an electric power house. We give you a pure and finished article, ready for immediate use, not a crude chemical product, which you have got to do a lot to before it is of any use to you. You are not a chemist; and unless you are, you cannot use gas without injury to your health and that of your family.'" We will not comment at length on this choice piece of Seabrookian philosophy. Many a gas consumer will know the proper designation to apply to the author of such nonsense; and we leave it to his friends to endeavour to digest it. But this from a single electrical engineer after the world's experience—the experience of countless people in countless homes—during a century and a decade with the combustion of gas! All the time, the poisoning process has, according to Mr. Seabrook, been actively going on. Is it not all very absurd when examined in the light of what has been done? The fact is the popularity of gas, the growth of its consumption, the increasing financial strength of the gas industry as seen by the accounts that are week by week being published, the consequent greater strength of gas in competition with electricity, are stinging our competitors to an extent that makes them more and more reckless in their statements. Gas-fires and gas-cookers are going in by their thousands year by year in the Metropolitan and other areas; and electric radiators and electric cookers are not. That is where the trouble comes in. But we will not pursue the subject, until we have definite answers to the definite questions addressed to Mr. Seabrook. In framing his answers, we hope that he will take the conditions produced by modern gas cookers and fires, and not antiquated ones. It is with the newest types that the gas industry is making such rapid progress in the cooking and heating business.

The omniscient one of the "Electrician" has again spoken. He has in times past accused us of being incapable of appreciating humour. That was an injustice. We have laughed and laughed again over an article of his, headed "Can it be Possible?" It is almost as bad as the sanguinary spectacle that the dear old "Electrical Review" once presented us with of the gas industry in its death throes in the last ditch. We are almost inclined to reproduce the "Can it be Possible?" article as a delectable tit-bit for holiday reading; but perhaps a few quotations will suffice. Here is a choice piece with which to start: "In the case of gas, the realization of the knowledge of the ultimate result of the struggle must be somewhat fateful, like the classic sword of Damocles over the heads of the contestants." The penetrative power of this remarkable writer in the "Electrician" courts our admiration. How on earth he managed to penetrate the growing prosperity of the gas industry and to discover at the back of it all a realization of "the ultimate result of the struggle," pass our comprehension. Perhaps our expression "omniscient" as applied to him is a little too strong, for we see that he is not prepared to discuss "at the moment" the "time appointed for the falling of that sword." He would confer a great boon on the stockholders of the gas industry if he would exercise his superhuman powers, and tell us approximately when the great catastrophe is to come. To proceed: "The development of the struggle between the two illuminants, particularly in the past twelve months, has witnessed a consistent advance of electricity side by side with the adoption of tactics by the gas adherents which can only be attributed to the promptings of despair." "The promptings of despair!" Has the "Electrician's" omniscient one been studying lately the gas accounts of the gas industry? Has he found the "promptings of despair" in the increased revenue derived per ton of coal carbonized (at lower prices for gas than ever ruled before), through the advances made in scientific carbonization, and the increased demand and consequent higher market values that exist for the secondary products? Has he noticed how, through these things, prices for gas are being reduced all round, how consumption is increasing, how connections of gas consumers, of gas fires and stoves, and water-heating apparatus are increasing in number, how full statutory dividends under the sliding-scale are being paid, and how the sums carried forward are of substantial amount, with reserves and depreciation well looked after? Where are the "promptings of despair" to be found in these conditions? The policy of the gas industry is to press forward; not to stand still. Hence its activity.

Ah! but there is the Electrical Exhibition at Olympia. While our friend "looks forward to it with confidence, the gas interests cannot but regard it with the utmost dread." The gas industry will not shiver over such frail and vacuous talk. "We appear to hold several trump cards in the game we are playing." Appearances are sometimes deceptive. Further on, we observe that the all-seeing faculty of this writer occasionally diminishes; for he remarks that "it is difficult to conceive that the cost of gas-consuming devices can be reduced very much lower than it is at present." From which it must be taken that in the view of this electrical writer, in the matter of the production of gas appliances, efficiency and economy have reached their utmost limits. Being "reduced to this extremity, the gas industry is occupying itself in the attempt to discover some means of stemming the tide in favour of electricity." Here is found the secret of the title of the article "Can it be Possible?" It all amounts to this, that, through some inexplicable lapse of omniscient powers, the writer in question has only just discovered that efforts are being made to secure for large consumers of electricity the economy to be derived from the adoption of gas-driven dynamos on their own premises. This is denounced as "a crafty manoeuvre," which "does not deserve to succeed." We do not care what it is called by this electrical journalist; but we call it legitimate business. The answer to this question "Can it be Possible?" is that not only is it possible, but it is being done with profit to gas undertakings and large electricity consumers. In our contemporary, the article succeeding the one upon which comment is made is, it may be noted, headed "Efficient Grinding."

Mr. T. R. Stancombe, of the Yorkshire Electrical Power Company, appears to be sadly misinformed. The public lighting of Kirkburton is in question; and the Electric Power Company want the business. A "Ratepayer," in the "Huddersfield Examiner," has controverted the statements made by the electrical partisans. Among his statements he very properly said the incandescent lamp is a better diffuser of light than the electric lamp. Mr. Stancombe comes along, and makes the following remarks:

Tests can be made with a street photometer, which prove that the diffusion of an electric lamp is greater than the incandescent gas-lamp (new inverted type), and this is owing to the fact that the maximum light from an electric metallic filament fitting is given off horizontally, due to the filaments in the lamp being vertical, whereas with the gas-fitting the maximum light is given off at an angle of 30° from the vertical, throwing the majority of the light directly around the column. It is clear, therefore, that the light from an electric lamp is diffused a far greater distance than with the incandescent gas.

Has Mr. Stancombe never heard of the Holborn tests, in which the Electric Light Company put in competition lamps of higher candle power than the Gaslight and Coke Company considered sufficient. Even by having electric lamps of between 70 and 80 candles higher illuminating power at the source, the Electricity Company failed to get any better distribution—in fact, the lower candle-power gas-lamps gave a superior result. Referring to this

matter at a meeting of the Borough Council on March 8, Alderman Max Clarke said:

With regard to the statement made by the Committee, that "tests of the lighting were taken photometrically at frequent intervals from Dec. 20 to Jan. 17, with the result that the electric lamps were found to be giving an average of 395-candle power each, and the gas-lamps 318-candle power," they explained that these results were obtained from readings taken at certain specified angles; but they said that "on a further test being made at equal distances along the centre of the road, the illuminating effect was found to be about equal for both forms of lighting." When this question of the testing at 20° and 50° and down the centre of the roadway was mentioned to the Electric Light Company, another set of tests was made, and plotted in a diagram, and with this the Company agreed—proving the correctness of the former tests, that down the centre of the roadway the gas lighting was superior."

Now what has Mr. Stancombe to say to this? Is he prepared to assert that the Works Committee of the Borough Council, those who made the photometrical tests, and the Electric Light Company did not know what they were talking about, and are a set of asses? We like the same gentleman's little artifice in quoting the change-over from gas lighting to electricity in the areas of Borough Councils in London where the electricity supply is run by the authorities. Why did he not quote the condition of things in other districts where both gas and electricity are run by companies? By so doing, he would have had a fair parallel with Kirkburton. But he does not dare to do so. Stay, he refers to Westminster, and says that there some 1100 electric lamps still exist that were originally changed over from gas. He does not state that the greater part of these lamps represent a contract entered into by the St. George's (Hanover Square) Vestry in their expiring hours—just before the district was merged in the City of Westminster—and that the Chairman, whose casting vote carried the contract, mentioned only a few months since in the City Council that had they known, when the contract was entered into, what was going to happen in connection with gas lighting, it would never have been signed and sealed. Does Mr. Stancombe want chapter and verse for this? We hardly think he will regard it as helping his case much.

It is much easier to get the Northumberland clause—the revised version of the Bermondsey one—inserted in local authority Acts and Provisional Orders dealing with electricity supply than was at one time the case. The pitiful plea that used to be advanced as to the electricity industry being in its infancy can no longer be decently made—at all events, can no longer be made without exciting ridicule over the long continuance of the industry in its tender state. The Rhondda Urban District Council, in the Bill they have had in Parliament this session, sought electricity powers. They have obtained them; but with the stipulation that the price is to be periodically revised, so that the receipts and expenditure on the undertaking balance as nearly as possible.

Vienna Corporation New Gas-Works.

An account of the new Leopoldau works of the Vienna Corporation, which are designed for an immediate make of 40 million cubic metres (about 1415 million cubic feet) of gas per annum—with extension ultimately to a productive capacity of 200 million cubic metres (about 7060 million cubic feet) per annum—states that they should be ready for use this autumn. The gas made, however, is to be received provisionally in a gasholder on the works, and pumped from it by means of a turbine blower through a wrought-iron main under high pressure to the large gasholder in the Brigittenau district, from which it will be distributed in the new area of supply which the Corporation take over from the Imperial Continental Gas Association, and the Austrian Gaslighting Company, on the 1st of January next. It is this large holder at Brigittenau which has failed, as noted elsewhere in to-day's issue. The contract for the new holder was placed about October, 1909, with the Augsburg-Nuremberg Engineering Works, at the same time that a contract was settled for a gasholder at the Leopoldau works, of 150,000 cubic metres (5,300,000 cubic feet) capacity, with the firm of Pauker and Son, of Vienna.

Presentations to Ilford Gas Company's Officials.—On Friday, the 11th inst., a meeting of the staff of the Ilford Gas Company took place, at which presentations were made to Mr. B. G. Old and Mr. B. L. Pratt in recognition of their approaching marriages. The Assistant-Engineer (Mr. T. F. Canning) made the presentations, which in each case consisted of a handsome timepiece bearing an inscription, and expressed the best wishes of the donors for the future happiness and prosperity of the recipients.

The Catskill Water Supply will be distributed to New York City from a deep pressure tunnel in rock, reached by twenty-five shafts, varying from 180 to 300 feet in depth. The risers and appurtenances for connecting the tunnel with the city's distributing mains were described substantially as follows by Mr. Thos. H. Wiggin in a paper submitted to the Engineers' Club of Philadelphia. The shafts will be closed by a concrete plug beginning at least 100 feet down in solid rock. In this plug one or two steel pipe risers, lined with concrete about 5 inches thick, will be embedded. At the lower end of each riser is a pear-shaped bronze plug valve, operated by a lever and rod, running to the surface. The plug shuts with the pressure, and is held open by its own weight; the rod is released by a magnet.

A GOOD ADVERTISEMENT FOR HIGH-PRESSURE GAS.

One Hundred and Eleven Electric Arc Lamps Displaced in Two Roads.

WE have had several indications recently of the trouble that high-pressure gas-lamps are giving to electricians; and of the popularity that a high-pressure system of gas lighting in main streets has attained, and is further attaining, among tradesmen. The discussion at the recent meeting of the Incorporated Municipal Electrical Association showed, with strong emphasis, which way the wind was blowing, and the effect that high-pressure parade lighting was having on the electrical competitors. The Brentford Gas Company are actively pushing the system in their district; and the result is seen by the following advertisement in the "West London Observer." It is the best possible advertisement the Company could have; and it will be useful to them as a peg upon which to further press home the advantages of the system.

Don't be Talked into
Installing High Pressure.

ELECTRICITY

IS LOW PRESSURE
AND THE

**SAFEST, BEST, AND CHEAPEST
OF ALL ILLUMINANTS.**

LANTERNS FIXED AND MAINTAINED

By the Borough Council on Easy Terms.

APPLY—

**Engineer and Manager,
85, Fulham Palace Road, Hammersmith, S.W.**

The Company are now putting down a 10-inch high-pressure main in the chief thoroughfares of Hammersmith; and the Borough Electrical Engineer found it necessary to call the attention of his Committee to the keen competition he was having to meet. As a result, the Electricity Committee reported to the Council to the following effect: They had for some time past had under consideration the question of advertising to bring the uses of electricity before the public. Up till then the only monies spent on publicity had been £156 per annum to a canvasser and £50 per annum for literature, &c. They were now strongly of the opinion, having regard to the active methods pursued by the Gas Companies, that it was advisable to spend an amount of not less than £300 per annum for this purpose (including the salary of the canvasser). The recommendation was agreed to by the Borough Council. The foregoing advertisement is the first fruit; and, as we have said, is one of the best possible advertisements the Electricity Department could have given the Gas Company.

We learn that the Company have recently replaced electric arc lamps with high-pressure lamps, 38 in number in Askew Road, and 73 in number in Uxbridge Road, Shepherd's Bush, which is in the area supplied with electricity by the Hammersmith Borough Council. This is good work.

Scottish Tube and Oil Companies.

It was announced in Glasgow on Monday of last week, that an agreement had been come to whereby eleven Scottish tube-making companies would be amalgamated under the title of "The Scottish Tubemakers, Limited." According to a correspondent of "The Times," the capital of the new Company will be £600,000; and that though the most important of the tube companies—Stewarts and Lloyds, Limited—will stand outside the combination, it will work in harmony with it, and will not only subscribe for a block of ordinary shares of the Company, but will be represented on the Board. A movement is on foot for the amalgamation of the four leading oil companies—the Pumphreyston, Young's, Broxburn, and the Oakbank. Details of the scheme have not been made public; but it is stated that the purchase price has been provisionally fixed at £3,000,000. The total issued capital of the four Companies is, in round figures, £1,900,000; and the ordinary portion of it stands at a substantial premium. A Committee has been appointed to draw up a scheme of amalgamation for submission to the shareholders of the different Companies. The position of the oil industry, though much harassed by competition, is by no means unsatisfactory; but it is thought that it can be greatly improved by concentration of management.

OBITUARY.

The "Journal für Gasbeleuchtung" reports the death, on the 13th ult., of Herr E. KUNKLER, Assistant-Manager of the Geneva Gas-Works, at the age of 47. Herr Kunkler had his first experience in the gas industry as an Assistant at the St. Gall Gas-Works. He was then for five years Manager of the lighting and water works at Biel and Interlaken, and then acted as Clerk of Works at the construction of the Langenthal Gas-Works, from which position he passed to Geneva.

Mr. PETER HURLL—whose absence from the annual meeting of the Irish Association of Gas Managers at Cork on the 8th inst. was noted, and a message of condolence with him in his severe illness sent to him—died at his residence at Woodneuk, Gartcosh, Glasgow, on the 14th inst. Mr. Hurl's ailment was paralysis. He was in his 70th year. He was of the firm of Peter and Mark Hurl, manufacturers of fire-brick, furnace blocks, and gas retorts and fittings. Mr. Hurl was fond of attending meetings of gas managers, at which his cheery disposition made him a general favourite.

Much sympathy will be felt for Mr. and Mrs. George Lane, of Aylesbury, who have just sustained a severe bereavement by the sudden death, at the early age of 23, of their younger son, Mr. GEORGE THEODORE LANE. Some eighteen months ago, he had to undergo an operation; and subsequently from time to time the advice of specialists had to be sought, and further operations performed. In the hope that a change would be beneficial, Mr. Lane went to stay at the house of a friend at Twickenham, where, on the 13th inst., about midday, a serious development of his complaint took place; and he succumbed a few hours later. Mr. Lane's commercial life commenced in London in the offices of Mr. Ernest L. Burton. He subsequently studied chemistry and engineering, and went through the workshops and offices of Messrs. Gibbons Bros., of Dudley. Seeking increased knowledge, he paid a visit to the Black Country, where he passed through all stages of his work. He so far advanced himself as to be entrusted with the charge of works in Caen and Antwerp; and his other engagements included the preparation of plans and estimates for works in Japan and New Zealand. He had travelled a great deal; his journeyings taking him into Palestine, across the Sahara Desert, into Egyptian territory, also to Italy, Algiers, and many other places. He had contemplated making a further trip to the Nile in the autumn. The funeral took place last Thursday at Aylesbury Cemetery. It was attended by many personal friends and several of the employees at the Aylesbury Gas-Works, of which the father of the deceased, as most of our readers are aware, has for many years been Engineer and Manager.

We regret to learn, from New Zealand papers just to hand, of the death, on the 7th ult., at the age of 61, of Mr. HENRY BIRCH, for many years Engineer of the Wellington Gas Company. Deceased had been for some time in ill-health; and, with the view of relieving him of some of his duties, Mr. Archibald Dougall, the Chemist and Second Assistant at the Hull station of the British Gas Company, was not quite two years ago appointed Assistant Engineer. Mr. Birch was a native of London, and went out to Australia with his parents when a child. Proceeding to New Zealand, he entered the service of the Wellington Gas Company in 1875 as a fitter. Four years later he was placed in charge of the Company's outside work, was appointed foreman of works in 1880, and engineer in 1897. This position he retained until the beginning of last year, when he retired from active work, and took up the position of Consulting Engineer. He leaves a widow and a grown-up family. At the funeral, there was a large attendance of sympathizing friends of the family, as well as members of the Gas Company's staff and of various friendly societies; while the floral tributes included wreaths from the directors, manager, and departments of the Company, some of the staff of which and members of the Wellington District of the Ancient Order of Foresters (of which the deceased was Treasurer) were pall-bearers. In 1907, he was a delegate to the High Court of the Order, held at Leeds; and when on the trip he made arrangements for the construction of the Gas Company's large holder, which has been erected at Miramar. He was a man of considerable ability, and was regarded with high esteem by all with whom he came in contact.

PERSONAL.

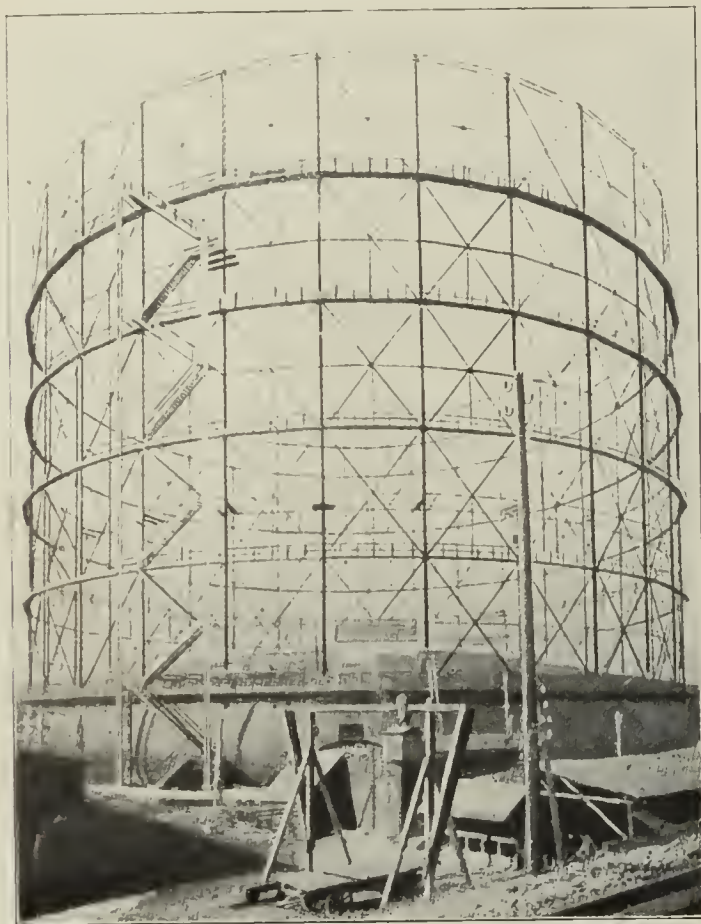
It is reported that on July 1, Herr C. KOHN, the Manager of the Frankfort-on-Main Gas-Works, celebrated his fifty years' jubilee as a gas engineer. The event was, at his own desire, not announced beforehand; but it received recognition in the bestowal on him of the Order of the Red Eagle of the Fourth Class. All Herr Kohn's colleagues in the gas industry will join in wishing him a further long continuance of his activities.

The "Journal für Gasbeleuchtung" announces that last Wednesday Herr ALEX. BETHE, of Magdeburg, celebrated his eightieth birthday. He is one of the oldest representatives of the industry, having entered the service of the General Gas Company of Magdeburg in 1864, and having since, with interruptions for military service in the campaigns of 1866 and 1870-71, been connected with that and other gas undertakings. He is now President of the Board of the Company, and is also on the Board of the German Continental Gas Company.

FAILURE OF THE LARGEST GASHOLDER ON THE CONTINENT.

THE "Neue Freie Presse," of Vienna, in its issue of the 5th inst., contained an announcement that the new holder at the Brigittenau station of the gas undertaking of the Corporation of Vienna had failed while being tested with air prior to being brought into use. This holder is of 250,000 cubic metres, or about 8,830,000 cubic feet capacity, and is the largest so far erected on the Continent of Europe. From the annexed view of the holder when nearing completion, it will be seen that (unlike most of the gas-holders of the Vienna Corporation) it stands in the open, and has a bulged steel tank. The following is a translation of the report of the accident.

An accident, which nearly cost twelve workmen who were engaged on the bell their lives, has this afternoon (Aug. 4) befallen the Vienna Corporation's new large gasholder, the erection of which was just finished in the Brigittenau district between the Forsthaus Strasse, the Schwedengasse, the North-West Railway Strasse, and the Danube Canal. In the trial filling of the holder with air, which was pumped into the bell by a blower, the roof of the bell suddenly broke loose and rolled down with a great clatter into the water-tank underneath. The twelve workmen engaged on the roof were able to escape in time on to the guide-framing, and so save themselves.



Gasholder, with the Augsburg-Nuremberg Works' Bulged Tank—
8,830,000 cubic feet capacity—at the Brigittenau Gas-Works in Vienna.

The Manager of the Corporation Gas-Works, Herr Menzel, has made the following statement in regard to the accident: In the testing of the holder, which had previously taken place twice without the least hitch, there suddenly occurred to-day a deformation of the topmost ring of the bell. The result of this was that the roof of the bell was ruptured, and the air contained in the holder rushed out. The bell of the holder rapidly sank into the water-tank; and, in so doing, it was further knocked about. The water-tank and the guide-framing remain perfectly intact. No one was injured. Those who were at work on the testing were able to escape in time on to the gallery going round the framing. The damage done can only be approximately reckoned at over 100,000 kronen (£4170). This does not, however, fall on the Vienna Corporation, but on the constructing firm, which is the Augsburg-Nuremberg Engineering Works ("Maschinenfabrik Augsburg-Nürnberg Aktiengesellschaft," frequently abbreviated to "M.A.N."), whose previously erected gasholder (of some 5,300,000 cubic feet capacity) at the Simmering works in Vienna has worked without a fault.* The holder to which the accident occurred to-day is the largest of this type on the Continent. It would contain 250,000 cubic metres (8,830,000 cubic feet) of gas. It is 260 feet high, 279 feet in diameter, and its circumference is 820 feet. Inside the gas-

bell is a large water-tank, on which there is a punt for use by the staff. Such accidents happen extremely rarely, but are not altogether unavoidable. Even if the static calculations are quite in order, it is possible that a small error may occur in the execution of the construction, or that such a mishap may ensue from the use of unsuitable material. It was fortunate that the workmen heard the buckling of the iron sheets in time, and fled. This accident will cause a delay of several months in taking over the holder. It will now be necessary to take to pieces the whole framing and the bell, and construct them afresh. The supply of gas to the Döbling district (for which this holder was intended) will not be affected by the delay in its construction. The gas for the district will be drawn from the Leopoldau works.

With reference to this report, the "Journal für Gasbeleuchtung" of the 19th inst. quotes the following from a technical authority: "We cannot fall in with the view put forward in the paper that such accidents are unavoidable. The fundamental rules for the static calculation of tanks, guide-framings and bells can now be laid down without any question. With proper care and, in particular, by taking account of an adequate margin of safety, an occurrence such as has been described cannot happen. From the short and not quite clear exposition given, the technical man will draw the following sketch of the event: The bell and telescoping lifts were raised with air for testing. This obviously relieves the rafters of the roof of load. As the angle-ring of the roof has collapsed, it can only have occurred because this angle-ring, with the connecting parts attached to it, has not proved safe enough for the roof of the bell. It cannot have been the roof which fell in; but the upper lift or bell in any case must have fallen into the tank after deformation of the ring, and thereupon the rest of the bell fell. The telescoping lift then followed as a matter of course. If the occurrence took place thus, the only explanation of the accident which could be found was that there had been some error in the static calculation. Faulty material cannot alone have caused such a collapse. The technical man must consequently assume either that incorrect premises were taken for the static calculation, or that the calculation has not allowed a sufficient factor of safety, especially in regard to the breaking strength of the top curb of the bell."

In regard to this opinion, the "Journal für Gasbeleuchtung" observes that clearly it depends only on an assumption, and that for investigating the matter it is eminently desirable that the static calculation should be made public. Our contemporary expresses its readiness to publish the calculations, so that technical men, and the members of the Gasholder Committee of the German Association of Gas and Water Engineers in particular, should have an opportunity of discussing them. We are only too glad to endorse this plea of the leading German gas journal for publicity of the calculations on which the dimensions of the structural parts of the collapsed bell were based, and for our part will undertake if they are placed at our disposal to publish them, so that English consulting and constructional gas engineers may also be in a position to discuss them. Our contemporary observes further that experienced gasholder constructors attach great importance to the strength of the top curb in large gasholders, because the proper action of the bell depends primarily on the safe design of this curb. In the case of the Hamburg gasholder disaster, investigation of the calculations showed that they were based on rules or formulæ which had until then been regarded as acceptable, but which now must not be employed, because the margin of safety then introduced had been shown to be insufficient. Not only in the general interest, but in that of the gas industry especially, it is of the greatest importance (our contemporary continues) that the present matter should be thoroughly investigated. Such incidents are apt to cause difficulties in securing new concessions. It cannot, therefore, be too strongly urged that occurrences of this kind should be properly investigated, in order that a repetition of them may be avoided. We need scarcely add that we are in hearty accord with the tenor of these remarks.

A report of the accident in the "Zeitschrift des Vereines der Gas- und Wasserfachmänner in Oesterreich Ungarn," of the 15th inst., states that the disaster occurred on Friday, the 4th inst., and caused great damage to material, though fortunately no one was injured. The holder was at the time undergoing the prescribed testing for soundness; and for this purpose it had been filled with air to raise it to its highest position, as had also been done a few days previously. While men were engaged in applying soap-suds to the riveted seams, the top lift gave way. The curb, from some not yet clearly ascertained cause, doubled up, and the crown of the bell folded over the indented place. The air streamed out with great velocity from the opening caused by the breaking away of one of the sheets. The bell sank rapidly; and as several of the axles of the guide-rollers had been sheared off, it was forced against one side of the guide-framing. The latter, and the iron water-tank, remained quite uninjured. The reconstruction will be put in hand as soon as the cause of the giving way of the bell has been clearly established; and probably the holder will be ready for use at the specified time. It is intended for the storage of the gas made at the new Leopoldau works of the Corporation of Vienna. The loss caused by the accident will not fall on the Corporation. The "Zeitschrift" promises to report in a subsequent issue more fully on the accident and its cause.

* An illustration of this 5,300,000 cubic feet gasholder, of similar construction, at the Simmering (Vienna) Gas-Works (and which is stated to have worked quite satisfactorily) was given in the "JOURNAL" for July 19 last year, p. 201.

FOUR YEARS' EXPERIENCE OF VERTICAL RETORTS AT COLOGNE.

By Dr. F. LEISSE, Chemist at the Cologne Gas-Works.

The twelve beds of vertical retorts which were brought into use at the Cologne Gas-Works on June 6, 1907, and the further twelve beds started two months later, constitute one of the first extensive installations of Dessau vertical retorts; and it is now opportune to review the experience gained in four years' working of them. This has been done by Dr. Leisse in a communication made to the "Journal für Gasbeleuchtung" of the 12th inst. The following is a summary of the contents of his article.

The reports of practical experiences, theoretical disquisitions, and long calculations, which have distinguished the contest between the modern systems of gas-making settings, have left the gas engineer a prey to new doubts and unsolved questions. The author hopes, by giving practical working results, obtained at Cologne in the course of the last four years, to throw light upon the subject for his colleagues. The installation at Cologne has been described by Herr Prenger, the Manager of the gas undertaking [see "JOURNAL," Vol. XCVIII., pp. 810, 1000; Vol. CII., p. 562.] It may be mentioned that the experimental plant at Cologne is intended for a daily make of 1,40,000 to 175,000 cubic feet, and the apparatus may be connected either with two settings of the vertical-retort installation, or eight settings of the inclined retort plant. It is thus possible to obtain direct comparative figures of the working results of the two types of plant by the use of this special experimental apparatus.

Westphalian coal only has been carbonized during the four years; and it has been a mixture from ten different pits. At first, the carbonizing time was eleven hours; but after about nine months this was extended to twelve hours, with the object of increasing the make of gas and of preserving the retorts, which in places were becoming unsound and showing signs of deformation due to overheating. The transverse walls in the heating passages were altered, and aprons were introduced between the retorts in order to effect better control of the heating of the settings. After these changes, the retorts displayed throughout their length a uniformly diminishing temperature, and there were no brighter rings at different levels. The empirical methods of controlling retort-settings which formerly sufficed are not adequate for vertical retorts, which require greater care and more scientific control. The ordinary regulation of the heats of the settings is chiefly effected through the flue and primary air-dampers. The supply of secondary air is kept constant. The setting of the primary-air damper, according to the proportion of carbonic oxide in the exit gases, as judged by the eye, suffices to keep the combustion almost within the theoretical limits. The proportion of carbonic acid in the escaping gases remains between 18 and 19 per cent., and the temperature between 500° and 550° C. (930° to 1020° Fahr.).

Special care must be taken in clinkering, and the draught and air supply carefully looked after at the time, as the setting is of light construction and stores up comparatively little heat. A troublesome construction of the grate has been remedied by introducing a step-grate. Owing to the small height between the grate and the gas-exit passages, there is only a comparatively small depth of incandescent coke in the producer, especially after clinkering, and as a result 1½ to 2 hours elapse before normal combustion is restored and the setting regains its proper temperature. The maintenance of a uniformly high temperature and uniform distribution of the heat in the different passages of the setting are absolutely essential for the proper working of the setting and for its durability. The lower passages should be inspected at least once a day, to see that they are not blocked by blown ash or clinker, and frequent measurements of the temperature should be made with a pyrometer, of which the Wanner type is ideal for this purpose. Various other cleaning operations are necessary once every two to four months. Owing to the shallowness of the regenerative flues and their ready accessibility, any caulking of them that may be required is easily carried out. The horizontal take-off pipes have to be cleared once in four days, and the pans in the hydraulic main cleared of thick tar. The original arrangement of the take-off pipes rendered the clearing of them a difficult matter, and required the services of three men; but in reconstructing, this difficulty is being avoided. Sprinkling the ascension pipe has diminished the formation of thick tar or pitch; but ammoniacal liquor has not proved satisfactory for the purpose, because it corrodes the numerous coeks.

The retorts are scurfed once in 30 to 35 days, by burning them out completely, for which 14 to 18 hours are necessary. The recovery of the scurf is thereby foregone; but, on the other hand, injury to the retorts by scurfing tools is avoided. The regular burning-off of the scurf has considerable influence on the discharging of the retorts, because when the layer of scurf has become too thick pieces of it fly off when steam is admitted, and the resulting holes serve to cause the cake of coke to hang up in the retort. For the first two days after scurfing, no steam is admitted to the retort; so that the rough surface becomes covered with a thin layer of scurf, which facilitates the discharge of the coke. According to experience at Cologne, it is an advantage in regard to the discharging of the coke to mix unscreened coal with nuts.

The coal then cakes better, probably owing to the rather higher proportion of water in the washed nuts, and the coke is denser and sticks less firmly to the walls of the retort.

In regard to the industrial results obtained with the vertical retort-settings, and the advantages of the system compared with the former working, the works' figures for the past years afford the best answer. The year 1907-8 is ignored, because vertical, inclined, and horizontal retorts were in use at the same time, and the results cannot be properly separated; while the regulation of the vertical-retort settings had not then been perfected and the transition from 11 to 12 hours carbonizing time had not been made. The figures for the make and quality of the gas and the quantity and composition of the bye-products given are average values for the last three working years. The working has been with steaming during the last two of the twelve hours occupied in working-off the charge; the steam being at half-an-atmosphere pressure. For comparison, the average results are given for the working of horizontal-retort settings in the years 1900 to 1907; and as repeated investigations extending over a number of years showed that the carbonizing results were the same for inclined retorts, the figures may be taken as applying also to the latter system.

The trial runs for the purpose of testing coal, which were made in one of the settings of vertical retorts without the admission of steam, show interesting results. About 30 tons of coal were carbonized in each trial. The temperature at which the setting was worked was higher in the last of the three years—viz., about 1240° to 1280° C. (2264° to 2336° Fahr.). This, since steam was not being admitted, was purposely lower than the temperature maintained in the other settings—viz., 1300° to 1315° C. (2372° to 2399° Fahr.). The results of the coal-testing trials in the experimental vertical-retort setting are shown in Table I.

TABLE I.—Coal Testing Trials. Average Results.

Retorts Year	Inclined. 1908-9.	Vertical, without Steaming.		
		1908-9.	1909-10.	1910-11.
Number of trials	16	14	30	31
Make of gas per ton of coal; cubic feet at 60° Fahr. and 30 in.	10,846	11,383	11,474	11,770
Calorific power, B.Th.U. per cubic foot at 60° Fahr. and 30 in.	570	568	572	575
Valuation figure (make mul- tiplied by calorific power) .	6,181,829	6,467,891	6,566,756	6,773,169

These results, speaking generally, are no higher than those obtained earlier from horizontal retorts when the latter were charged, as had been found advantageous, with uniformly mixed large and small coal from different pits. The make of gas, however, showed a considerable increase in an experiment in which coal of different origin and of different size was mixed, as had been done in large-scale working. Trials made with such mixed coal showed, without steaming, an average make of 12,200 cubic feet per ton. The inclined retort tests of coal made in 1908-9 [Table I.] likewise were on about 30 tons of coal, and the values agree closely with the trial figures obtained from horizontal settings, which, for the year 1904-5 showed a make of 11,002 cubic feet per ton. In the last two years, the tests of coal have been made only in the vertical retort-setting. The noteworthy feature of the results of the different years is the rise in calorific power and in the valuation figure which accompanies the increase in the make of gas. This is a striking characteristic of vertical-retort working, and is contrary to earlier experiences in carbonization. For instance, the figures given in Table II. show the results of the working of horizontal retorts in the years 1902-3 and 1904-5.

TABLE II.—Results of Horizontal-Retort Working.

Year	1902-3.	1904-5.
Make of gas per ton of coal, cubic feet at 60° Fahr. and 30 in.	10,668	11,343
Calorific power, B.Th.U. per cubic foot at 60° Fahr. and 30 in.	593	559
Valuation figure (make multiplied by calorific power)	6,331,223	6,340,709

In the latter year, the heats of carbonization were considerably higher than in the former; but it will be seen that the valuation figure is practically identical—the increased make of gas being attended by a falling off in the calorific power. The rise in the valuation figure with increase in the heats of carbonization, which the trials with the vertical retort-settings show, is also clearly displayed in the results of working on the large scale; but in the latter, the better utilization of the steam introduced when

TABLE III.—Working Results with Vertical Retorts with Steaming.

Year	1908-9.	1909-10.	1910-11.
Make of gas per ton of coal, cubic feet at 60° Fahr. and 30 in.	12,703	13,399	14,203
Calorific power, B.Th.U. per cubic foot at 60° Fahr. and 30 in.	544	538	526
Valuation figure (make multiplied by calorific power)	6,910,689	7,209,465	7,464,875

the temperature of the setting is increased has also to be taken into account.

The results of the vertical-retort working with steaming in the last three years are shown in Table III.

Frequent analyses of the gas obtained with the make of 14,203 cubic feet per ton showed that it had the following average composition:—

	Per Cent.
Carbonic acid	1·9
Heavy hydrocarbons	2·4
Carbonic oxide	13·4
Methane	22·1
Hydrogen	56·9
Nitrogen	3·3
	100·0

It might be argued that the favourable results obtained with the vertical retorts have been due to the coal having improved in quality in recent years. The results of the analyses made of the coal in the last three years and in the year 1902-3 are given in Table IV., and show such close agreement that the results of the make obtained in the different years may be taken as comparable values.

TABLE IV.—Average Composition of Coal Carbonized.

Year	1902-3.	1908-9.	1909-10.	1910-11.
No. of Analyses	128	132	73	118
Moisture, per cent.	3·05	2·50	2·37	2·36
Volatile matter, per cent. . . . .	..	28·49	28·86	28·82
Coke, per cent. . . . .	..	69·01	68·77	68·82
Ash, per cent.	11·07	10·73	10·63	11·58
Calorific power, B.Th.U. per lb.	12,571	..	..	12,533

The question whether the introduction of the vertical retort constitutes a great advance in gas manufacture must therefore, on the strength of these working results extending over a number of years, obviously be answered in the affirmative. It is interesting, however, to inquire how the improved values are obtained, and in what respect the conditions of carbonization in vertical retorts differ from those of the older systems. In the author's opinion, the vertical retort combines in a happy consummation two factors. (1) The complete filling of the whole retort space up to a certain height—i.e., about 27½ inches from the upper edge of the retort mouthpiece—and the closer packing of the coal, whereby the highly-heated, uncovered retort walls are reduced as far as possible, and a greater velocity of the stream of gas ensues; and (2) the temperature selected and the possibility of increasing it up to the limit of durability of the fire-brick material, and its gradual diminution from the bottom to the top of the retort. The rise in the valuation figure with the increase of temperature is directly dependent on the far greater protection afforded to the produced gas. Gasification takes place more quickly when the heats are higher, while with the vertical retort the gas passes to the ascension pipe chiefly through the cold mass of coal, and only to a small extent past the hot walls of the retort; and as the evolution of gas is greater, its velocity increases and a greater proportion is protected from decomposition. On the other hand, with horizontal and inclined retorts the gas must pass through the comparatively large free space above the coal, in which it is exposed throughout to the high temperature of the setting. Gasification accelerated by increase in the temperature will in these unfavourable conditions be less capable of realizing the advantages which are associated with the greater production of gas.

The assumption that the gasification process takes place in the vertical retort in altered conditions is clearly supported by the quantities and the composition of the bye-products obtained. The variations in the ammonia, tar, sulphur, eyanogen, and naphthalene produced can only be explained by assuming that the method of working in the vertical retort is fundamentally different. The amount of tar produced in the vertical retort-settings was on the average 4·99 per cent. by weight of the coal carbonized the last three years, as compared with 4·44 per cent. in the years 1901-2 to 1906-7 when other types of retort were in use. The tar products from the various types of setting are also quite different. The tar from the vertical retorts is a thinly fluid, oily product, whereas that from horizontal and inclined retorts is a thick and viscous material. Table V. shows the difference in the properties of the two tars.

TABLE V.—Properties of Coal Tar.

From	Vertical Retorts.	Horizontal Retorts.
Specific gravity	1·112	1·120
Proportion of pitch, per cent.	25·30	55·60
Free carbon, per cent.	1·5-2·5	20-25
Naphthalene	None separated on distillation	Large quantities separated in solid state

The yield of ammonia, computed from the amount of ammoniacal products sold, was, on the average of the last three years with vertical retorts, 0·322 per cent. of real ammonia on the weight of coal carbonized, or equivalent to 28 lbs. of sulphate per ton of coal; whereas in the years 1901 to 1907 the proportion of real

ammonia was 0·232 per cent. of the weight of coal carbonized, which is equivalent to 20½ lbs. of sulphate per ton.

The coke produced under the higher pressure prevailing in the vertical retort is denser than that produced in inclined and horizontal retorts, and more nearly resembles oven-coke. It is in large pieces, and the weight of a given volume is greater. The ratio of the weight of a given volume of inclined-retort coke to vertical-retort coke is 1 : 1·16.

Attempts to ascertain the amount of coke consumed in water-gas production led to no conclusive result; but it is clear that the scurf largely contributes to the decomposition of the steam, because in the lower half of the retort it is of a porous honeycombed structure, as opposed to the close structure of that in the upper part. It may be pointed out that the water gas produced in vertical retorts differs considerably in calorific power and composition from that made in separate generators. It is carburetted to a certain extent with methane and heavy hydrocarbons, either in the retort or on its way to the hydraulic main. This should be taken into consideration in any comparison of the economy of the two methods of producing water gas. Table VI. shows the difference in the composition of the two gases.

TABLE VI.—Quality and Composition of Water Gas.

From	Vertical Retorts.	A Generator.
Calorific power, B.Th.U. per cubic foot at 60° Fahr. and 30 in.	330	288
Carbonic acid . . . Volumes per cent.	1·6	2·2
Heavy hydrocarbons	0·8	..
Oxygen . . . . .	..	0·4
Carbonic oxide	40·0	42·4
Methane	1·2	0·3
Hydrogen	53·3	50·6
Nitrogen	3·1	4·1
	100·0	100·0

The introduction of the vertical retort has been attended with certain indirect advantages of considerable importance. The proportion of naphthalene in the gas is so small that naphthalene washers are no longer necessary. The amount in the purified gas is so little that it cannot be estimated exactly. When vertical retorts were first brought into use, however, the naphthalene already clinging to the walls of the distributing mains was taken up by the gas poorer in naphthalene and carried forward, and it was either recovered in the syphons or it blocked the service-pipe. The proportions of cyanogen and sulphur in the crude and purified gas are shown in Table VII.

TABLE VII.—Cyanogen and Sulphur in the Gas.

Gas	Crude.		Purified.	
	Vertical.	Inclined.	Vertical.	Inclined.
Retort				
Cyanogen, grains per 100 cubic feet	46·3	101·4	8·74	19·67
Sulphur,	323·4	458·9	13·98	20·98

It has not been possible to establish the relief afforded to the purifiers on the large scale by the reduction in the proportions of eyanogen and sulphur in the gas, because a new purifying system was brought into action at the same time as the vertical retorts, and later, artificial purifying material was substituted for oxide. Exhaustive experiments in the experimental plant, however, show that the artificial oxide purifies about double as much vertical-retort gas as inclined-retort gas. These figures are in substantial agreement with the analytical results given in Table VII.

Naturally, it has not hitherto been possible to give an exact answer to the question of the durability and the cost of repairs of vertical retort installations. Previously, the only answer that could be given was that in this respect they appeared to be quite fulfilling the best anticipations. It has now been established, however, that during the period of four years working there has not been a single case where it has been necessary to repair the retorts or the settings themselves. Current maintenance charges included only the natural replacement of mechanical parts, the renewal of the lower doors which burned through after a time, and partial renewal of the upper lids. The latter, as first made, were too weak, and have been strengthened by ribs and an alteration of the eccentric framing. The consumption of the lower doors averages 10 per cent., and of the upper lids 12 per cent. per annum. The different benches of settings have remained in work for the number of days stated below before it has become necessary to renew, partially or entirely, the retort-chamber.

Bench No. I	1501	setting-days
No. II.	963	" "
No. III.	1115	" "
No. IV.	1345	" "

The average working life has, therefore, been 1231 days. The great differences shown for the various benches are due to the desire to avoid repairing the whole of the settings at the same time, and to distribute the work of repair. Consequently, the lower halves of the retorts in Benches II. and III. were replaced before absolutely necessary; while Bench No. IV. was reconstructed in May and June last, and the renewal of Bench No. I.

will be put in hand this autumn. The average make of gas per setting has been 166,504,300 cubic feet, compared with 123,606,000 cubic feet for horizontal-retort settings. The cost of the repairs for the 24 vertical-retort settings has been £3500. This includes the cost for Bench No. I., which is to be carried out this autumn, and for which the expenditure on Bench No. IV. gives the necessary figures. The cost of repairs or renewals has, therefore, been found to amount, for vertical retort-settings, to 0·23d., and for horizontal retort-settings to 0·4d., per 1000 cubic feet of gas made. It has not yet been possible to ascertain exact figures for the inclined retort-settings, as they have been so little used that renewal will only become necessary in the course of the present year.

The lower cost of repairs of the vertical retort-settings is chiefly to be ascribed to the much greater make of gas and the lighter construction of the settings. On taking down the settings, however, they were found to be throughout in such good condition that, with the exception of the retorts and the stiffening slabs in the lower parts, almost all the material could be used again in the reconstruction. There were only trifling settlements of the side walls of the settings, and the burner-nozzles had not been affected by the fire. The producers were relined in the furnace zone, and the slabs above the clinkering doors were also renewed in order to ensure smooth working.

In conclusion, the author points out that the comparative values given in his paper admit of deductions being drawn as to the working and economical advantages of the vertical-retort system over the older systems of carbonization. The greater make of gas, the increase in the valuation figure with the rise of temperature, and the quantity and composition of the bye-products obtained, show that carbonization takes place under greatly altered conditions, which open out a hopeful prospect for the further development of the vertical retort-setting. The settings of eighteen vertical retorts which are now being introduced, with still better working results, already show further progress.

COKING INDUSTRY OF SOUTH YORKSHIRE AND DERBYSHIRE.

In the "JOURNAL" for the 11th of April last (p. 109), an abstract was given of a paper read by Professor L. T. O'SHEA, of the Sheffield University, on the subject of "Recent Progress in the Bye-Product Coking Industry." The author has an interesting communication in the current number of the "Journal of the Society of Chemical Industry" on the position of the industry in South Yorkshire and Derbyshire; and we make the following extracts from it.

The manufacture of coke has been an extensive industry in South Yorkshire for many years, owing to the fact that most of the seams north of the Don yield coking coals. Before the year 1899, the coals were coked chiefly in beehive ovens, and, except in a few isolated instances, the recovery of bye-products from coke-ovens was not attempted. A noticeable instance of this exception is the successful recovery of bye-products from coal coked in the beehive oven by Messrs. Newton, Chambers, and Co., at the Thorncliffe Coal and Iron Works. This firm have for many years recovered ammonium sulphate, and illuminating and lubricating oils, from coal coked in their patent beehive oven, and are well known for the manufacture of the disinfectant "Izal" from the products of the distillation of the tar oils. The manufacture of coke in the modern retort or closed oven with bye-product recovery in South Yorkshire practically dates from 1900, when the first battery of 35 ovens was started at the Wharcliffe Silkstone Collieries by Messrs. Simon-Carvès. Since that year considerable progress has been made in South Yorkshire and North Derbyshire. The development of the industry is interesting, not only from the point of view of its rapid growth, but also as affording an example of the improvements and modifications in oven construction which have closely followed one another as manufacturers and oven constructors gained experience of the conditions necessary for successfully working the plant.

The following figures, taken from the Mines and Quarries General Report, Part III., "Output" for 1909, show the extent of the industry in Yorkshire and Derbyshire. The quantity of

	Yorkshire.		Derbyshire.	
	No. of Batteries.	No. of Ovens.	No. of Batteries.	No. of Ovens.
Simon-Carvès . . .	20 (a)	729 (a)	0	0
Simplex	1	44	2	150
Semet-Solvay . . .	3	92	0	0
Koppers	8 (b)	317 (b)	0	0
Huessener	1	30	2	100
Mackey-Seymour . .	1	32	0	0
Otto-Hilgenstock . .	5 (c)	325 (c)	1	60
Coppée	0	0	2 (d)	117 (d)

(a) Including 4 under construction, consisting of 94 ovens.
(b) " 2 " " " " 65 "
(c) " 2 " " " " 100 "
(d) " 1 " " " " 50 "

coke manufactured at coke-ovens in the United Kingdom was 10,240,093 tons; in Yorkshire, 2,684,102 tons; and in Derbyshire,

234,825 tons. With the exception of Durham, in which county 5,335,790 tons of coke were produced in 1909, Yorkshire is the largest coke-producing county in the United Kingdom.

The following figures, supplied by the various firms of oven constructors, show the extent of the bye-product recovery industry in the counties named.

The number and kind of oven, whether bye-product or not, in use in 1909, are shown by the following figures, taken from the report above mentioned:—

Kind of Oven.	Yorkshire.	Derbyshire.
Beehive	3802	302
Simon-Carvès	709	0
Semet-Solvay	125	0
Coppée	50	67
Koppers	72	36
Otto-Hilgenstock	325	60
Simplex	44	150
Huessener	25	34
Collins	45	0
Mackey-Seymour	32	0
Other kinds	74	0
Total	5303	649

COKING COALS.

South Yorkshire Coalfields.—Most of the coal seams north of the Don are coking coals, and among the seams which are used in South Yorkshire for coking, either alone or mixed with coal from other seams, are the Tinsley Thin, High Hazels or Kents Thick, Barnsley Bed, Swallow Wood, Fenton, Parkgate, Thorncliffe Thin, Silkstone, Whinmoor, and Soft Bed or Coking Coal. Among the Yorkshire coals, the most important, and perhaps the most generally used, for coking are those from the Barnsley, Parkgate, and Silkstone seams.

Derbyshire Coalfields.—This coalfield is co-extensive with the South Yorkshire coalfield, and in its northern area furnishes many excellent coking coals, though south of Ilkeston the coals appear to lose their coking properties. Among the coking coals of North Derbyshire are those from the following seams: High Hazels, Top Hards, Waterloo, Deep Softs, Deep Hards, Piper, Tupton, Three-quarter, and Black Shale.

Correlation of the Seams.—It is generally accepted that the following seams in the two counties correspond with one another. Barnsley Bed and Top Hards, Parkgate and Deep Hards, Silkstone and Black Shale; but the correlation of the other seams presents some difficulties. Approximate analyses of some of the Yorkshire and Derbyshire coals are given in the following table:—

	Volatile Matter.	Fixed Carbon.	Ash.	Moisture.	Sulphur.
<i>Yorkshire.</i>					
High Hazels	35·32	63·11	1·57	..	2·49
Barnsley	30·97	64·65	4·38	..	1·94
Swallow Wood	30·44	63·69	5·86	..	2·64
Parkgate	30·56	65·59	3·84	..	2·18
Thorncliffe Thin.	35·52	63·98	0·50	..	..
Silkstone	32·29	65·08	2·36	..	..
Whinmoor	32·95	60·83	4·60	1·62	..
<i>Derbyshire.</i>					
Waterloo	34·17	53·38	3·89	7·94	..
Deep Softs	35·27	55·50	3·55	5·68	..
Deep Hards	33·48	56·95	5·18	4·39	..
Piper	34·78	55·35	5·94	3·93	..
Tupton.	34·17	58·89	3·38	3·56	..
Black Shale	36·12	55·11	6·29	2·48	..

It will be seen from the analyses that the proportion of volatile matter obtained from the Yorkshire and Derbyshire coals is very high. The substances recovered from them are ammonium sulphate, tar, benzol, and gases. The yield of products generally obtained is: Ammonium sulphate, 22 to 35 lbs. per ton of coal; tar, about 5 per cent.; 65 per cent. benzol, from 2·25 to 2·5 gallons per ton; and gases, 10,000 to 11,500 cubic feet per ton.

THE COKING SLACK.

The coal generally used is the small coal or slack that is separated from the larger coal in the process of screening which the coal undergoes directly it is drawn from the pit. In cases, however, where the quantity of slack made is insufficient, some of the larger coal is crushed and sent to the coke-ovens. Sometimes dry slack is used for coking purposes. Washing the slack is generally resorted to where it is required for use in bye-product ovens. This, by removing the mechanically mixed dirt, greatly improves the quality of the coke, and reduces the quantity of ash and sulphur in it.

COKING IN BEEHIVE OVENS.

The manufacture of coke in beehive ovens is more extensively practised in South Yorkshire than in Derbyshire. In the former county, 3802 beehive ovens were in use in 1909; in the latter there were 302. The ovens are dome-shaped chambers, about 13 feet in diameter and from 7 to 8 feet high in the centre. They are built in batteries in two rows, back to back, with a common flue running the whole length of the battery. In front of each oven is a doorway, which, during the coking process, is closed with bricks well covered with "daub," while in the crown of the dome is an opening or hopper used for charging purposes. Each oven

is connected with the central flue by means of a port through which the waste gases pass into the flue, and from it are conducted under boilers, where they are used for generating steam. The ovens are charged with a layer of slack (usually washed) 2 ft. 3 in. to 2 ft. 6 in. thick, and air is admitted through a small opening left in the bricked-up doorway. The heat retained in the masonry soon causes the coal to distil, and the gases take fire in the dome of the oven. When the gases are well alight, the hoppers at the top of the ovens are closed with dampers, and the coking of the coal proceeds slowly from the top downwards. The coking time varies from 72 to 96 hours; and when complete the coke is quenched inside the oven by breaking-down the upper part of the doors, and discharging copious quantities of water on the red-hot mass. After quenching, the coke is raked out by hand or else by means of mechanical rakers, on to platforms in front of the batteries. The chief qualities of coke produced are blast-furnace, steel-smelting, and foundry.

BYE-PRODUCT OVENS.

Retort-ovens without recovery of bye-products were in use in Yorkshire more than thirty years ago; but for various reasons the process fell into disuse until the year 1899. During this period, the only successful plant was the beehive open recovery plant of Messrs. Newton, Chambers, and Co.

In 1899, the construction of the first retort-oven bye-product plant in this district was commenced at the Wharnccliffe Silkstone Collieries, and in 1900 a battery of 35 Simon-Carvès ovens with recovery plant was started. This may be looked upon as the pioneer plant; and in comparison with the more modern plants it serves as an illustration of the great advances that have been made in oven construction.

In the early days of oven construction, the horizontal flued ovens were generally preferred. The tendency of recent years has been to adopt vertical flued ovens, though there are certain well-known instances of horizontal flued ovens. Examples of the vertical flued ovens in the Yorkshire district are the Simon-Carvès, Koppers, Otto-Hilgenstock, and Coppée; while the Semet-Solvay and Huesseuer are horizontal flued ovens.

One of the most striking improvements in oven construction is the distribution of the air supply as well as the supply of gas to each combustion flue. The first ovens on this principle to be erected in this district were the Koppers ovens; other examples are the Simon-Carvès (Poctter patent). The dimensions of the ovens are generally: Length, 30 feet; height, 6 to 8 feet; width, 15 to 22 inches. Both ends of the oven chamber are open, and are closed with doors during the coking process. The ovens are built in batteries of from 35 to 50 ovens in a battery.

The slack is charged into the red-hot oven by hand through charging-holes in the crown of the oven, or mechanically, after compression into the form of a cake, through the doors. The doors and charging holes are closed, and well luted with puddled clay. The decomposition of the coal begins at once, and the coking proceeds slowly from the sides of the oven towards the centre. The volatile products are removed from the ovens by means of exhausters through stand-pipes in the roof, which connect with mains that convey the products to the bye-product recovery plant. The exhausters are usually placed between the coolers and the ammonia scrubbers. The coking time varies from 36 to 45 hours. When the charge is completely coked, the oven is drawn by opening the doors and pushing the coke out on to a platform, where it is quenched by discharging on to the red-hot mass copious volumes of water. This may be carried out by hand, or by mechanical quenchers. As soon as the oven is discharged, the doors are closed, and the oven is again filled with a fresh charge of slack.

RECOVERY OF BYE-PRODUCTS.

The Old Process.—The old process for the recovery of bye-products consists in: (1) Cooling the gases for condensation of tar and ammoniacal liquor. (2) Water washing to recover ammonia from the cooled gases. (3) Creosote washing for benzol recovery. The general arrangement of the plants is based upon those used in gas-works, and presents no novel features. No steps are taken to purify the gases after the removal of the bye-products, unless the gases are to be used in gas-engines, when usually filtration, and occasionally oxide of iron purification, are resorted to.

The tar is separated from the condensed ammoniacal liquor, and sold without further treatment. The composition of the tar produced in retort-ovens resembles that made in gas-retorts. It is rich in naphthalene, carbolic acid, and anthracene, and its specific gravity varies from 1.1 to 1.2. The ammoniacal liquor is distilled in continuous stills of the Coffey type, with steam and lime, and the gases passed into sulphuric acid in the usual way. The benzol is recovered from the creosote oil by distillation; and the process may be intermittent or continuous.

The treatment and disposal of the effluent from the ammonia stills is a most important question in bye-product plants in Yorkshire, owing to the restrictions imposed by the various Rivers Boards on the discharge of effluent from the stills into streams, and several methods are used for its disposal, of which the following are the most generally adopted: (1) The liquor flows into settling-tanks, and the clear, but dark-coloured, liquor flows away into the stream. (2) Where disused workings are available, it is allowed to flow into them without preliminary treatment. (3) It is pumped on to spoil-heaps that are on fire, and there gradually evaporates. (4) After passing through settling-tanks, it is used to

quench the coke. (5) It is evaporated by spraying the liquor into a furnace heated with solid fuel or waste gases from the coke-ovens.

DIRECT SULPHATE OF AMMONIA PROCESS.

The problem of doing away with the effluent from ammonia stills, or at least confining the quantity to the smallest limit, would appear, in some measure, to have found a solution in the recovery of sulphate directly from the gases. The process originated with Herr F. Brunck, of Dortmund, who passed the gases coming from the coke-ovens at a temperature of 70° C. into saturators containing sulphuric acid. The process failed through the imperfect condensation of tar. It has, however, since been perfected, and direct-recovery processes are now recommended by the various oven-construction firms. Those now adopted are all based on Brunck's original plan—viz., to pass the gases into the saturator at a temperature above their dew-point (60° to 70° C.), and so avoid the condensation of the moisture they contain.

The processes may be divided into two classes: (1) The gases are cooled to 15° C. to condense the tar, and subsequently heated to 70° C., after which they pass through the saturator maintained at about 100° C. The initial cooling causes the condensation of ammoniacal liquor, which is distilled with lime, and the ammonia liberated passes into the saturator. The effluent from the still is reduced at least 50 per cent. by this process. Koppers was the first to introduce this method successfully; and there are at least two other plants designed to work on similar lines. In Yorkshire, one Koppers direct-recovery plant is in work at the Corton Wood Collieries. (2) In the second class, the gases do not undergo any special cooling beyond that which takes place in the mains conveying them to the bye-product plant. To this class belong the Otto process, in which the tar is removed by a tar spray, and the Simon-Carvès process, in which the tar is mechanically removed. After removal of the tar, the gases, at 70° C., charged with the moisture that they originally contain, pass through the saturator, the temperature of which is about 100° C.

For these processes it is claimed that no effluent, or at least only a very small quantity, is produced, and that quite harmless. In these processes benzol cannot be recovered unless the gases are cooled after passing through the saturator. If the benzol is recovered, an effluent is produced; but it is claimed that the effluent that separates is innocuous, as it is free from the cyanides, thiocyanates, and tar compounds.

FELD AND BURKHEISER PROCESSES.

The latest advance in ammonium sulphate production is to use the sulphur in the gases for the production of sulphate. There are two such processes—the Feld and the Burkheiser. In the Feld process, the sulphuretted hydrogen is fixed as ferrous sulphide, which, by treatment with sulphur dioxide, is converted into ferrous thiosulphate. This is converted into ammonium thiosulphate, which is subsequently oxidized to sulphate. In the Burkheiser process, the sulphur compounds are removed by oxide of iron purifiers, and subsequently converted into sulphur dioxide by oxidation. The sulphur dioxide is combined with the ammonia, and Burkheiser salt—a mixture of ammonium sulphate and sulphite—is produced.

THE RESULTING GASES.

The gases that come from the bye-product plant are primarily used for oven-heating. With the Yorkshire and Derbyshire coals, from 30 to 50 per cent. of the gas produced is required for this purpose. The remainder is surplus gas. In most of the plants this surplus is used for raising steam; but at a few collieries it is employed for generating power in internal combustion motors. The amount of gas available for this purpose is from 5000 to 7000 cubic feet per ton of coal carbonized. The composition of the gas is similar to that of illuminating gas, and its calorific power varies from 450 to 600 B.Th.U. per cubic foot, according to the quantity of nitrogen it contains.

At the Wharnccliffe Silkstone Collieries, considerable developments have taken place in the use of gas for power generation. The plant consists of engines entirely run on the gas from a battery of Simon-Carvès ovens. At the Thornccliffe Iron-Works and Collieries, engines amounting to 500 H.P. are driven with gases from a battery of Kopper's ovens; and at Mitchells' Main, gases from a battery of Simon-Carvès ovens are used to generate 500 H.P. in 250 sets.

ELECTRIC POWER IN GAS-WORKS.

The current issue of the "Engineering Review" contains an article on this subject by Mr. J. A. Seager, B.Sc., Assoc.M.Inst. C.E., much of which (so far as the description of plant is concerned) is familiar reading to gas-works engineers. The introduction to the article gives the personal views of the author.

Mr. Seager writes: Viewed in the light of present-day experience, it is unfortunate that the starting point of both gas and electric light undertakings was the provision of illumination for the general public. If the motor and the gas-engine had attained widespread use before the carbon lamp and the gas-jet, there is every probability that the essential antagonism of gas and electricity supply would not have been taken for granted by their respective engineers. The question as to whether an electricity supply should be run by town's gas-engines, or the mechanical

operations of a retort-house and yard should be carried out by electric power, would probably have been settled purely on financial and technical grounds; the engineering pros and cons being weighed up without reference to sentiment or animus. As it is, a mutual interchange of power appears to be unthinkable. At one end of the scale, however, we already see the large power gas-engine an accomplished fact for alternator driving; and it is probable that within a very short period the gas-turbine will challenge the steam-driven rotary-engine. We have, on the North-East Coast, one example of the way in which electric lighting has become an altogether secondary problem to the large power-in-bulk supply of electricity. Viewed from the gas engineer's standpoint, the lighting problem of the middle-class population is solved by him; but he has to face either an expensive system of high-pressure gas transmission, involving costly compressing plant, and the possibility of a large percentage leakage, or be content with a short radius distribution, while the electric supply uses three-phase high voltage and goes far afield. The introduction of the mantle in place of the jet has made a heating gas more generally desirable than an illuminating gas; and therefore town gas could approximate much more closely to power gas than was the case in the past. Moreover, the sulphur restrictions are not now so necessary; and town gas will probably develop into as cheaply made a commodity as producer gas. It would, therefore, seem as if, in the future, gas and electric engineers could abandon their differences, and operate conjointly. Possibly the day will come when gas will be made chiefly to feed electric generators and local town lighting and such cases of steady power as can be easily reached by a comparatively compact group of gas-mains, while the electric section will transmit power to the outer circumferences of the area served with minimum losses, for power and traction purposes, together with a supply to such lighting consumers as prefer electricity to gas.

This, of course, is a very big subject which has many conjectural points; but it is necessary to outline the general prospect in order that the next statement may not be misunderstood. In view of the very large extent to which electric power has been adopted in all classes of industries, it is an extraordinary feature (leaving out of count the hampering condition that the introduction of electric power to a gas-works might under the present conditions of antagonism be regarded as giving the wrong kind of advertisement to gas power) that electric power has not been more largely used in gas-works. In no other industry requiring so much power scattered over appreciable distances, and in some cases involving awkward systems of transmission except by electricity, has so little electric power been used; and it is the object of this article to show that such use is technically and commercially possible by describing actual instances of the installation of electric power in gas-works in operation at the present time.

The possible uses of electric power in gas-works may be briefly summarized as follows. On arrival of the coal at the wharf or siding it has to be transferred from the barge or truck to a store, from which it is fed to the retort-house as required. Here it is charged into retorts by machines adapted to the purpose, and after distillation is complete the coke is drawn mechanically. This coke has to be conveyed away to a store, and has to be broken into convenient sizes by coke-breakers. The gas has to be propelled by exhausters or blowers, while the residual liquids have to be pumped to the departments dealing with them. In the application of electric driving for plants erected in gas-works, it is the usual custom, at present, to lay down duplicate generating plant driven by gas-engines, and in consequence independent of any external municipal power station supply, in order to ensure that in the event of the failure of the latter, the gas manufacturer would not be affected.

The degree to which electric power can be advantageously used in gas-works depends to a large extent on their size, as the mechanical operations in a small works are carried out as far as possible by hand, and where power is necessary, steam or compressed air is found suitable over comparatively small radii from the engine-house. Where the question of coal and coke handling becomes an important one, however, electric transmission is found useful from the point of view of convenience in application. The question of efficiency as compared with the gas or steam engine does not enter very largely into the matter, as the mechanical efficiency of the handling plants themselves is so low. [This was shown by a table extracted from a paper by Mr. R. E. Gibson, given before the Liverpool Engineering Society on the "Transport of Materials in Gas-Works."*] The highest of these, excluding the tip waggon and railway, is 39.03 per cent.; and therefore it is no use debating whether for coal and coke handling gas or electric drive is going to give an extra $\frac{1}{2}$ per cent. efficiency—the question is that of convenience.

This point of view is borne out in a letter sent to the writer of the article by West's Gas Improvement Company.

We often find it convenient to apply electric power for the purpose of driving our coal and coke handling plants, owing to the fact that the driving gear is chiefly applied at elevated positions and at a long distance from the main source of power supply. We have also applied electric power to our stoking machines; but we are not prepared to state in this case that it has any advantage over compressed air for this particular purpose—each system having some advantages over the other.

Mr. Seager then proceeds to describe the application of electrical plant to coal loading and conveying plant and to retort charging—reserving other applications for a subsequent article.

JUNIOR INSTITUTION OF ENGINEERS.

Summer Meeting in East Anglia.

Unlike their Seniors, the members of the Junior Institution of Engineers do not read and discuss papers during the summer meetings; the time being solely devoted to the visiting of engineering and other places of interest, alternating with what perhaps might be termed days of "pure" pleasure.

The Council were wise in their choice of venue this year; for East Anglia was found to afford ample material for both divisions of the programme. The district was probably chosen with reference to the workplace of the Institution's distinguished President, Sir J. J. Thomson, F.R.S., who is Professor of Physics in the University of Cambridge. It was really delightful to notice how this great physicist fraternized with all the members—strolling along with them and discussing science in quite a free and easy fashion. Lady Thomson, too, was extremely kind and gracious. Unfortunately, the death of her cousin, the Bishop of Oxford, prevented her from being present at the summer dinner; but the members had the honour of a greeting from her at the "At Home" which was given as the concluding item of the programme "to meet the members of the Junior Institution of Engineers."

The majority of the members attending hailed from the Metropolis; but the Provinces were also well represented—particularly, of course, the eastern counties district. Those present included Mr. H. G. Kettle, of Ipswich, Mr. E. P. Hudson, of Norwich, and Mr. Julian Julian, the Borough Engineer and Surveyor of Cambridge; from Sheffield, there was Mr. J. R. Williams, the Superintendent of the Corporation Tramways Department; from Dublin, Dr. W. E. Lilly, Professor of Mechanical Engineering at Trinity College, and the Institution's Member of Council for Irish districts; and from Swansea, Mr. H. E. Hyne. Of the Council, the attendance list contained the names of the Chairman, Mr. B. E. Dunbar Kilburn, M.A. (Cantab); the Vice-Chairman, Mr. S. Bylander; Mr. Sydney V. Cooke (Hon. Librarian); Mr. G. T. Bullock (Past-Chairman); Mr. Reginald Krall, Assoc. M. Inst. C.E., Mr. J. H. Pearson, M.S.A., and Mr. H. P. Philpot, Wh.Sc., Members of Council; and the Secretary and Treasurer, Mr. Walter T. Dunn, F.C.I.S.

For the convenience of the London contingent, carriages were reserved in the ten a.m. non-stop train from Liverpool Street to Felixstowe on Saturday, July 29—a most enjoyable week-end being spent there, with headquarters at the Felix Hotel.

Visit to Ipswich Engineering Works.

The technical portion of the programme opened on the following Monday morning; the party proceeding by Great Eastern Railway Company's steamer to Ipswich. On arriving, they were met by the Directors of Messrs. Ransomes and Rapier, Limited, and conducted round their works in groups, so that the explanations of the various processes could be heard by every member. The wood-working department consists of two bays—one occupied by the pattern shop and the other by the carpenters' shop. They are well equipped with modern tools of all descriptions. The power-house attracted much attention. It contains three direct-coupled 250-volt steam-driven generating sets; two having an output of 100 k.w. each, and the other is a 200 k.w. set. There are two air compressors, delivering air at a pressure of 100 lbs. per square inch, and a testing set of variable voltage and current for testing electric cranes. Three boilers, fitted with an economizer, supply steam at 150 lbs. pressure per square inch.

The turnery, occupying three bays, contains a number of fine lathes, capstans, planers, gear cutters, and a large boring mill for foundation plates. A 10-ton electric crane commands the centre bay. Three bays of the works are relegated to the girder department, one for the setting out, plate planing, and straightening, one for bending and straightening sections under the hydraulic presses, and sawing off to lengths with band and circular saws, and the third for drilling and riveting—the rivets being heated by oil furnaces burning tar refuse. Overhead electric cranes serve each bay; and there are several single-rail side cranes, besides two 10-ton cranes running outside the shops to the store yard. Various turntables, sluice girders, and overhead crane girders were seen in course of construction. On visiting the foundry—all iron castings are produced at the works—it was seen that the shop was well arranged with core ovens, sand-mixing machines, &c. The iron and coke are lifted to the cupola staging by an electric hoist. There are two cupolas—one of 6 tons, and the other of 4 tons melting capacity per hour.

In the fitting shop, a large boring machine, on which crane sides are bored out when mounted on their own foundations, came in for a good deal of attention, as well as the special drilling and screwing machines. Several cranes were here in process of erection, both those of the steam breakdown and electric overhead type; and there were also on view a refrigerator of the absorption type, concrete mixers, hydraulic buffer stops, and other examples of the works' productions.

In the yard was shown how the final erection and testing of the cranes is carried out by means of various travelling steam-cranes. Among others erected for testing were seen a 3-ton tall electric wharf crane—one of an order of ten for South Africa; a 30-ton steam breakdown crane for India; sluices for India and Canada;

* See "JOURNAL" for Jan. 17 last, p. 163.

water-tanks and hydraulic buffer stops for Egypt; and engine turntables, water-eranes, &c.

The whole party afterwards assembled at the "Crown and Anchor" Hotel to partake of luncheon, on the invitation of Messrs. Ransomes and Rapier—the Chairman and Managing-Director, Mr. Wilfrid Stokes, M.Inst.C.E., presiding. The local guests included the Mayor of Ipswich (Mr. P. W. Cobbold), the Town Clerk (Mr. W. Bantoft), the Borough Surveyor (Mr. E. Buckham), and Mr. Harold Jefferies (of Messrs. Ransomes, Sims, and Jefferies). At the conclusion of luncheon, after "The King" had been honoured, Mr. S. Bylander proposed "The Town and Trade of Ipswich," to which the Mayor replied, prefacing his remarks by a few words of welcome. "Continued prosperity to Messrs. Ransomes and Rapier, Limited," was submitted by Mr. Dunn, and heartily received. Mr. Stokes, after acknowledging it, proposed "The Junior Institution of Engineers," which was responded to by Mr. Kilburn.

The members were then taken in hand by Mr. H. Jefferies, who, with the assistance of the General Manager and heads of the various departments, conducted them over the extensive and busy works of Messrs. Ransomes, Sims, and Jefferies, while the ladies, under the guidance of Mr. Kettle, were shown places of historic and Dickensian interest for which Ipswich is so famed.

As is no doubt generally known, the Orwell works of Messrs. Ransomes, Sims, and Jefferies produce traction engines, road locomotives (simple and compound), small tractors, single and double cylinder portable engines, horizontal and vertical compound, and single cylinder stationary engines, stone corn mills, electric and other power overhead traversing cranes, pneumatic drills, dry back boilers with superheaters, &c.

Probably one of the most interesting instruments shown was the hardness testing machine—the invention of Mr. Brinell, a Swede. This was seen in the tool room near the tool shop. A hardening furnace with automatic pyrometer, buffing, grinding, milling, shaping, and other machines were also examined with keen appreciation, as were the capstan and turret lathes, the special lathes for connecting-rods, valve-rods and axles, the piston-rod grinding, magnetic chucks, cylinder boring machines and drills, slotters, &c.

In the foundry, the excellent system noticeable throughout the whole works was apparent—the sand mixers, six cupolas, special appliances used in the production of iron and brass castings, machine moulding, pneumatic moulding machines, &c. In the smiths' shop were to be seen all in full swing—olivers, hydraulic forging presses, steam and pneumatic hammers, Bradley hammers, bolt-making machines, &c. The boiler-shop, as noisy as ever, gave members the opportunity of seeing how rapidity of execution and accuracy could be simultaneously attained; much thought having evidently been given to the design and arrangement of the plant, consisting of plate furnaces, hydraulic presses, flanging machines, plate rolls, shears, plate-edge planers, air compressor, drills, hydraulic riveters and cranes, electric overhead traversing and power cranes, portable hydraulic riveters, and pneumatic caulking and tapping machines.

In the wood-working department, the visitors' attention was called to a large stock of logs ready for reducing in the saw mills. Here was shown a horizontal log band-saw, saw-sharpening machines, band, circular, and other saws, and sawdust and wood refuse exhausting plant; the boilers being fed with this refuse. Time only permitted of a walk through the thrashing machine department, where the frames and parts of the machine were being expeditiously turned out. Here were to be observed wood lathes, planing, mortising, and sand-papering machines; the processes in the production of metal parts for thrashers and tea machinery. In the machine shop were still more lathes, shapers, slotters, multiple drills, boring machines, &c. Mr. Jefferies, pointed out that all their engines, thrashing machines, &c., are thoroughly tested before leaving the works, so that the high reputation of "British made" shall be maintained beyond the shadow of a doubt. There was so much to occupy the two hours set apart for the Orwell works that it was not possible to visit the Company's lawn-mower works, where the complete manufacture of all kinds of lawn mowers is carried on. It is equipped with its own foundry, machine, erecting, and testing shops, paint shop stores, and warehouses.

Another reunion of the party took place at the "Crown and Anchor" for afternoon tea on the invitation of Messrs. Ransomes, Sims, and Jefferies. The thanks of the members for the extremely interesting afternoon they had spent were expressed by Mr. R. Krall; and Mr. Jefferies having in a few words said how pleased his Company had been to receive the Institution during their visit to Ipswich, the party were shortly afterwards on their way to the station to join the Cromer express for Norwich; dinner being negotiated *en route*. The "Maid's Head" Hotel, so quaint and antiquated, proved a quite comfortable head-quarters during the members' sojourn in the ancient city.

Visit to the Norwich Gas-Works.

On Tuesday morning, the members were met by Mr. Thomas Glover, M.Inst.C.E., the Engineer and General Manager of the Norwich works of the British Gaslight Company, and under his guidance examined with the closest attention the many features of interest for which these works are distinguished. Mr. Glover told his visitors that the annual production of gas was over 574 million cubic feet, about 420½ millions being coal gas and the remainder carburetted water gas. Of coal, 38,000 tons were carbonized annu-

ally, while 156,000 gallons of oil and 238½ tons of coke were used in addition to 5700 tons of coke for the regenerative furnaces for the manufacture of producer gas for heating the retorts. The coal is received from South Yorkshire by water, and delivered on the river alongside the coal-store. It is elevated by a bucket elevator at the rate of 30 tons per hour, and passes through an automatic weighing-machine on to band conveyors which transport it into the store, having a capacity of 7000 tons. Thence it is elevated into hoppers in the retort-house, and from this point transferred to the stoking machine.

The action of the De Brouwer combined charging and discharging machine was explained by Mr. Glover, who pointed out how the current for actuating it was conveyed to, and returned from, the machine by overhead bare cables and trolley arms, at 220 volts pressure. An idea of the power required for working was obtained from the fact that the circuit-breaker is arranged to break the circuit at about 20 amperes less than the fuse-blocks are arranged for on the switchboard in the power-house. These fuse-blocks blow at 100 amperes. The circuit-breaker is a safeguard for all motors on the machine; and in the event of an overload on any of them, it prevents destruction to the armatures or the mechanical breakdown of the machine.

The projector motor is of about 6 H.P., and shunt wound; but on some machines it has been found necessary to use a similar motor of greater power to deal with the modern practice of heavy and full charges. The charging drum is moved on the starter only making about 800 revolutions per minute when it is full on. When about to charge a retort, the speed is accelerated by advancing the handle of the field controller, so putting resistance into the field magnet coils until the motor is working about 1900 revolutions per minute, giving the charging belt a lineal velocity of about 3500 feet per minute when charging. On this speed being attained, the coal-hopper is opened to the feed; the feed motor having previously been started. The coal descends through the telescopic shoot into the grooves of the pulley, and is projected into the retort. As the charging proceeds, the handle of the field controller is gradually lowered, taking out the resistance and diminishing the speed as the charge of coal nears the machine end of the retort.

Upon completion of the charge the coal feed is shut off, and the handle of the field controller is lowered to zero when the motor is running on the starter only, until the machine is ready to deal with the next retort. It is found that about 8½ H.P. maximum is required to completely fill a retort 22 in. by 16 in. by 21 ft.; the time taken being 45 seconds. About 10 H.P. maximum is required to expel the charge; the load, of course, being a decreasing one from the time of starting to push the charge. All the motors are of the enclosed type; and in many cases fins are cast on to facilitate the dissipation of the heat generated. Their positions on the machines are arranged as far away from the bench as possible. In the case of the projector motor, the fan is enclosed in a box. Current is supplied from a 37 k.w. generator of Laurence Scott and Co.'s construction. The same generator supplies power to the motors driving the coke-conveyors.

Mr. Glover showed the members that the machine had the unusual addition of a mechanically operated tray under the charging belt. This device was to enable the "Norwich" chambers, which are 3 feet deep, 12 inches wide, and 21 feet long, to be filled with coal. He explained that the chambers were the first of their kind to be used on a gas-works in this country, and that they were designed with a view to the use of larger units than the ordinary Δ -shaped retorts, and to produce a better quality of coke than ordinary gas coke. Since these chambers had been put into use, by further adaptation of the De Brouwer machine, the Δ -shaped retorts had been filled and longer periods of carbonization adopted. The quality of the coke from the Δ -retorts was now almost equal to that produced from the chambers.

The De Brouwer coke-conveyor, compressed air plant, for the West stoking system, the water-gas plant, including the De Laval turbine running at about 25,000 revolutions per minute, and the mechanics' shop and smithy, were open to inspection; and at the Bishop Bridge works, Mr. Glover showed the exhausters, purifiers, station meters, gasholders, and the workshops of the distribution department. The latest gasholder erected, on the Gadd and Mason spiral-guided system, was seen; the tank being 120 feet in diameter, and 35 feet deep. It has three lifts, and a total capacity of 1,100,000 cubic feet.

At the conclusion of the visit, the ladies, who had been doing some of the sights of Norwich, joined the members; and the party partook of refreshments on the invitation of the Chairman and Directors of the British Gaslight Company. Dr. W. E. Lilly voiced the members' feeling of appreciation of all that had been done to make the visit so pleasant and profitable; and Mr. Glover, in a few well chosen sentences, replied.

Tuesday afternoon was spent in visiting Norwich Castle, by invitation of the Corporation, and under the conductorship of the Curator—Mr. Frank Leney—who was full of interesting information about the wonderful collections of birds, reptiles, historical relics, and other objects under his charge. At four o'clock, the Cathedral was visited, under special arrangements, by courtesy of the Dean; the service being attended subsequently. The music was specially selected, having regard to the attendance of a body of engineers.

An Excursion Day.

Wednesday was fully occupied by an excursion on the Broads, and was greatly enjoyed. Mr. Harold Collins, the Assistant City

Engineer of Norwich, acted as cicerone. The party left Norwich for Wroxham, where launches were in readiness for a morning's cruise to Cottiehall, returning to Wroxham for luncheon at the "Horse Shoes" Hotel. In the afternoon, Salhouse and Ranworth Broads was the programme. After tea at the "Horse Shoes," the party returned to Norwich.

Inspection of Messrs. J. & J. Colman's Works.

The Carrow works of Messrs. J. & J. Colman, Limited, were visited on the following morning, through arrangements due to the courtesy of Dr. James Stuart, M.A., who was formerly Professor of Applied Mechanics at the University of Cambridge, and is now one of the Directors of these great works.

On entering, the members and ladies accompanying them had the pleasure of listening to a succinct lecture, illustrated by specimens, on the subject of the growth and production of the mustard plant, treatment of the seed, and its manufacture into the yellow powder of the dinner table. They were then conducted to the crushing machine room, where the actual making of the mustard commences. From large hoppers and bins the seed rattles down into a whirr of wheels, to be ground and reduced to powder. It has then a certain degree of roughness, which quality disappears in the process of sifting. This is carried out by means of a number of eccentrically revolving tables. All husk and seed are thus effectively separated; white and brown seed being treated separately, and the product mixed in order to form the various qualities of mustard, of which there are about half-a-dozen. The making of the tins was then shown; some extremely ingenious machinery being employed. The oil yielded by the mustard seed is used for various purposes—some for lubricating the machinery at the works. It also possesses medicinal virtues for the treatment of rheumatic complaints, to say nothing of the "sinapism" as the plaster is called, which, when taken off in the morning, does not bring the epidermis away with it.

In making the boxes, the tin plates are run through cutting machines and sheared off into strips of the requisite lengths, dozens at a time. They then pass on to the stamping machines, and bent ready for the bottom to be attached. The bottoms and covers are produced in another stamping machine; all the operations being performed with remarkable celerity. The making of the wood boxes was shown; attention being called to the speed and precision with which the nailing machine worked—the nails being fed from an elevated hopper. The weighing and packing of the mustard, labelling of the tins, and other incidental operations were being carried on, and showed how nimble the human finger could become; the deftness and quickness of the girls engaged on this work being quite astonishing.

The visitors were afterwards taken to see how blue is made. It was explained that there were indigo blue and ultramarine; but the latter was rapidly displacing the former. Indigo was a vegetable, but ultramarine a mineral, and as such could be worked easier and gave quicker results. The powder is carefully weighed and then sent to a circular table perforated with square holes the size of the squares of blue. These are filled with the powder, which is compressed into a solid block. The blocks are then dried for three or four days, after which they are ready for packing.

The starch works were also visited; it being shown that rice was the raw material used in its manufacture. In its first stages, the blocks are dried in ovens heated from 120° to 170° Fahr. They are then carefully scraped to get the outside crust off, and are then wrapped and tied in paper and baked in another set of ovens, after which they are cooled down.

The party were subsequently the guests of Messrs. Colman at luncheon in the Criterion Restaurant—Mr. Adcock in the chair. Mr. Krall expressed the Institution's acknowledgments of the interesting morning the members had spent, and of the hospitality that had been extended to them. Late in the afternoon, the party left Norwich for Cambridge; the "University Arms" Hotel being the head-quarters.

The Hopkinson Laboratory.

The following morning (Friday), the members were welcomed by the President, Professor Sir J. J. Thomson, and Professor Bertram Hopkinson at the Hopkinson Laboratory, over which they were shown, as also over the Physical Laboratory, where Sir Joseph conducted some striking experiments with liquid air. The whole of the apparatus and appliances were fully explained; the members listening with special interest from the fact that Professor Hopkinson is the son of an honoured Past-President, the late Dr. John Hopkinson, F.R.S.

Soon after leaving the laboratories, the party gathered in the Cambridge Guildhall Council Chamber, where they were received in civic state by the Mayor, Alderman G. Stace, J.P. In addressing a few words of welcome to them, he expressed the pleasure felt by the Corporation that Cambridge had been included in the places to be visited during the Institution's itinerary in East Anglia, and said he was sure the members had been greatly edified by their visit that morning to the physical and engineering departments of the University. Sir J. Thomson, in responding, referred to the long period of his residence at Cambridge, and paid a high tribute to the excellent work carried out by the Corporation in seeing to the hygienic well-being of the inhabitants, and in providing means for their recreation. The party were then entertained at luncheon by the Mayor, after which Mr. W. L. Raynes, a member of the Corporation, gave a short recital on the organ in the large hall.

At half-past two, the members assembled in Trinity College

Chapel, where the Organist (Dr. Alan Gray) rendered a selection of music. After this, the President led the party to the famous dining hall of the college, where so many celebrated men have sat, and then on to the college library, designed by Sir Christopher Wren, in which were seen the series of busts by Roubillac, Thorwaldsen's statue of Byron, exquisite earrings by Gibbons, the MSS. of several of Milton's poems, a large collection of coins, and many rare books and manuscripts.

The members attended the service (unaccompanied) in King's College Chapel, and in the evening the Institution's summer dinner was held at the University Arms Hotel—Sir J. J. Thomson in the chair. Among those present were Sir J. Larmor, M.P.; Mr. Mollison, member of the University Senate; Alderman Stace, Mayor of Cambridge; Professor M'Lennan, of the University of Toronto; Mr. Thomas Glover, Engineer and Manager of the Norwich station of the British Gaslight Company; Mr. J. W. Auchterlonie, Engineer and Manager of the Cambridge Gas Company; Dr. W. E. Lilly, of Dublin; and Professor T. H. Richardson, of the Civil Engineering College, Sibpur, Bengal.

After the loyal toasts had been honoured, Mr. S. Bylander proposed "The University and Town of Cambridge, and the Proprietors of the Works, &c., open to the Visit of the Institution during its Summer Meeting in East Anglia." The toast was acknowledged by Sir Joseph Larmor (St. John's College), Alderman Stace, and Mr. Thomas Glover.

Professor Sir J. Thomson, in proposing the toast of "The Universities of our Dominions beyond the Seas," said he had had many opportunities of seeing the facilities which the Universities in the Colonies afforded to students of engineering; and in Canada and the United States they found laboratories admirably equipped for the teaching of engineering. There was a great demand for the students; and practically each year's graduates were absorbed by the engineering profession. In many cases, they could not find enough men for the appointments open. This was a condition of things they would be glad to see in this country.

Professor M'Lennan, in responding to the toast, admitted that they were very proud of their engineering school at Toronto; but he said there were matters on the practical side of engineering to which they might give more attention. One was in respect to the ventilation of their buildings, in which the United Kingdom was far ahead of them. Another was the finish and permanence of their works. British bridges did not fall down as did the bridge over the St. Lawrence. They had much to learn as to the supply of water to their great cities. Typhoid fever was prevalent in the large towns; and at Toronto, while they were on the banks of a lake 200 miles long and 40 miles broad, the public water supply was so bad that they had to drink distilled water. Their engineers were not specially trained in municipal engineering, and so they could not create great works like those furnishing the Manchester and Birmingham water supplies.

Mr. Auchterlonie submitted "The Junior Institution of Engineers." He referred to the important work it was carrying on in the interests of the junior members of the profession, though he said he noticed that many of the existing members could hardly call themselves junior engineers. Their continued association with the Institution must, of course, be of considerable advantage to the younger members, who had the benefit of their companionship and professional help. He also alluded to the devoted work of the Secretary, Mr. Dunn, whom gas engineers also knew well as the Secretary of their own Institution.

Mr. B. E. Dunbar Kilburn, in acknowledging the toast, thanked everyone who had assisted to make the Institution's summer meeting in East Anglia so pleasant and instructive. He said the members sincerely appreciated what had been done for them; and he alluded to the recent election to honorary membership of the Institution of Professor Bertram Hopkinson, of Cambridge, Mr. Thos. Glover, of Norwich, and Mr. Wilfrid Stokes, of Ipswich.

The toasts were interspersed by a programme of music provided by the Chorister Glee Singers (most of them from the College choirs), and was greatly enjoyed.

Cambridge Scientific Instrument Company's Works.

On the following morning the works of the Cambridge Scientific Instrument Company were visited. Here were seen in course of construction all types of pyrometers—including the platinum resistance, the thermo-electric, and the radiation patterns. The platinum resistance pyrometers are usually the most accurate, and are largely used in commercial and scientific work for temperatures up to about 900° C. The Féry radiation pyrometers, which, as "JOURNAL" readers may remember, are manufactured by the Company, were seen, and their construction and application were explained. They can be employed commercially for measuring any temperatures above 600° C, though they are chiefly used for the higher temperatures where the other types of pyrometers are not so suitable. For pottery-kilns, gas-retorts, steel-furnaces, &c., they have an extended application. Thermometers and mechanical instruments were also seen in course of manufacture. Extensometers and repeated impact testing machines were shown. The latter are particularly useful for testing the quality of such steels as are to be used in motor-engine parts, or in any position where they will be subject to repeated reversals of stress. A large comparator was being completed for use in comparing the standards of length which are being employed in the Geodetic Survey of India. Of electrical instruments, the Duddell oscillograph, used for recording alternating current wave-forms on any alternating current circuit up to 50,000 volts, was shown; and the

Einhoven galvanometer, the Duddell thermo-galvanometer, and a large variety of other scientific instruments of all kinds, were seen in actual working condition.

The garden party given by the President and Lady Thomson at "Homeleigh," West Road, Cambridge, formed a most agreeable termination to a week full of interest and enjoyment. A number of notable University people had been invited to meet the members; and the time was pleasantly spent in conversation beneath the trees on the lawn over ices and seasonable articles, and in listening to the stringed orchestra discoursing music.

In the evening the party dispersed in all directions—some to return to London, others to sunny Felixstowe, and others to Ireland and other parts of the kingdom. Thus ended the Juniors' summer meeting of 1911, which was voted as being one of the best arranged in the whole course of the Institution's history.

RECENT GASHOLDER TANK CONSTRUCTIONS IN HOLLAND.

The Dutch paper "De Ingenieur," has published an article on new types of gasholder tanks which have been adopted for gasholders in some Dutch works in recent years. The following summary is taken from the "Journal für Gasbeleuchtung."

Based on the fundamental idea of Intze, that a horizontal iron bracing ring should take up the horizontal forces and only leave the vertical forces to be dealt with, a new patent has been taken out. According to the latter, the inner wall is divided into a number of segments consisting of vertical iron cylindrical bulged walls attached to vertical columns, as shown in fig. 1. The bowed walls transmit the water pressure directly to the vertical columns, so that the resultant R of the left and right hand pressures, P G, is directed by the columns to the centre of the gasholder. If all the columns are propped or stayed on the centre, the construction is in equilibrium.

An example of this type of construction on a large scale is afforded by the gasholder of about 3½ million cubic feet capacity at the Western Gas-Works at Amsterdam, the fundamental prin-

ciple underlying which may be seen from fig. 2. Both the large dimensions of the inner chamber (which has no central column) beneath the gasholder, and the way in which the vertical columns of the inner wall of the tank are relieved of weight during the filling of the annular tank, are very remarkable. The middle of the bottom of the tank is constructed as a reservoir, holding water to a depth of 17 inches instead of, as usual, holding only a little water. The weight of this water causes a pressure on the inclined stays, which transmit it to the forty columns of the inner wall. This makes it possible to have a lighter construction. Notwithstanding careful execution, tangential deflections in the angle-pieces of the props, and deflections from the vertical of some of the vertical columns necessitated two tension-rods being inserted crosswise in each bay in the year 1904.

The construction of the tank of the gasholder of 2,120,000 cubic feet capacity at the Eastern Gas-Works at Amsterdam is shown in fig. 3. This is provided with a heavy compression-ring in order to avoid the deflections referred to; and, on filling, it gave rise to unpleasant surprises. The circular tank consists of an annular base, a cylindrical outer wall, and thirty-six bulged segments, which together form the inner wall. The relief of the weight on the vertical columns when the middle portion was filled with water and the ring was filled at the same time, was attended by a twisting of the whole structure about the axis of the gasholder by 1·18 feet. This incident taught the lesson that cross diagonals should never be omitted whenever they could be applied.

In addition to the tank wholly of iron, a type has been introduced in which iron is retained for the outer wall, but is given up for the base. The difficulty in this construction is in joining the upright wall to the rigid concrete base. Of the different combinations, the construction patented by Scheuss and Cool, which is specially applicable to annular tanks, has been much used. The inner wall of the horizontal base of their annular tank consists of masonry, concrete, or reinforced concrete, and the outer wall of iron or steel, see fig. 4. The advantage of this combination lies in the utilization of the special qualities of the different component materials—i.e., the outer wall is of iron to take up tensional strains; while the inner wall is to take up compression strains and to prevent flexures. Apart therefrom, there is an economy of first cost as compared with the annular iron structure. By using a water-tight iron lining, one-fifth to two-fifths of an inch in thickness over the concrete, which is one with the outer wall, the escape of the tank water is avoided if cracks occur in the inner wall or in the concrete bottom.

In 1904, such a gasholder of 1,060,000 cubic feet capacity was erected at the gas-works on the East Sea Dyke at Rotterdam.

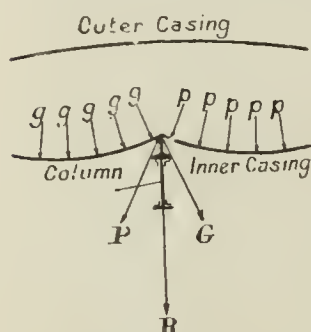


Fig. 1.

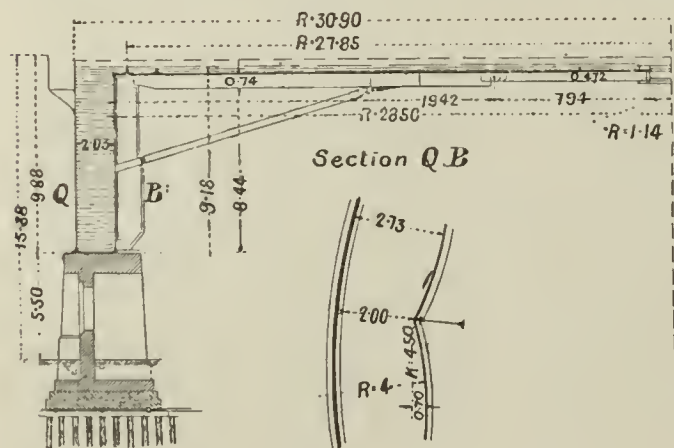


Fig. 2.

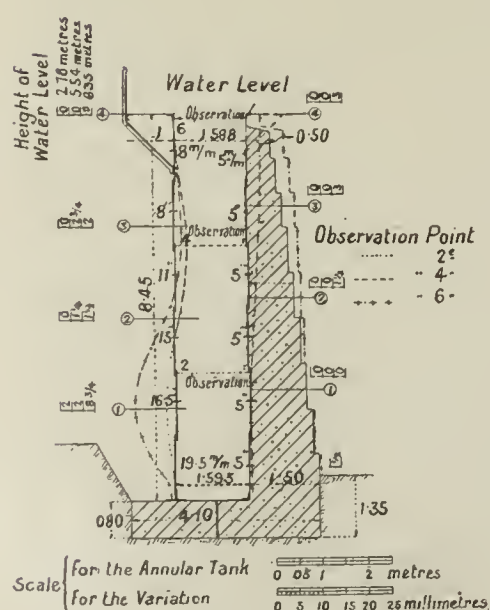


Fig. 3.

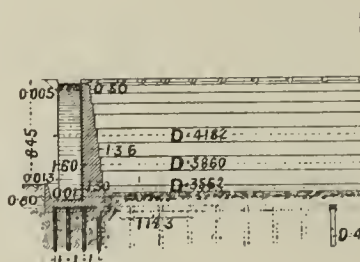


Fig. 4.

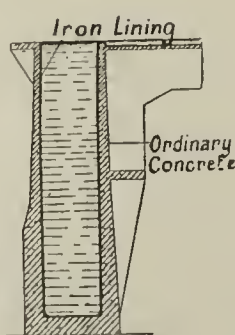


Fig. 5.

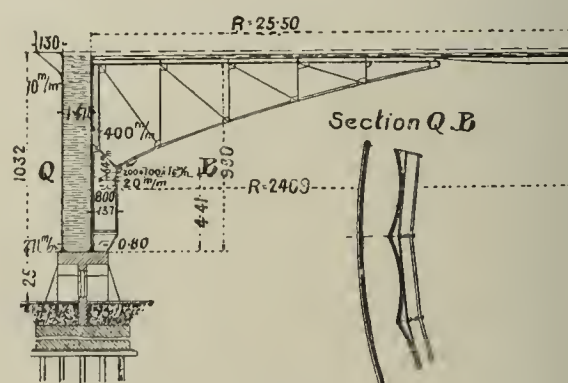


Fig. 6.

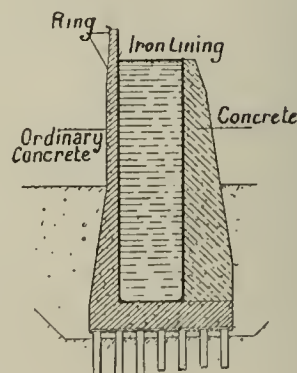


Fig. 7.

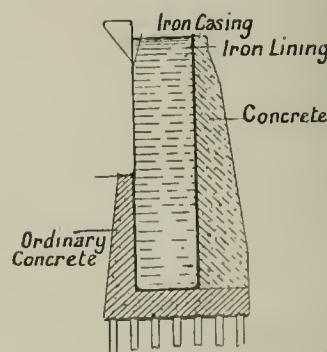


Fig. 8.

The construction of the annular portion of the tank of this holder is shown in fig. 4. There are also, in addition to this holder, in Holland the following specimens of the same construction with or without an accessible inner vault: At Rotterdam, two gasholders of 1,500,000 cubic feet capacity; at The Hague, one of 2,120,000 cubic feet, and one of 2,500,000 cubic feet capacity; at Zwolle, one of 630,000 cubic feet capacity; at North Scharwoude, one of 42,380 cubic feet.

In the first and second cases in which this system was applied at Rotterdam, the tank was, when completed, filled with water in order to test whether the riveted seams were tight and the different parts were sufficiently strong. In four places diametrically opposed, and at four different levels, the alterations in the tank were measured both inside and outside at different levels of the water; and the conclusion was drawn therefrom that the greatest tensional strain occurring in the outer wall did not exceed 17,064 lbs. per square inch. Fig. 5 shows the alteration of the cross section on filling. The iron was soft, and not the hard iron prescribed in the German standard prescriptions; and the concrete for the masonry consisted of one of cement to three of sand and six of gravel.

The use of reinforced concrete for the outer wall of a complete tank, and the use of a compression wall in masonry, concrete, or reinforced concrete, led the Dutch engineers, Rutger and Cool, to the idea of placing the bottom of the gasholder below the level of the ground, in order to circumvent the difficulties of construction with elevated large tanks. They thus avoid the great thickness of the lower portion of the vertical wall and the dangerous bending strains at the junction of the base and side walls. Figs. 6, 7, and 8 show different constructions, of which the one shown in fig. 8, in which the wall is partly of reinforced concrete and partly of iron, is the most economical. Such an outer wall can be used either for a complete tank or an annular tank and in conjunction with an inner wall of concrete or reinforced concrete.

UTILIZATION OF BLAST-FURNACE GAS.

In connection with the fiftieth anniversary of the granting of the Charter of the Massachusetts Institute of Technology, a congress of technology was held at which Mr. E. M. Hagar presented a paper on "The Utilization of Blast-Furnace Waste."

The author pointed out that, until the last decade, practically the only utilization of the wastes or bye-products of a blast-furnace was the use of a portion of the waste gases to raise the temperature of the incoming blast through heating the brickwork in so-called hot stoves; and in some cases a small portion of the power value of the gases was obtained by burning them under boilers to generate steam for driving the blowing-engines. At the present time, the calorific value of the waste gases is being utilized directly in gas-engines for blowing purposes and for generating electric power; a considerable portion of the slag is used in the manufacture of portland cement; and the flue dust, consisting of the finest ore and coke particles, is being collected and converted so as to be chargeable again into the furnaces. He showed that the aggregate saving or profits resulting from these three developments is a matter of millions of dollars per annum, and in a modern blast-furnace plant it would almost seem that pig iron was the bye-product—indeed, the investment in the equipment to utilize these former wastes exceeds that of the blast-furnace itself.

In the course of his work, the writer has come in contact with these evolutions, with plants in operation, or under construction, of a capacity to produce 12,000,000 barrels of portland cement per annum from slag and limestone, using upwards of 1,300,000 tons of slag in a year. These plants are driven entirely by electric current generated by gas-engines directly from the waste blast-furnace gases; the power requirements being 40,000 H.P. for 24 hours every working day. By using the blast-furnace gases directly in combustion engines, after suitable washing to remove the grit, the power obtained from a given amount of gas is equal to at least two-and-a-half times that obtainable by burning the gas under boilers for generating steam for use in steam-engines. A modern blast-furnace of the usual size, with gas blowing-engines and gas-engines driving electric generators, will provide sufficient gas to furnish 7000 kilowatts electric power, in addition to driving its own blowing-engines. This permits the most modern steel-works practically to do away with the use of coal for power purposes; operating the rolling-mills by means of electric power from the surplus gases.

A water-tunnel which had been in service 35 years in Chicago was recently found to be clean, and looking as if it had just been built, according to the City Engineer's report. The tunnel has been abandoned, as it crosses diagonally under the business district of the city, where it is likely to be injured by sinking caissons for deep foundations. It has a 7-feet internal diameter, and is lined with three rings of sewer brick, laid in cement mortar. Inspection of one portion of it showed that most of the old line and grade points as run by the engineers during construction were in position, and a large percentage of the station numbers were still found on the sides of the tunnel. For the entire length inspected, no leaks, cracks, or other defects were apparent.

CORRESPONDENCE.

[We are not responsible for opinions expressed by Correspondents.]

Gas Engineering Workers' Wages.

SIR,—In the issue of the "JOURNAL" for Aug. 15, p. 442, reference is made, under the above heading, to a report that we came to terms with our men after a few days' stoppage. This statement is incorrect. As a matter of fact, the advances were conceded without any stoppage of work on the part of any of our men.

WEST'S GAS IMPROVEMENT COMPANY, LIMITED.

F. J. WEST, General Manager.

Miles Platting, Manchester, Aug. 19, 1911.

Corrosion of Service-Pipes.

SIR,—I will answer the question contained in Mr. M'Leod's letter of last week in true Scotch fashion, by asking others of a far more pertinent character.

Is it correct to speak of a subsoil containing moisture as a moist subsoil? Is it correct to speak of a subsoil containing salt water as a brackish subsoil? If so, then I submit that it cannot be wrong to speak of a subsoil admittedly containing acids as acidiferous. That is the sole question at issue. I have declined, and shall continue to decline, to widen the controversy by following Mr. M'Leod on the other points which his letters have raised.

If it is suggested that it is a question of degree, then my answer is that these and similar terms are simply general descriptions, which possess no exact quantitative value.

Leeds, Aug. 18, 1911.

WALTER HOLE.

PARLIAMENTARY INTELLIGENCE.

HOUSE OF LORDS.

Last Friday, the following Bills, in which readers are interested, received the Royal Assent by Commission: Ashborne and District Gas Bill, Chapel, Whaley, and District Gas Bill, Chasetown Gas Bill, Chester Water Bill, Gas Orders Confirmation Bills (Nos. 1 to 4), Gas and Water Orders Confirmation Bill, Gloucester Corporation Bill, Halifax Corporation Bill, Hornsea Urban District Council Bill, Ipswich Corporation Bill, Kingston-upon-Hull Corporation Bill, Local Government Provisional Orders (Gas) Bills (Nos. 1 and 2), London County Council (General Powers) Bill, Margam Urban District Council Bill, Marple Urban District Council Gas Bill, Merthyr Tydfil Corporation Water Bill, Metropolitan Water Board (New Works) Bill, Northampton Corporation Bill, Oystermouth Urban District Council Bill, Paignton Urban District Council Bill, Rhondda Urban District Council Bill, Rotherham Corporation Bill, St. Helens Corporation Bill, Sidmouth Gas and Electricity Bill, Swansea Gas Bill, Thames Conservancy Bill.

HOUSE OF COMMONS.

South Metropolitan Gas Company's Workmen and the National Insurance Bill.

In the "JOURNAL" last week (p. 429), the answer by the Chancellor of the Exchequer to Sir Henry Kimber's question on the above subject, was given. Sir Henry, it may be remembered, pointed out that the workmen in the employ of the South Metropolitan Gas Company would, under their sick fund, gain all the benefits afforded by the National Insurance Bill, except that relating to maternity, at considerably less expense than under the Bill; and he wished to know whether they, and any similar body who provided not less favourable terms than those offered by the Bill, would be excluded from the compulsory clauses. Mr. Lloyd George replied that as every penny contributed by the employers and workmen under the National Health Insurance would be applied exclusively for the benefit of the workmen under their own administration, it followed that they could not lose through being brought under the Bill, and since they would have the State grant in addition to their own contributions, it further followed that they must gain. If they could so manage the fund as to provide larger benefits than the minimum indicated in the Bill, they would be in a position to enjoy them. He added that he was not prepared to penalize all the best-managed provident funds by withdrawing State aid from them.

Arising out of Sir Henry Kimber's question were several others. Mr. H. W. Forster asked the Chancellor of the Exchequer whether he was prepared to put the Treasury in the position now occupied by the employer, who guaranteed the benefits. Mr. Lloyd George said he thought that, on reflection, the honourable member would be the very last to support such a suggestion, because the only guarantee of good management was that those who managed should suffer if they did badly. Mr. Shirley Benn inquired whether the society to which the gas men in question belonged would be considered an "approved" society within the meaning of the Act. Mr. Lloyd George said that he should not like to answer the question without seeing the conditions. He should not have thought that there would have been the slightest difficulty, under the Bill, in their adapting themselves in such a way as to become an "approved" society.

Cancer among Workers with Pitch.

Some days ago, Mr. Perkins gave notice of his intention to ask the Home Secretary whether, in view of the fact that the spread of cancer among workers with pitch is attributed to the anthracene contained in tar and pitch derived from gas-works, in that tar and pitch coming

from blast-furnaces is free from anthracene, he would take this fact into consideration in the new Home Office regulations, given in the "JOURNAL" for the 1st inst. (p. 293). Mr. Winston Churchill replied to the question on Monday last week as follows: The fact that blast-furnace pitch is much less liable to give rise to cancer is already recognized in the draft regulations which have been issued by the Home Office for the manufacture of patent fuel (briquettes) with the addition of pitch. Factories and workshops in which no pitch other than blast-furnace pitch is used are specifically exempted from the regulations. It is not, however, certain that anthracene is the constituent of ordinary pitch to which the prevalence of cancer in the industry is due.

LEGAL INTELLIGENCE.

COWDENBEATH GAS COMPANY'S SHARES.

Judgment in Favour of the Pursuers.

Last Thursday, Lord ORMDALE issued his judgment in the action by Alex. Waddell and Forbes Waddell against James Hutton, in which evidence was heard before his Lordship in the Court of Session at Edinburgh in July last (see "JOURNAL" for July 11, p. 115). The pursuers sued for £1010 as the amount of the loss they had sustained through the defender not taking up for them the proportion effeiring to their shares of a new issue of 300 shares in December, 1906. The shares were £10 each, but were, it was averred, of the value of £20 each; and the number the pursuers claim to have been entitled to was 101. Defender said that, under the agreement between them, it was not required that the pursuers should get part of the new shares.

Lord ORMDALE, in the course of his speech, said: The first question I have to determine is whether or not the defender, James Hutton, failed to communicate the offer of new shares to the pursuers; and whether they were otherwise aware of the intended issue. The averment of the pursuers is: "He (Hutton), however, did not inform the pursuers of the said offer of shares or of the said intended issue thereof, and the pursuers were not aware thereof." The defender, in answer, admits that he was offered the proportion of shares effeiring to the number of shares registered in his name, "and that he did not inform the pursuers of the offer made to him." *Quoad ultra* he admits the pursuers' averment, and explains that pursuers were aware of the necessity of further capital for the Company, of the contemplated issue of 300 shares, of the intention of James Hutton to take up no more than 79 shares, and of the issue of shares made by the Company. It is perfectly clear that no formal notice was sent to the pursuers of the issue of the new shares. It was not incumbent on the Company to send such notice to the pursuers, for their names were not on the register of shareholders. But the defender Hutton was the Chairman of the Company; and as the other Directors were nominees of his, I have little doubt that the true position of Hutton, with respect to the majority of the shares standing in his name, was perfectly well known to them all. It was certainly quite well known to Mr. Brown Tweedie, who was the Law Agent of the Company, and also of Mr. Hutton. There is no record in the minutes of the Directors of any intention on their part to issue new shares prior to Aug. 28, 1906—the date of the annual meeting of the Company. At that meeting Hutton, who was Chairman, mentioned that the Directors were considering the erection of a coal and coke handling plant, and of a new holder, &c.; that these works would involve the raising of more capital, probably to the extent of £3000; and that the necessary shares would be offered to the present shareholders at par, in proportion to their present holding. The only shareholder, other than the Directors, who was present at the meeting was Mr. Alex. Wilson. There is no doubt Mr. Wilson was an intimate friend of the pursuers; and it was maintained that he informed the pursuers of what passed at the meeting. I do not think that this is proved. On Nov. 19, 1906, at a meeting of the Directors, it was resolved to issue 300 new shares; and the Secretary was empowered to intimate accordingly to the shareholders—"the shares to be offered in the first place to the shareholders of the Company in proportion to their present holding." The Secretary was instructed to name Nov. 28 as the last day on which application could be made, and, further, to call a meeting for Dec. 3 for the allotment of shares. The Directors proceeded to allot the new shares. To the defender Hutton, 79 were allotted, and varying numbers of shares were allotted to seven other persons. The names of three of them were not on the register. They got 80 shares among them; and to Mr. Brown Tweedie, who was already the holder of ten shares, but only as the nominee of Mr. Hutton, and who declined to take up the *pro rata* number offered to him, 80 shares were allotted. Nothing could have been simpler or more straightforward than for the defender Hutton to have given notice to the pursuers of the Directors' resolution of Nov. 19. But the evidence satisfies me that to bring the position early before the pursuers was the last thing the defender desired to do, and that his aim and object was, if he had the legal right to do it, to prevent the pursuers from participating to any extent in the new allotment. I can come to no other conclusion than that the defender deliberately refrained from making the pursuers aware of the intended new issue, and of the course which he proposed to follow with reference to the shares which would be offered to him in respect of those which he already held as security for the advances made to the pursuers. In marked contrast to his conduct on the occasion of this issue, it may be noted that, in connection with the issue of shares made in October, 1905, he intimated to both the pursuers that the Directors proposed to make a further issue, and that the shares would either be taken up by himself or by the firm of Alder and Mackay, whose nominee he was. It is not surprising, therefore, that in cross-examination the defender says: "Between Nov. 19 and Dec. 3 I never intimated to either of the pursuers that I had the offer of the allotment, or consulted them as to what they wanted to be done." The defender's attitude towards the pursuers' right to get an allotment was such that he says that if they had offered him payment of the first instalment on the shares which they maintain should have been offered them, he would have declined to accept it. Such being the position

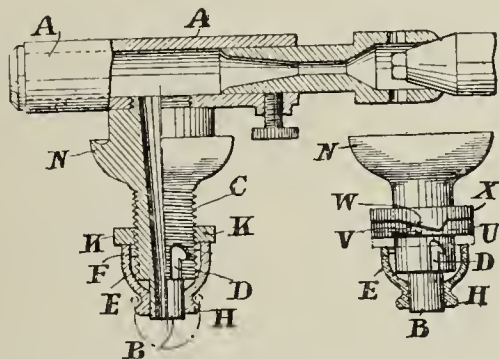
taken up by the defender, it seems to me idle to inquire very closely into the evidence which is said to support the defender's contention that, admitting that the defender did not inform them, the pursuers were aware otherwise of the intended issue of shares. This contention is based mainly on evidence, chiefly that of the defender himself, of meetings between the defender and Alex. Waddell, in the summer and autumn of 1906, and appears to me to be in direct contradiction of the admission made by the defender. It is said that the position was at these meetings disclosed to the pursuer, Alex. Waddell. This is not proved. I think that Alex. Waddell was aware, but only in a general way, that fresh capital would be required. He was also aware that the Directors proposed to bring in outsiders—a course to which he strenuously objected. But it is not proved that Alex. Waddell was made or became aware, before the issue of the shares, of the number that were to be issued, or of the intention of the defender to keep the pursuers from getting any. There seems to be no evidence at all that the pursuer Forbes Waddell had any knowledge whatever of the proposed issue, either from the defender or from his brother, Alex. Waddell; and it is not proved that there was any arrangement that Alex. Waddell was to act in any way for Forbes Waddell in connection with the Company matters. If the pursuers had been a little more alert, they might have ascertained more than they did; but they cannot, because of their inactivity, be held responsible for remaining in ignorance of what was actually occurring, as in a question with the defender, who, *ex hypothesi*, had imposed on him the duty of letting them know about the new issue, and who could have implemented this duty without the slightest difficulty. The next question I have to decide is whether, if the pursuers had been notified of the allotment of 101 shares, they would have been willing and able to take them up. I think it is proved that they would have been perfectly willing to do so. As to their ability to do this, there is more difficulty. They could not themselves have provided the cash—not even, I think, for the first instalment. Nor do I consider that they had the right to insist on the dividends falling to them on the shares held for them by the defender being applied to the acquisition of fresh shares. In my view, the option was—under Article 15 of the agreement with the first parties—to apply the dividends either towards the pursuers' indebtedness to Hutton, or to the purchase of new shares. In point of fact, the total amount of dividends to date had been already applied towards reduction of the debt. On the other hand, the shares, when issued, were worth considerably more than par; and I think that it is a reasonable inference to make from the whole evidence that the pursuers could have, either by obtaining an advance from a bank, or by getting a friend to purchase the shares, after allotment, from them, placed themselves in a position to reap the full benefit of the new issue. It is also clear that the possible financial inability of the pursuers to take up shares was not present for a moment to the defender's mind. The third question is what damage have the pursuers suffered by reason of the defender's failure to notify them of the new issue of shares? This must be answered, in my judgment, according to the value of the shares in December, 1906, when they were issued. I do not think that there is any relevant averment of damage resulting from the alleged loss of control in the management of the Company's affairs. The Dean of Faculty was in a sense well founded in saying that, by the sale of twelve shares by Forbes Waddell in January, 1905, the equality in the management was already lost. But twelve shares were comparatively negligible, as compared with 101 shares. My difficulty is in estimating the value of the so-called right of control. I do not find in the evidence any materials for aiding me to make such a valuation. In considering the question of the value of the shares of the Company as at December, 1906, it has to be kept in view that the Company was really a new concern when it was reconstructed in 1900. In my judgment, the fact that the Company had been reconstructed in 1900 did not tend to make the shares a less desirable investment. It was a prosperous Company from the start in 1900, and after three years' existence paid a dividend of 8 per cent. The next year—1904-5—it paid 9 per cent.; for each of the next three years, 10 per cent.; in 1908-9, 9 per cent.; and in 1909-10, 7½ per cent. Accordingly, in December, 1906, the dividend had steadily risen from 8 to 10 per cent.; and it was known that the Company was in a flourishing condition. I do not propose to examine at length the evidence of Mr. Millar and other witnesses, who found the diminution of the dividend on special causes concerned with the administration of the Company. There had been a further extension of the capital since 1906—viz., in 1909—and it appears natural enough that the comparative profit should diminish until the full benefit of the enhanced capital should be reaped. I see no substantial reason for thinking that the affairs of the Company were administered in anything but a careful and economical way. The payment of capital charges out of revenue, which appears to be, in effect, the point at which the hostile criticism of the pursuers is directed, must ultimately strengthen the financial position of the Company, and so enhance the value of its shares. It may be quite true that there is no market, in the stockbroking sense, for the shares of the Company; but, on the other hand, it seems to me clear that for the shares of such an undertaking there may be, and that in the present instance there truly was, a special market. Anyhow, there does not appear to have been any difficulty on the part of the Waddells, when they wished to dispose of shares, in finding a purchaser. The defender Hutton admits that the shares issued in December, 1906, were worth more than par value. He says £12; but then admits that he might sell his own shares, if he were hard up, for £18. The parties to whom the shares were at that time allotted were keen to get them; and they were all persons who had an intimate knowledge of the Company. On the whole matter, I value the 101 shares, to which the pursuers had right, at £17 10s., as in December, 1906. I believe that a higher price might have been obtained at the time for a small number of them; but if the pursuers had had to sell the whole 101 shares—as I consider they probably would—I think that only a smaller price would have been realized. I think that the possible issue at par, or at a price less than the true market value, of further shares, was present to the minds of purchasers at the prices referred to. I shall accordingly grant decree in favour of the pursuers against the defender Hutton for £757 10s., with interest on this sum at 5 per cent. per annum from June 4, 1908, when the last call was paid, with expenses.

REGISTER OF PATENTS.

Burners for Incandescent Gas-Lamps.

STILL AND SONS, W. M., of Hatton Garden.
No. 17,428; July 22, 1910.

This invention has reference to burners for incandescent gas-lamps of the inverted type, and is more especially designed for use as a high-pressure burner in railway carriage and similar lamps.



Still and Sons' High-Pressure Inverted Burner.

The burner, which is usually screwed into the mixing-tube A, is formed with a lower cylindrical portion B and, above this, with an externally screw threaded portion C, of larger diameter, and in which are formed a number of recesses D of approximately inverted V or equivalent shape; one limb of each recess having its lower end open, and usually being disposed parallel to the axis of the burner. The mantle-support E is in the form of a cup provided with internal lugs F corresponding in number and position to the recesses in the burner, and formed with an aperture in its base through which the lower part of the burner projects, and which it more or less closely fits. The base of the cup has an external bead H, around which the neck of the mantle is contracted. On the upper part of the screw-threaded portion C of the burner is mounted a collar K; the arrangement being such that, the lugs of the mantle support having been caused (by an upward movement followed by a rotary movement) to enter the closed end parts of the inclined limbs of the V-shaped recesses, shaking or disengagement of the mantle support can be prevented by screwing-down the collar until it meets the top of the support. The collar at the same time serves to close the passage M between the support and the burner when the burner does not closely fit the aperture in the base of the support. Usually the burner is formed with an enlargement N, of partly spherical form, above the screw-threaded portion C; and its bore tapers slightly from the upper to the lower end.

As will be understood, the burner may be modified, as shown. Thus, instead of a nut or collar screwed upon a threaded portion, in some cases, a collar U, mounted on a non-threaded part, may be forced and held down upon the support E by co-operating cam surfaces V and W formed on the collar U and a flange X on the burner.

Gas-Burners for Heating Apparatus.

WITHERS, J. S.; a communication from E. G. VAN ZANDT, of
St. Louis, Mo., U.S.A.

Nos. 17,779, 17,780, 17,781; July 26, 1910.

These three allied specifications fully describe many arrangements of gas-heating burners, applicable to several types of apparatus.

The first specification relates more particularly to the class of burner described in patent No. 6763 of 1908; and it has for its object to provide a burner for heaters in which "approximate perfect combustion" is produced in such a manner that all the "poisonous gases of the products of combustion" are consumed, so that thereby "the atmosphere is not impaired by the commingling with it of the poisonous gases." By the burning of these gases, the heat produced thereby is said to be added to the heating effect by means of which the total heat efficiency is very large, and the efficiency of the burner therefore a very good one.

In his prior specification, he described a burner or heater having an initial burner surrounded by a horizontal cylindrical shell which has restricted openings in its flanged ends and a V-shaped longitudinal opening in its top. The present invention includes the above features, and also further improvements in construction which are fully described with reference to five sheets of drawings and pointed out in the claims. These summarized indicate that the arrangement patented comprises an "initial" burner, with a cylindrical shell surrounding it, and having inwardly projecting flanges at its open ends to provide restricted end-vents, and a V-shaped opening in the upper part of its wall, extending longitudinally of the shell and terminating approximately at the flanges. A flat or curved horizontal plate is disposed over the opening at the top of the shell. A plurality of longitudinal or transversely disposed vent openings are provided in and near the top part of the shell or container, and the plate arranged over them. There are openings alone, or openings and projections or tongues combined thereon, extending partly over the openings of the plate, while the openings of the plate are disposed over the openings of the shell.

The second invention is likewise said to relate to gas-burners for heating apparatus, more particularly the class of burner described in patent No. 6763 of 1908; the object of the improvements being "to provide a burner which will bring about almost complete combustion of the gases so as to prevent the dissemination of poisonous gases in the atmosphere, and to burn these poisonous gases so that the heating effect of the burner is correspondingly increased."

Here the claim is for a gas-burner comprising a container or shell of

circular shape, and having a plurality of perforations in the top, or of semi-cylindrical spherical or annular shape and having at the top a restricted slot or slots of V-shaped axial section, and an initial burner within the container, with downwardly and inwardly projecting flanges or retarding partitions around or on opposite sides of the top opening or openings. The burner has a horizontal cylindrical shell with restricted openings at the top, with a large opening in the bottom of the shell. A curved and outwardly-extending flange forms a chamber on each lower edge of the shell; the flange extending upwardly concentrically to the shell so as to form a guide-channel from the chamber, and having its discharge opening or spout adjacent to the openings of the shell. It is provided with openings communicating with the interior of the shell and with the chambers and openings in the top of the latter.

As to the third "invention," it also is a variant of the 1908 patent already referred to. As before, its object is stated to be "to provide an improved gas-burner by means of which the gas may be almost entirely burned, and the products of combustion thereof subjected to heat and air treatment in such a manner that any combustible gases therein, or formed thereby, are also completely consumed." The nature of the invention consists in a shell or container over an initial burner, which shell or container has a closed top and gathers the products of combustion of the initial burning. The thus collected products are subjected to the further heat of the initial burner, until the shell or container is filled, when the products of combustion of the initial burner flow out of the bottom of the shell. The invention consists, further, in such a shell or container and a cylindrical rim, spaced apart from the shell and slightly longer than the shell or container.

Separately Delivering at Equal Pressures Two Gases Received under Unequal Pressures.

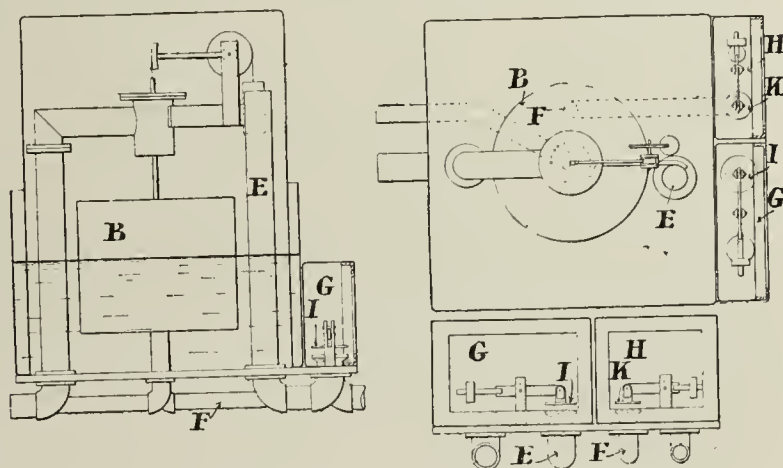
IONIDES, A. C., jun., of Porchester Terrace, Bayswater, W., and
SWAN, J. B., of St. John's Wood, N.W.

No. 18,267; Aug. 2, 1910.

This apparatus, for separately delivering at equal pressures two different gases or fluids received under unequal pressures, is applicable for use in connection with the production of a combustible gas of approximately unvarying composition capable of being readily burnt and formed of a mixture of definite proportions of air with a suitable inflammable gas (preferably ordinary coal gas) within apparatus ready for delivery into the main or before distribution through the service-pipes.

It has been proposed, the patentees explain, to burn acetylene with a mixture of air; the admixture taking place in the flame by conducting the gas and air under equal or proportional pressures to the burner. For this purpose, apparatus has been devised whereby air and gas under unequal pressures have been passed through separate gasholders, the bells of which have controlled inlet valves and have been so connected together that increase of volume in one of the bells caused the valve of that bell to close and open more fully the valve of the other bell, "so that the pressures of air and gas delivered separately to a two-jet burner bear a uniform ratio."

The apparatus suggested comprises a closed chamber, an inverted bell adapted to float in water (or other suitable fluid) to act as a seal contained within the chamber, valved inlets to the chamber, and a bell for the air and gas respectively, and adapted to be controlled by the movement of the bell, and suitable outlets from the chamber and bell for the escape of the air and gas under equal pressures.



Ionides and Swan's Pressure Equalizer.

A front elevation (partly in section) of the apparatus is shown, together with a plan with the covers removed, and a side elevation.

The apparatus comprises a closed chamber containing an inverted floating bell B, adapted to act as a seal, contained within the chamber. C D are valved inlets to the chamber and bell for the air and gas respectively, and adapted to be controlled by the movement of the bell. E F are outlets for the escape of the air and gas under equal pressures to the mixing-chamber (not shown). The bell is counterpoised in any convenient manner—preferably, as shown, by a counterweight, pulley, lever, and flexible connection with the top of the valve spindle. In order to prevent any excess of pressure in the mixing-chamber affecting the proper working of the bell which controls the valves, the outlets E F, instead of opening directly into the mixing-chamber, are arranged to deliver into two separate closed chambers through check valves I K, so arranged that any back-pressure from the mixing-chamber through the outlets of the chamber will cause the valves to close. The air, under pressure, enters through an opening C controlled by a valve, the spindle of which is carried directly by the top of the bell. The gas,

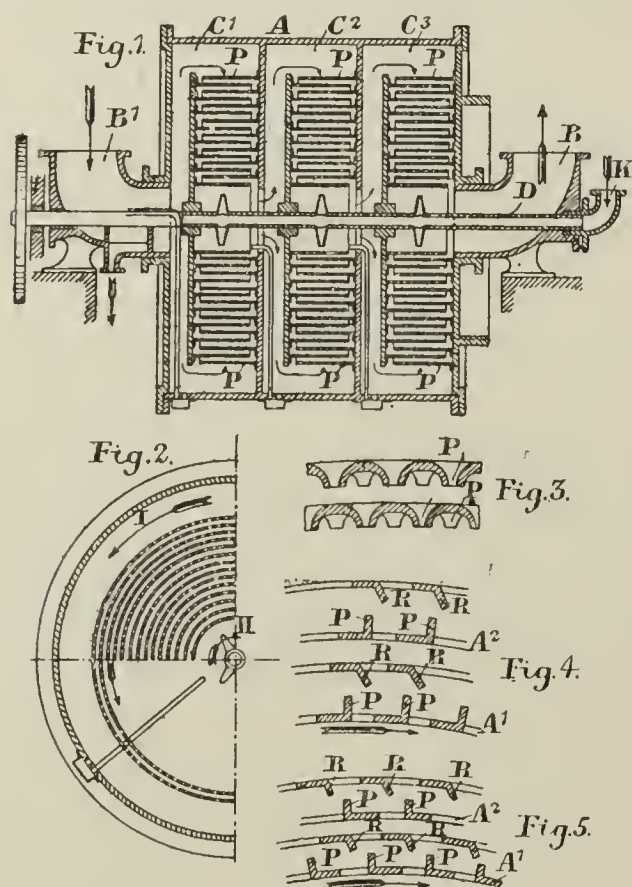
also under pressure, enters beneath the bell by a pipe, the outlet D of which is controlled by a valve whose spindle is also directly carried by the top of the bell. The outlet pipes E F, from the air-chamber and gas-bell respectively, are preferably of less cross sectional area than the inlet pipes to the chamber-bell.

Purifying, Cooling, and Mixing Gases.

THEISEN, H. E., of Munich.

No. 22,433; Sept. 27, 1910.

Apparatus resembling disintegrators for purifying gases are well known, the patentee remarks, in which between concentrically arranged bars mounted on the casing other bars (also concentrically arranged on a revoluble disc) rotate, and in which gas and water are so introduced that a thorough spraying of the water takes place between the bars, and so there is a mixture of the water with the gas to be purified. Disintegrator-like apparatus for washing gases are also known, in which drums provided with apertures are arranged concentrically in a casing, and in which bars rotate (in the intervals between the drums), provided with slots for the purpose of introducing the water. It has also been proposed to pass the gas and liquid between two sets of intermeshing concentric cylindrical plates rotated in opposite directions; the plates being provided, if desired, with slots to secure additional space for the passage of the gas and liquid. In this class of apparatus, the centrifugal action is used to separate out the particles of liquid suspended in the gas and not to disintegrate the washing water admitted at the outer periphery of the conical plates. Further, the outlets for the condensed liquid and the washing water are also at the periphery of the apparatus, so that the washing water can escape before it has been brought into intimate contact with the bulk of the gas being treated. The gas is made to pass through perforations in large drums, so as to provide ample condensation surface for the liquid particles.



Theisen's Gas Purifier and Cooler.

According to the present invention, a similar form of apparatus is used in which the construction is modified in order to bring the washing water and the gas into intimate contact. The apparatus so modified is essentially a disintegrator; the plates being rotated with the object of breaking-up the particles of water as finely as possible, so that the maximum surface is exposed to the gas. Further it is desired to continually expose fresh surfaces of water; and hence the water is made to pass through the whole series of drums, which are arranged either to rotate in opposite directions or for one set of drums to rotate while the other set is held stationary. With this arrangement, the water is sprayed by one drum on to the next, where it is first partially condensed and collected and then sprayed again on to the next drum, and so on through the series of perforated drums.

The apparatus consists substantially of perforated cylinders or conical snells, which rotate relatively to one another or are partly rotating and partly stationary, and which are arranged concentrically in one or more chambers; the apertures of the rotating cylindrical or conical casings being preferably formed as suction nozzles, and the apertures of the fixed cylindrical or conical casings having inwardly bent baffle or deflecting walls and bars. This arrangement is particularly advantageous if the mutually rotating or partly rotating and partly stationary perforated cylindrical or conical casings are constructed in the suction chamber of a centrifugal or fan washer, concentrically with the washer axis, in such a way that the gas must first pass through them before it reaches the centrifugal or fan washer.

Various forms of this disintegrator-like cleaning apparatus are shown in the drawings attached to the specification.

The particular form shown in figs. 1 and 2 consists of a horizontal rotating continuous cylindrical drum A, which has gas inlet and outlet apertures B¹ B², and is mounted in bearings. The shell or outer

drum A is divided by partitions into a number of chambers C¹, C², C³, &c. The partitions between the chambers have circular slots in the middle, and have on the left-hand side concentrically arranged perforated sheet-metal cylinders, while the right-hand side remains free. The cylinders are riveted or screwed to the partitions by angle irons. The drum, with the partitions and the cylinders, rotates in the direction of the arrow I fig. 2.

Discs firmly keyed on a rotary shaft D project into the chambers C¹, C², C³, being mounted in bearings and driven by a belt pulley. The discs have on their right-hand sides concentrically arranged sheet-metal cylinders, which project into the intervals between the other concentric sheet-metal cylinders without encountering the cylinders themselves. The shaft D (with the discs and cylinders) rotates in the direction of the arrow II fig. 2. Spaces are left between the uncoupled right-hand sides of the partitions and the left-hand sides of the discs, as shown.

The gas enters at B¹, and is forced by the partitions to travel forward in the direction of the arrows in fig. 1, in order to reach the gas-outlet B². The washing liquid is carried in an opposite direction. It enters at K, flows through the shaft D, and escapes from it, by means of sprinkling pipes, into the gas-chamber.

In order that the washing liquid may pass from one chamber to another and be carried forward to the end, recesses (provided externally on the periphery of the drum A) are connected by apertures with the respective chambers and by pipes with the interior of the next chamber. The cylinders are provided in any suitable way with apertures as shown in figs. 3, 4, and 5.

Fig. 3 shows an arrangement in which the apertures are conical, and formed in such a way that the portions remaining between them are as round as possible in shape. The drum or casing A may also be arranged so as to be stationary. The apertures of the rotating cylindrical and conical surfaces are then preferably provided with baffle-plates or projections by bending upwards the parts formed when the rectangular and triangular apertures are punched. On the rotation of the apparatus, these projections have a centrifugal action on to the next fixed baffles, which may also be punched out triangularly.

Fig. 4 shows a similar arrangement, in which A¹ A² are the rotating cylindrical and conical surfaces; P the upwardly bent rectangular projections of the rotating cylindrical and conical surfaces; and R the downwardly bent projections of the fixed cylindrical and conical surfaces.

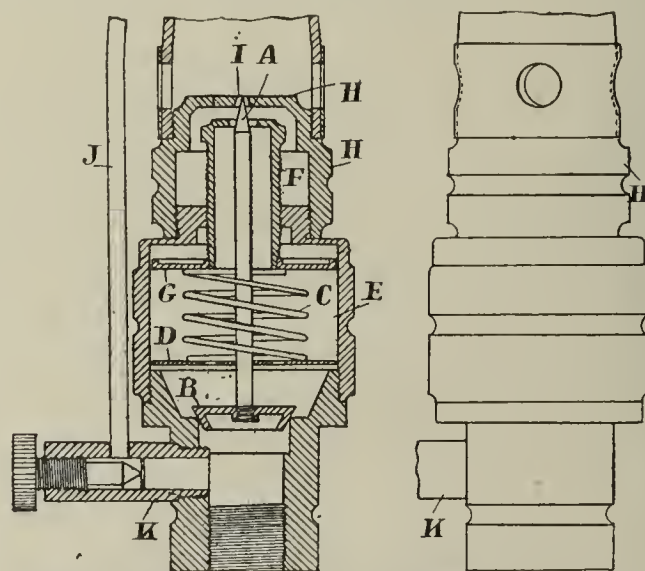
It has been found that deposits of dirt were formed behind the rotating bent up projections shown in fig. 4. In order to avoid this drawback, it is preferable to arrange the apertures directly behind the projections, as in fig. 5, so that the water spurting through them washes clean the rear of the projections, while deposits of dust against the front of the projections P are prevented by the centrifugal force.

Automatic Lighting and Governing Gas-Burners.

KELLEY, F. A., of Ecclesall; DUTCHMAN, E., of Sheffield; JESSOP, S., of Hathersage.

No. 23,036; Oct. 5, 1910.

This invention relates more particularly to a type of gas-burner in which the gas-reservoir is fitted with a plate or cup covering the gas-supply orifice, and having attached to it a conical needle valve reaching upwards into an outlet orifice in the top of the gas-reservoir, and surrounded by a coiled spiral spring; the pressure of the entering gas causing the plate or cup and the conical needle valve to rise or fall, and so close or open the gas-outlet. It is somewhat similar in general arrangement and action to that described in Gozzard's specification No. 1671 of 1909; the improvement consisting in a modification of the internal construction, arrangement, and adjustment of the valve.



Kelley, Dutchman, and Jessop's Regulator Gas-Burner.

The patentees dispense entirely with the independent small cylindrical conical ended valve and its chamber; and in lieu of it form the end of the main valve stalk with a coned end which fits into an inverted seat on the underside of the orifice I, so as to obtain a direct action of the secondary valve A, by the movement of the main or primary valve B. They also dispense with the arrangement of weights by which they are able to make this main valve B of less diameter than the valve in the former patent, so that a smaller surface is exposed to the pressure of the gas, besides which, by dispensing with the weights, it is no longer necessary to open the body of the valve when adjustment is required.

In lieu of the weights, a helical spring C is used, formed of some non-corrosive metal or metallic alloy; and by having a reduced area

of valve, a comparatively small tension on the spring is necessary to keep the day pressure down, so that when the increased night pressure comes on less power is required to lift the valve. On the stalk above the main valve is fixed a flange or disc D (approximately fitting the gas chamber or reservoir E) on which is placed the helical spring, and several small holes are made in the disc in the vicinity of the stalk to facilitate the passage of the gas. In the cover of the gas-chamber is a hollow screwed plug F, of sufficient length to allow of the spring being regulated and adjusted to the required amount of tension, which is effected by a milled collar on its outer end. Across the opening is placed a bridge or guide through which the valve stalk is passed and retained in a central vertical position. On the inner end of the plug a disc G is attached for the upper end of the helical spring to abut against. Above the cover of the gas-chamber is a cap or nipple H, which encloses the plug F; and in the centre of the nipple is a small coned orifice I, the underside of which forms a seat for the conical end of the stalk of the main valve. This constitutes the secondary valve by which the area of the small central orifice in the nipple may be increased or decreased by the varying pressure of gas on the main valve B. By this arrangement, it is only necessary to remove the nipple H to obtain access to the plug F by which the burner may be regulated to suit various pressures.

When the main valve B is closed down on its seat, no gas can pass through this central orifice to the burner; but when a light night pressure is turned on, the main valve has a sufficient lift to allow of a supply of gas to pass through the valve; thence through the orifices in the flange or disc D; and thence into and through the gas-reservoir E, and upwards through the hollow screwed plug F, through the central orifice I in the nipple H in sufficient quantity to allow the burner to give a normal jet for illuminating. As the pressure increases, the main valve lifts higher and proportionately closes the orifice I in the nipple by the secondary conical valve, through which the supply to the burner may be gradually decreased or increased so that a normal illuminating jet may be maintained.

The pilot light J is supplied by a connection K, placed below the main valve B, so that it is not affected by the movement of the valve and remains always alight.

Coke-Ovens and Retort-Furnaces.

STETTINER CHAMOTTE-FABRIK AKTIEN-GESELLSCHAFT, vormals
DIDIER, of Stettin, Germany.

No. 6924; March 20, 1911. Date claimed under International Convention, Sept. 12, 1910.

This invention relates to coke-ovens, retort-furnaces, and the like, used in the manufacture of coke and lighting gas having horizontal heating flues and gas-supply conduits formed in the heating walls between the retort-chambers—the object being “to improve the efficiency of such furnaces.”

Accordingly, the individual heating flues are provided with several gas-supply conduits (each with a regulating valve) opening into the heating flues at different distances from the air-inlet end of the flues. By so arranging the gas-conduits, only a portion of the heating gas is introduced into the heating flues near the air-inlet end, where it is burnt with an excess of air. The products of combustion give off a part of their heat when passing through the heating flues, and their temperature is thus reduced. To replace the heat given off by the

products of combustion, additional supplies of gas are introduced at certain distances in the length of the heating flues; this additional gas combining with the excess of air, already present, and being thus consumed—ensuring “uniform heating of the retorts and therefore economical working of the furnace.”

If the heating flues are horizontal, gas-conduits arranged in this manner may be used in connection with vertical as well as horizontal retorts for gas manufacture, coking, or the like.

A construction of furnace according to the invention is illustrated. Fig. 1 shows the furnace in longitudinal section, on the left-hand side on the line 6, and on the right-hand side on line 7. Fig. 2 is a cross section, which, starting from the left, is carried out on lines 8, 9, 10, 11 of fig. 1. Fig. 3 is a horizontal section, which, starting from the top, follows the lines 12, 13, 14, 15 of fig. 1. Fig. 4 is a vertical section on an enlarged scale through a portion of a gas-distributing box on the line 15 of fig. 3. Fig. 5 is a horizontal section on an enlarged scale through a gas-distributing box on the line 16 of fig. 1.

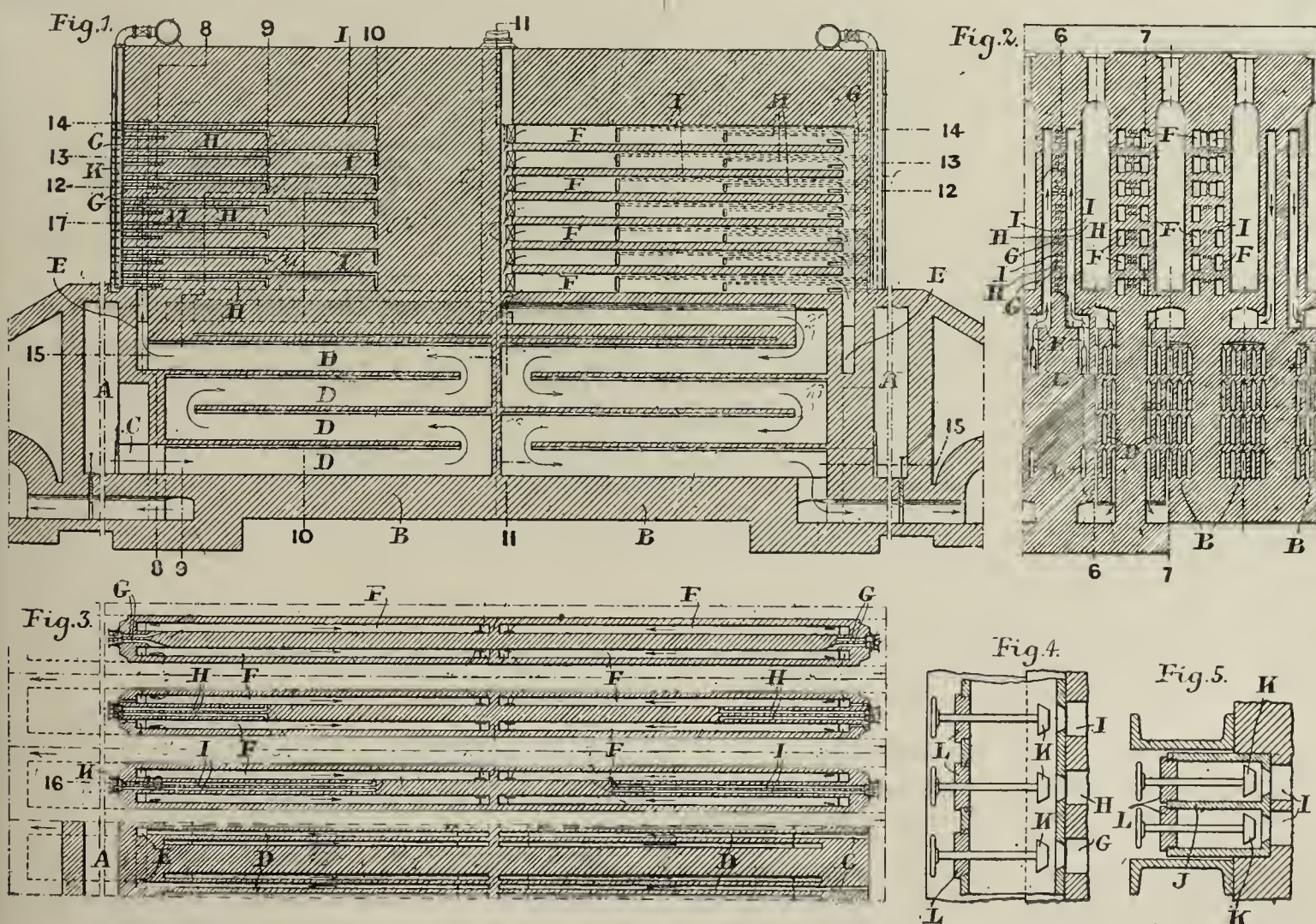
In the example illustrated, a horizontal retort or coking-furnace is shown heated at either end. The retorts extend from one end of the head of the setting to the other, and are separated from each other by heating walls, in which are horizontal heating flues arranged in both halves of the setting, one set being arranged in pairs parallel to each other, and in two vertical series separated from each other by central partitions. In the centre of the setting, partitions are provided between the groups of heating flues of each half of the setting.

The furnace operates in the following manner. Combustion air passes through the tunnel A, below the bottom of the furnace, into the inlet conduits of the recuperators B in each half of the setting; the quantity of the air admitted being regulated by a slide-valve. Owing to the removal of combustion air from the tunnels, fresh air will constantly flow into them; so that they will be properly cooled. From the inlet conduits C the secondary air passes into the superimposed conduits D of each recuperator, through which it flows in the direction of the arrows, and in which it is subjected to preliminary heating. Thereupon the air is admitted through the angular conduits E into the vertical air-distributing conduits at the head of the furnace. From these latter conduits the air passes into the various heating flues F, in amount regulated by valves.

The main quantity of gas required for heating each individual flue F enters the latter through the lowest of the respective conduits G, H, I—i.e., through the conduit G, which opens into the heating-flue near the air-inlet end. The supply of gas delivered by the conduit is burnt in the heating-flue with an excess of air; and the products of combustion, in flowing through the flue towards the centre of the retort-setting, give off a part of their heat to the retorts, and thus the temperature of the gases is reduced.

If only products of combustion which are continually falling in temperature were used to heat the retorts, the latter would not be heated uniformly—that is to say, the amount of heat imparted to them would diminish towards the centre of the setting, so that distillation or coking would be completed in different periods of time and “economical working of the furnace would be prevented.” To replace the heat given off by the products of combustion, additional supplies of gas are introduced through the conduits H I situated above the conduits G into each heating-flue at varying distances from the air-inlet end, and burnt with the excess of air contained in the products of combustion. This “ensures the most uniform heating possible of the retorts” throughout the whole length of the flues.

The height of the outlet openings of the gas-conduits increases, as



Stettiner Retort-Furnace.

shown in fig. 1, towards the centre of the setting—that is to say, towards the discharge end of each heating-flue. Thus, as the excess of air diminishes as the products of combustion pass towards the discharge end of the flues, the mixture of the additional heating gas with the air is facilitated.

Uniform distribution of the heating gas in the pairs of conduits in each half of the heating wall is rendered possible by the arrangement of the vertical partition J (fig. 5) in each gas-distributing box. The quantity of gas flowing from each box into the individual conduits can be regulated by the valve K at the head of the furnace.

As will be seen from the foregoing, the combustion gases always flow in the same direction from each end of the furnace to the centre of the setting through the heating flues F. Owing to the arrangement of the gas-conduits G, H, I, opening into the heating flues at different distances, the heating in the retorts described can be regulated as required by means of the gas-regulating valves K, not only as regards the height, but also as regards the length of the retorts, "so that economical working of the furnace is rendered possible."

The waste gases, on escaping from the heating flues F, pass in front of the valves by means of which the draught produced by the chimney in the flues can be regulated. From the flues the waste gases pass into the vertical conduits arranged in the centre of the setting, and thence into the horizontal sole flues under the retorts. The guiding of the waste gases through these sole flues is merely intended to maintain the temperature in the bottom portion of the setting, but not to assist coking from below. From the sole flues the waste gases, in passing into the recuperator conduits, give off heat to the fresh air flowing in the opposite direction through the adjoining conduits. From the former, the waste gases pass finally to the main or smoke flues leading to the chimney.

By unscrewing and removing the glands L (fig. 4) of the regulating valves K controlling the supply of gas to the conduits G, H, I, these conduits can be cleaned by suitable implements introduced through the openings provided. Any dirt contained in the conduits is then forced towards the centre of the setting, and falls through the outlet openings into the respective heating flues F.

Alternately Lighting and Extinguishing the Main and Bye-Pass Flames of Lamps.

JULIUS PINTSCH AKTIENGESSELLSCHAFT, of Berlin.

No. 26,191; Nov. 10, 1910. Date claimed under International Convention, Dec. 17, 1909.

This invention relates to apparatus for alternately lighting and extinguishing the main and bye-pass flames of (say) railway carriage lamps or the like, in which gas continues to be admitted to the flame which is to be extinguished for a certain time—capable of regulation—before the supply is completely cut off, while the necessary supply of gas is at once admitted to the burner to be lighted.

The apparatus is distinguished, on the one hand, from one class of such apparatus by the fact that the controlling device is operated by gas diverted from the pipe supplying gas to the burner and not used for burning purposes; and, on the other hand, it is distinguished from another class of apparatus having the same object by the fact that the controlling device is actuated by means of the existing pressure in the gas-main, and without raising the pressure temporarily for the purpose.

The gas passes through a regulating cock, and thence to one of two diaphragm chambers according to the position of the regulator cock, while the other diaphragm chamber is open to the atmosphere. The two diaphragm chambers are arranged in a casing, and in one construction are separated by a third chamber connected at one end with the gas supply pipe, and at the other end with the valve casing containing the valve controlling the burner and bye-pass pipes. The two diaphragms are connected together by a rod, and to the latter is attached the lever operating the valve.

Counting Apparatus for Meters.

BESANCON, J., of La Chaux-de-Fonds, Switzerland.

No. 28,885; Dec. 12, 1910.

The patentee points out that in gas, water, electricity, and other meters in which the consumption is indicated by rotatable discs or rollers—of which one indicates the units, a second the tens, and a third the hundreds; and so on—the use of a spiral spring which is periodically tensioned and untensioned to effect the movement of the meter discs or rollers, is known. As, however, the tension of the spring must be dependent upon the speed of rotation of the meter-disc, one end of the spring is connected to the shaft of such meters and moves with it, while the other end may be secured in any adequate manner.

According to the present invention, neither end of the spring is fixed, but each end is connected to a driving wheel, and the wheels are rotated at different speeds; so that the tension of the spring is still dependent upon the speed or number of revolutions. It is not, however, tensioned so rapidly as was hitherto the case. In this manner, it is possible to use smaller springs, and less power is required for the meter than with the known operating mechanism, even though the mechanism is applied to meters in which the shaft rotates fairly rapidly and the units are only indicated at longer periods of time.

Quenching and Removing Coke.

ADOLF BLEICHERT AND CO., of Leipzig-Gohlis, Germany.

No. 3518; Feb. 11, 1911. Date claimed under International Convention, Feb. 11, 1910.

For carrying out the quenching and removing of coke as described in patent No. 19,287 of 1907, the patentees proposed to use electric rope railways in connection with gas-ovens; but they are said to be not always convenient in connection with chamber and coke ovens.

The bulk of the expelled coke necessitates large receptacles—generally too heavy for the structure on which the rope-railway is laid, and specially powerful motors must be provided for the several operations of travelling, lifting, and lowering. Moreover, the local conditions are frequently unsuitable for rope-railways; and a large bulk of coke shot into a tank is liable to splash the water therefrom, and to require considerable time for quenching.

The object of the present invention is to adapt the method referred to, to more convenient use in connection with chamber and coke ovens. According to it, the coke-receptacle is not lowered into, and removed from, a tank which is separately run in front of the respective ovens, but the receptacle and tank are collectively moved in front of the ovens by means of a rope or the like, which, at a conveniently arranged station, also serves for lifting, lowering, and separately removing the receptacle by itself.

APPLICATIONS FOR LETTERS PATENT.

- 17,922.—LOVE, W. C., "Incandescent gas-burner." Aug. 8.
 17,924.—AIRD, K., "Gas-fires." Aug. 8.
 17,943.—HANCOCK, C. E., "Lamps." Aug. 8.
 17,947.—SUTCLIFFE, J. H., "Carburetted air for lighting, heating, or motive power." Aug. 8.
 17,964.—JEWELL, W., "Cooking pan or tin for use with gas and other stoves or cookers." Aug. 8.
 18,002.—MARTINI, F., "Generators for acetylene gas." Aug. 8.
 18,014.—ALRIQ, P., "Breaking and screening coal and coke." Aug. 8.
 18,019.—COOPER, A. G., and WOODROW, D. M., "Purification of illuminating gas." Aug. 9.
 18,076.—TUCKER, J., "Gas-cooking stoves." Aug. 9.
 18,089.—ZEPLER, E., and SUTTON, T. H., "Incandescent gas-mantles." Aug. 10.
 18,108.—RECORD, J. W., and RECORD ELECTRICAL COMPANY, LTD., "Protective coverings for incandescent gas-mantles." Aug. 10.
 18,193.—WOLTERECK, H. C., "Desulphuration of coke." Aug. 11.
 18,206.—BLOCK, L., "Condensing and cooling ammonia." Aug. 11.
 18,222.—HASSALL, W., "Incandescent gas-burners." Aug. 11.
 18,277.—REIS, A., "Producing gas from petroleum and other hydrocarbons." Aug. 12.
 18,307.—WALTERS, J. C., and GOOD, A., "Leakage detecting devices for gas-meters." Aug. 12.
 18,309.—MARCUS, H., "Conveying mechanism." Aug. 12.

Chester United Gas Company.

The accounts presented at the ordinary general meeting of this Company on Monday last week showed a balance of £6466 on the revenue account for the half year ended the 30th of June, and a sum of £5163 available for distribution. The Directors recommended the declaration of an interim dividend on the ordinary stock at the rate of 2½ per cent. In moving the adoption of the report, the Chairman (Mr. J. G. Frost) said that, as they had a balance in hand of £1000 in excess of what was required for dividend, they thought they could safely make some further concessions to the consumers; and they therefore proposed to reduce the price of gas to those using ordinary meters from 2s. 11d. to 2s. 8d. per 1000 cubic feet, subject to the existing scale of discounts. Should, however, the present lamentable state of unrest in the labour market assume more serious national dimensions, the reduction would have to be deferred. The Directors had not thought it wise to refrain from announcing their proposals; but no one who had the slightest interest in the welfare of the country, whether financial or social, could fail to watch with most serious apprehension the momentary tendency of important sections of labour to ignore the advice or counsel even from their own elected leaders. The development or continuance of this tendency must mean something like national ruin, and would certainly preclude the possibility of any reduction in price. The report was adopted, and the dividend recommended declared.

Marseilles Gas and Electricity Supply Last Year.

According to the report of the Directors of the Gas and Electricity Company of Marseilles for the past year, the quantity of gas sold was 1423½ million cubic feet, or 7·77 per cent. more than in 1909. Satisfactory as this result is, it would have been better if the weather had not been so mild. An installation of vertical retorts was brought into use last November, and the results obtained with it are stated to be very satisfactory. There was a considerable increase in the sale of electric energy, for both large and small powers, due in great measure to the low prices which the Company are compelled to charge to meet the competition in this branch of their business. The amount standing to the credit of the profit and loss account at the close of the year was 1,741,381 frs. (£69,655), and after deducting 5 per cent. for the reserve fund, there was a balance of 1,654,311 frs. (£66,176), out of which a dividend of 5 per cent., or 25 frs. per share, was paid. Of the difference, 89,240 frs. (£3570) went to the Municipality, 10 per cent. to the Directors, and the rest was utilized, with a draft upon the reserve, in paying an additional dividend of 2 frs. 50 c. per share. The Municipality profit largely by the Company's prosperity. Apart from the 89,240 frs. above referred to, they were paid for Customs duties and taxes a sum of 607,595 frs. (£24,304), or about 12,000 frs. (£480) more than in 1909. Beyond this, the Company paid last year, in the shape of various other duties, 162,486 frs. (£6499), or an increase of 10,000 frs. (£400) on the sum paid in the preceding year.

The Morecambe Town Council last Tuesday adopted the recommendation of the Gas Committee to accept the tender of Messrs. Parkinson and W. & B. Cowan, Limited, for a new retort-house governor, and agreed to the Committee purchasing a tar-column, an exhaustor regulator, and a twin pressure recorder.

MISCELLANEOUS NEWS.

LIVERPOOL UNITED GAS COMPANY.

Reduction in Price.

The Annual General Meeting of this Company was held last Tuesday—Mr. H. WADE DEACON (the Chairman) presiding.

The accounts presented showed that the total revenue for the year ended the 30th of June was £632,606, of which £513,704 was for gas, £15,183 for meter and stove rents, and £102,993 for residual products. The expenditure on the manufacture of gas was £362,488; on distribution, £58,876; and on management, £22,040; rents, rates, and taxes came to £32,046; and the total expenses were £486,533. The balance carried to the net revenue account was consequently £146,073; and the amount available for distribution was £107,803. The Directors recommended that a dividend for the past half year be declared of 5 per cent. on the ordinary consolidated stock and 3½ per cent. on the 7 per cent. stock.

The CHAIRMAN, in moving the adoption of the report, referred to the Standard Burner Act, and said he was glad to be able to state that since the candle power was reduced they had not received a single complaint. They had had a successful year, and there had been 3 per cent. increase in the quantity of gas sold. The working had been better, and upwards of 12,000 cubic feet of gas per ton of coal had been made. The cost of manufacture was down by about £27,000. The income from the sale of gas was £9000 down, as compared with the previous year, not owing to a reduction in the quantity sold, but to reductions in the price charged. The amount received as rents for stoves had increased by nearly £1000. After paying the usual dividends, there would be £54,620 to be carried forward, which enabled the Directors to again reduce the price of gas. He had pleasure in announcing that they had decided to make a reduction of 2d. per 1000 cubic feet, to come into operation as regards ordinary consumers from the 1st of July last, and as regards users of prepayment meters as from September next.

Mr. J. LISTER seconded the motion, and it was carried unanimously.

The retiring Directors and Auditor having been re-elected, a vote of thanks was accorded to the Chairman, Directors, officials, and staff, for their satisfactory management of the Company's affairs.

CROYDON GAS COMPANY.

The Half-Yearly Meeting of the Company was held last Friday, at the offices, Katherine Street, Croydon—Mr. CHARLES HUSSEY, J.P., in the chair.

The SECRETARY (Mr. W. W. Topley) read the notice convening the meeting; and the Directors' report and the statement of accounts were taken as read.

LARGE INCREASE IN CONSUMPTION.

The CHAIRMAN, in moving the adoption of the report and accounts, said he thought the latter spoke for themselves. They needed little from him in the way of comment—certainly nothing of the nature of justification. One of the most satisfactory features was the increase in the sales of gas. This was at the rate of 8·36 per cent. over those of the corresponding half of last year. For the six months, this represented 52 million cubic feet. In money, notwithstanding that the reductions in price had benefited consumers to the extent of £4208, there was an increase of £3280. This growth in sales had coincided with a greater increase in the number of cookers let on hire than they had secured in any preceding half year. The increase for the six months in gas-stoves on hire, added to the number they had sold in the period, came to 1818. The Company now had on hire 21,363 cookers, and 6472 fires, besides which there must be in use several thousand gas-stoves bought by consumers, either from the Company or direct from the makers. Those on hire alone now bore to the total number of consumers the satisfactory relationship of upwards of 72 per cent. The fact that the increase in the sales of gas was more than proportionate to the increase in the number of consumers warranted the pleasing inference that the use of gas for other purposes as well as those of lighting was growing; and confirmation of this, so far as cooking was concerned, was to be found in the fact that even in the very bright and hot weather that had been experienced they had not only maintained, but substantially improved upon, the daily output. There was little doubt that this year was another instance of the frequent experience of gas companies that sustained hot weather in the early months of summer induced consumers who had not previously cooked by gas to try the experiment; and cooking by gas, once tried, was little likely to be given up when its convenience and economy had been experienced.

POPULARITY OF HIGH-PRESSURE LIGHTING.

The proprietors would have seen from the report that the success so far attained with high-pressure lighting—particularly for the outside illumination of shops—had been such that the Directors had thought it wise to spend a considerable sum in laying a special main for high-pressure gas in the principal retail business thoroughfare—North End, Croydon. They had secured accommodation there for the compressing plant, and had now for some months had several installations working. The advantage of distributing high-pressure gas from their own central station was that consumers were freed from the necessity of providing accommodation for it on their own premises. The Company, for an inclusive quarterly charge, supplied the gas and the lamps, kept them in order, and lighted them for a prearranged number of hours each business day. This gave to the tradesmen who had accepted their offer the best and cheapest outdoor lighting so far discovered, without any trouble to themselves. The favour which the system had met with from those who had adopted it warranted the expectation the Directors confidently held, that this method of shop lighting was

destined to grow considerably. They had seen to it that, in this part of Croydon at all events, they would be able as the days shortened, and business hours of lighting lengthened, to deal promptly with the requirements of the consumers.

EXPENDITURE AND INCOME—COAL AND RESIDUALS.

On the expenditure side of the revenue account, there was little calling for mention. The Engineer was again able to show economies in manufacture; carbonizing results in particular showing a well-marked improvement, which he was glad to say was being maintained. Expenditure generally had increased to a less extent than had the sales of gas. On the credit side, they had the gain of £3280 from gas which he had mentioned, and the extremely good increase of £5808 from residuals—a result to which coke, tar, and sulphate of ammonia had all contributed. The cost of the raw materials of the business—coal and oil—less the revenue from residual products, was the lowest the Company had ever reached. For the coming year, they would be receiving coal at a lower cost than in the past year; and so far as could be seen at present, the prospects from residuals—at all events, coke and tar—were good. The use of tar for road treatment continued to find favour with road authorities. This was a good omen for gas undertakings; for so long as they were content to accept a reasonable price, which nevertheless showed a marked gain over that obtainable for distillation purposes, the demand was likely to be a growing one. The Directors fully appreciated the importance of ensuring that this remunerative outlet should not be restricted by seeking to secure the last possible farthing in price; and while they had felt justified in making a small advance, they had not gone beyond a price at which they were assured the use of tar was remunerative and satisfactory to local authorities. He was sure the proprietors would concur in the wisdom of thus sacrificing a small immediate profit rather than prejudice a growing and profitable trade.

NATIONAL INSURANCE.

Those proprietors who had read reports of recent meetings of other large gas companies and of some railway and other companies would have noticed references to the proposals of the National Insurance Bill in their bearing on the interests of the workmen employed in these undertakings. The position of the workmen of most gas companies differed from that of the general body of workmen throughout the country, in that they were already, generally speaking, better secured against the risks of life than they would be under the provisions of the Bill. Take, for instance, their own workmen. They each contributed to the Company's sick fund 4d. per week (the same amount as under the Bill), and received during illness 10s. per week for the first three months, and 8s. for the next three months, against the 10s. and 5s. the Bill gave them. Moreover, they received this from the first day of illness, and whether or no they were receiving payment in respect of an accident arising out of their work, while the Bill would exclude from payment the first week of illness, and would make no provision for cases coming under the Workmen's Compensation Act. They also received, at the cost of the Company, medical attendance for their wives and families, as well as for themselves, where the Bill would provide these for only themselves. He might say that these facts were some months ago brought by the Directors to the knowledge of the Chancellor of the Exchequer and of the Members of Parliament representing the Company's area of supply; and at a general meeting of the workmen called the previous week by their Engineer and General Manager, a resolution was unanimously passed asking the Directors to secure, if possible, that the present arrangements should not be disturbed.

FURTHER REDUCTION OF PRICE AND INCREASE OF DIVIDEND.

He did not doubt that the proprietors would share with the consumers' satisfaction at the announcement that the Board saw their way to make, after Oct. 1, a further reduction of 1d. in the price of gas—the third reduction within twelve months. The Directors felt that the time had come when the holders of the Company's ordinary stocks might rightly look to receive, in the form of a higher dividend, some small share of the Company's increasing profits. They, therefore, recommended, as would be seen, an increase of ½ per cent. per annum in the dividends on the "A," "B," and "C" stocks. It was interesting to note how these changes illustrated the mutual relationship which now existed between the shareholders, consumers, and employees. The changes made the last twelve months represented to the Company a lessened revenue of about £19,800 per annum. Of this sum, the consumers would gain to the extent of £16,800, the proprietors £1600, and the co-partnership employees £1400.

CO-PARTNERSHIP.

The Directors had every reason to believe that the system of "co-partnership" introduced two-and-a-half years ago was justifying itself in the permanent benefits it conferred on the Company's employees, and also in the gain to the Company from the general and whole-hearted devotion on their part to its interests which the Directors had always appreciated, and never more so than recently. Practically all their permanent employees—some 530 in number—were now co-partners; and of these at least 370 would be, by the end of next month, also stockholders. He was interested to see, from figures laid before him recently, that, while the total amount of bonus credited to the co-partners had been £4373, they had themselves deposited with the Trustees no less a sum than £2645. In other words, they had voluntarily put by, over and above their bonus, no less than 60 per cent. of its amount. Further than this, up to June, no co-partner had, while in the Company's service, withdrawn any sum placed to his credit as bonus. These facts, they might, he thought, refer to with legitimate satisfaction.

ALLOCATION OF THE PROFITS.

Turning now to the appropriation proposed for the available balance of profit. They had written a further £2500 off the old Caterham works. The sum of £1500 had been placed to the credit of the renewals fund. This now amounted to £5200; and it would be needed in the near future to meet the cost of modernizing the washing, scrubbing, and purifying plant of the old section of the works. The carbonizing part had, as most of the proprietors were probably aware,

been already remodelled. The Board also expected shortly to have proposals laid before them by their Engineer for improving the accommodation available at the works for social and recreative purposes, in the form of the workmen's mess and club rooms, bath-rooms, &c. The appropriations gave them, as available for division, the sum of £40,815; and after payment of the dividends recommended, amounting to £23,524 for the half year, the substantial sum of £17,291 would remain to be carried forward—enough to pay, within £6200, next half-year's dividends.

The DEPUTY-CHAIRMAN (Mr. T. Rigby) seconded the motion, which was unanimously carried.

THE DIVIDENDS.

Mr. WILLIAM CASH proposed the declaration of dividends at the rates per annum of 15 per cent. on the "A" stock, 12 per cent. on the "B" and "C" stocks, 5 per cent. on the "D" stock, and 10 per cent. on the "E" stock—all less income-tax.

Mr. PERCY H. HALL seconded the motion, which was unanimously carried.

Proposed by Mr. MAITLAND, and seconded by Mr. SAMSON, a hearty vote of thanks was passed to the Chairman and Directors.

MR. HELPS' RECENT INDISPOSITION.

The CHAIRMAN, on behalf of himself and his colleagues, made due acknowledgment, and then proposed a vote of thanks to the Engineer and General Manager (Mr. James W. Helps), the Secretary, staff, and workmen for their efficient services. He observed that no words were really necessary from him to commend this resolution, as, if their officers and men had not done their duty properly, the Board would never have been able to place such a satisfactory balance-sheet before the proprietors as they were enabled to do that day. On the last occasion, at their meeting, their Engineer and Manager was unfortunately absent through a breakdown in health; and that was the first meeting he had missed since he had been in the service of the Company. The fact that the record was broken grieved him very much indeed. They then passed a vote of sympathy with Mr. Helps, and a telegram was sent to him in Spain, assuring him of the deep regret of the proprietors, and wishing him a speedy return to health. He was with them that day, but not in such good health as they could wish. He was, however, about to have his annual holiday; and they all hoped he would come back refreshed and with renewed energy for the winter campaign. As to Mr. Topley, he was one of the best servants they could possibly have, and the same applied to the members of his staff. As to the workmen, in these unfortunate and troublous times in the labour world, it was something to be able to say that they were on the best of terms with their men at the works. In his opinion, co-partnership was no small factor in cementing good relationships.

Mr. SAMUEL SPENCER seconded the motion, which was carried.

Mr. HELPS, in reply, said it was a great pleasure to him to once again sit there to listen to the words of approbation that had fallen from the lips of the Chairman and Mr. Spencer, and to hear the hearty manner in which the proprietors approved of them. In the case of their Company, they were fortunately a body every part of the machinery of which was working well to the same end, and not at variance. If it were not for this fact, he was sure they would not be so successful or happy as they were. They had one of the best staffs of workmen any gas company could possibly have. They had had a good test of this during the past few months. As many of the proprietors could quite imagine, a gas-works was not an ideal place in which to work during such torrid periods as they had been experiencing. He had frequently of late gone through the retort-houses when the temperature had stood at three figures; and he had never had a single word of complaint from a single workman. The men did their work as cheerfully under these conditions as under the most comfortable circumstances. He wanted to acknowledge the work of Mr. Caddick, his chief assistant at the works, and of Mr. Sandeman, the superintendent of the distribution department; also the loyalty of the secretarial staff, and of the whole of the employees of all ranks. He concluded with an expression of his deep appreciation of the sympathy of the proprietors towards him at the last meeting, and of the telegram which they kindly sent him.

Mr. TOPLEY remarked that the conditions under which they all worked were such that the discharge of their duty was a pleasure. He acknowledged the cordial co-operation of Mr. Anderson, the Assistant-Secretary, and Mr. Haines, the Assistant-Accountant. Regarding the recent illness of Mr. Helps, his absence was keenly felt by all; but there was one matter which assuaged one's regret during the time—a time during which there was a fairly heavy pressure of work—and it was the cordial manner in which all worked together and pulled together to make things go smoothly and well. That these efforts were in a measure successful was shown by the accounts.

The CHAIRMAN, before the proceedings concluded, mentioned that a pressing engagement prevented Mr. Corbet Woodall's presence at the meeting.

ALDERSHOT GAS, WATER, AND LIGHTING COMPANY.

Value of Publicity—Future of Tar.

The Half-Yearly General Meeting of this Company was held on the 11th inst.—Mr. W. T. ROBERTSON (the Chairman) presiding.

The GENERAL MANAGER AND SECRETARY (Mr. R. W. Edwards) read the notice convening the meeting; and the report of the Directors, with the accounts for the six months ended June 30, some figures from which were given in the "JOURNAL" for the 25th ult. (p. 253), was presented.

The CHAIRMAN, in moving the adoption of the report, said there had been increased expenditure for coal and oil during the past half year; but this had been more than neutralized by the improved revenue from residuals. In all the repair accounts, there was evidence of the policy the Directors had pursued for many years of maintaining the plant in a high state of efficiency. It had always been a strong point with them; and they were determined to adhere to the principle of main-

taining the plant in the very best possible condition, and at the same time to exact the very best returns and results consistent with the material and circumstances. The revenue account contained an item for "publicity and advertising" which appeared for the first time, and would increase as the Company's business expanded. Apart from the local advertisements, which necessarily grew owing to the Directors constantly bringing before the public the economical advantages of the use of gas for various purposes, the Company had agreed to support the new movement recently introduced by the Institution of Gas Engineers in respect to the Publicity Fund, the annual subscription to which was on the basis of 2s. 6d. per million cubic feet of gas sold. That the scheme was quite in the right direction, there was no doubt whatever; and provided that the Special Committee who had been appointed to manage the fund fully realized their responsibilities, the Directors were confident as to the benefit the Company, in common with other gas undertakings throughout the kingdom, would derive from so excellent a movement. The revenue from the sale of gas had increased from £18,125 to £19,671; and it was principally under the heads of private consumers and public authorities. The rentals of meters, cookers, and fires also showed an increase during the six months of more than £141; and it was gratifying to see that gas-fires represented nearly £60. This particular account was very pleasing, because it indicated a new departure in the Company's business. The sales of water showed a small, but welcome, increase. Turning to the residual products, with the exception of breeze they showed a gratifying increase. It promised well to see the returns from tar rising; and the Directors hoped they would be still larger in future. Every effort would be made on their part to see that they shared fully in any increase in trade which might be developed in consequence of the wider use of tar for roads. Naturally, this increased demand for tar for the purpose would take off the market a large quantity which had hitherto gone for distillation; and therefore the Directors concluded that the principal bye-product, pitch, would ascend in value owing to these conditions, and consequently improve the general market in this direction. They looked forward very hopefully to the sale of tar in the future. The revenue account was satisfactory; the balance being £9492, against £8221. The amount on the profit and loss account, after payment of the dividends, was £8326, compared with £7496; but £384 had been taken for writing-down investments and £172 for levelling-up the reserves.

The DEPUTY-CHAIRMAN (Dr. F. Stroyan) briefly seconded the motion; and it was carried unanimously.

On the motion of Mr. HUGH FOSTER, seconded by Colonel BARKER, a vote of thanks was very heartily accorded to the Chairman, Directors, management, and staff, for their services.

The CHAIRMAN and Mr. A. F. WILSON (the ex-Chairman) having acknowledged the vote,

Mr. EDWARDS said he was sure the compliment would be much appreciated by all the staff.

This concluded the business of the ordinary meeting.

A special meeting was subsequently held, at which the Directors were authorized to issue £25,000 of stock, plus one-third loan, under the 1903 Order, and a like nominal amount of stock and loan capital under the 1909 Order.

PORTSEA ISLAND GAS COMPANY.

The Ordinary Half-Yearly General Meeting of this Company was held at the Offices, Portsmouth, on the 12th inst.—Mr. R. EDGCOMBE HELLYER (the Chairman) presiding.

The Directors reported that the quantity of gas sold in the six months ended the 30th of June was appreciably in excess of the corresponding period last year—650,762,800 cubic feet, against 613,664,800 cubic feet—and that the number of consumers had steadily increased. The Company's mains had been extended to Porchester; and a supply of gas was being furnished to a number of the residents in the district. The Engineer and General Manager (Mr. J. D. Ashworth) reported that the buildings and plant at the several stations, as well as the mains and meters, had been adequately maintained, and were in efficient working order. The accounts accompanying the report showed that the revenue in the six months was £118,548 and the expenditure £99,521; leaving £19,027 to go to the profit and loss account. The amount available for distribution was £41,025; and the Directors recommended dividends at the rates per annum of 13 per cent. on the "A" and "B" shares, 12 per cent. on the "C" shares, 10 per cent. on the "D" and "E" shares, and 5 per cent. on the stock; leaving a balance of £23,093 to be carried forward.

The CHAIRMAN, in moving the adoption of the report, remarked on the highly satisfactory result of the half-year's working, and pointed out that, compared with the corresponding period of the previous year, the quantity of gas sold showed an increase of 36 million cubic feet, that 1555 more consumers had been supplied, and 920 additional cookers and gas-fires sent out. Against an increase of £1414 in the expenditure, the receipts were £5282 in excess of the first half of 1910, and the net profit was £3968 more.

A SHAREHOLDER criticized the quantity of gas unaccounted for and the profits made in the fittings department, and also objected to the interest and dividend warrants being signed by the Secretary only.

The CHAIRMAN, in reply, pointed out that the percentage of unaccounted-for gas for the half year was 5.34 only, which compared favourably with the experience of other gas undertakings of similar capacity; and that the work and sales executed by the fittings department showed a considerable increase on the previous year, but that the charges to consumers had been reduced in the hope that the introduction of improved fittings and appliances would further popularize and increase the demand for gas. As to the third point, he said the Company's practice conformed with that of other large undertakings, and that safeguards existed against any possible irregularity.

The DEPUTY-CHAIRMAN (Mr. F. M. Aylen) seconded the motion; and it was carried unanimously.

The dividend recommended was declared; and the meeting terminated with a vote of thanks to the Engineer and General Manager, the Secretary (Mr. H. A. Stibbs), and staff generally.

GAS SUPPLY IN NORTH LONDON SUBURBS.

Evidence of the growth of two of the northern suburbs of London is afforded by the half-yearly reports of the North Middlesex and the Southgate and District Gas Companies. That of the former Company was presented to the proprietors yesterday; and the other will be submitted at the meeting of the Southgate Company on Thursday.

Compared with the figures for the six months ended June 30, 1910, there was an increase of 6,481,500 cubic feet, or 6·6 per cent., in the quantity of gas sold by the North Middlesex Company; and there was a better return from residuals. The total revenue was £22,631, and the expenditure £17,919; leaving £4712 to go to the profit and loss account. The amount available for distribution was £8360; and the Directors recommended payment of dividends of £10 10s. and £7 7s. per cent. per annum on the original and additional ordinary capital, and the addition of £474 to the reserve fund. This appropriation came to £4005, and left £4355 to be carried forward.

There was an increase of 8,440,500 cubic feet, or 11·2 per cent., in the quantity of gas sold by the Southgate and District Gas Company in the past half year compared with the first six months of 1910; and the returns from residual products were higher by £260. The total revenue was £18,784, and the expenditure £15,055; leaving £5729 to go to the profit and loss account. The amount available for distribution is £7324; and the Directors recommend the payment of dividends at the rates of 10 and 7 per cent. per annum on the original and additional capital. This will require £3012, and leave £4311 to go to the profit and loss account for the current half year. The good position of the undertaking is shown by the fact that in May last an issue of £5000 of additional capital and a like nominal amount of 5 per cent. preference stock, when offered to the public, realized £12,931.

BOURNEMOUTH GAS AND WATER COMPANY.

Extension of Carbonizing Plant on the Vertical System.

The Ordinary Half-Yearly General Meeting of the Company was held last Friday, at the London offices, No. 90, Cannon Street, E.C.—Mr. G. CRISPE WHITELEY in the chair.

The SECRETARY (Mr. H. A. Plumb, F.C.A.) read the notice convening the meeting; and the Directors' report and the statement of accounts were taken as read. The former stated that, in consequence of the increase in the Company's business, the Directors were engaged in the erection of further plant at the Poole gas-works. Additions to the water-gas plant, new retorts on the vertical system, and further purifiers were in course of erection. The Company's central offices at Poole Hill, Bournemouth, had been reconstructed and enlarged. The supply of water had been adequately maintained; but the demand had been exceptionally heavy in consequence of the dry season lately experienced. Further filtration plant was about to be installed at Wimborne. The revenue account, it was also stated, continued to show satisfactory growth under every head. The Directors recommended the payment of dividends, less income-tax, for the half year at the rate of 6, 7, and 15 per cent. per annum on the preference, "B" ordinary, and the original shares respectively. These dividends would amount to £17,620, and leave a sum of £39,112 to be carried forward. The revenue account showed that the income of the half year amounted to £92,556; and the expenditure to £70,508—the gross profit amounting to £22,048.

The CHAIRMAN, in moving the adoption of the report and accounts, remarked that ever since the leading case of the children of Israel was decided a great many years ago, it had always been held to be a difficult task to make bricks without straw; and he must confess that he found it increasingly difficult to address the proprietors at any length at their meetings, or to say anything of fresh interest, as there was nothing half year by half year but successful working to record in regard to the Company. To tell the simple truth, there had been another excellent half year. There had been increase on all hands; and the Company was as strong, and even stronger, than it had ever been in its history. Having said this, he thought he could commend the accounts to the proprietors, and ask them to pass on, and simply declare the excellent dividends which the report suggested should be paid. There were, however, one or two points of interest perhaps to which he might allude now that he was addressing those present, not only in their individual capacity, but as representatives of the (nearly) 1400 proprietors of the Company. To begin, he thought that, under the circumstances, and with this weather, the water demands had first claim to notice. This had been a wonderful summer; and he knew that the supply of Bournemouth with water had been a work of anxiety and care, and that there had been an unusual strain upon the Company's resources in order to do it satisfactorily and well. He claimed for the Company a certain amount of praise for having got through the strain successfully, and for having supplied the town and district with an adequate quantity of pure and wholesome water during this trying time. To show what it had been like, he might say that, during the last three months, they had had an increase of 43 per cent. in the consumption, compared with the corresponding three months of last year; and that it had often meant constantly pumping into Bournemouth 4½ million gallons of water per day. His friend the Engineer (Mr. Harold W. Woodall) told him this would represent a lake of 1½ acres square, and 14 feet deep. This would give some idea of the work that they had had to do, and some idea also of the resources that the Company possessed, whereby they could do it. They had been able to accomplish this by the forethought of the past; and the Board were now looking to the future, and were making provision for fresh supplies and fresh means for meeting the increased demands for water that Bournemouth and the district would undoubtedly make. Regarding the gas undertaking, they had had an increase in the consumption of gas, and they had, of course, to meet this growth. They were now hard at work extending the plant at the Poole gas-works; and he certainly need not tell the proprietors that

the plant would be of the most up-to-date kind, and the methods of working the most scientific that were now applied. They would have continuous carbonization by means of vertical retorts; and the proprietors would not be surprised to hear this, for they knew it, that the process had been evolved by their own officials, and had been cradled, nurtured, and developed at their own works. There were one or two other matters that called for reference. The chief offices at Bournemouth had for many years been inadequate, and neither worthy of the work that had to be done in them, nor of the Company whose head-quarters they were. The Board had enlarged and improved them; and he thought they were now an ornament to the town. Though a fair amount of money had been expended in decorating and enlarging them, the Company would be amply repaid by the improved working of the staff, and the improved arrangements they could make by having the work done under one roof. It might interest the proprietors to also know that the co-partnership scheme which had now been going on for three years was an absolute and complete success. He addressed a meeting of the staff and the men in July; and he need not say they were pleased with the increased bonus that the Company were able to distribute owing to the reductions that had taken place in the price of gas during the past three years. He might incidentally say that the relationships between the Company and their men were of the most healthy and satisfactory character. Having said this, he thought he could commend the report to the proprietors for their support; their watchwords being—in the past satisfaction, in the present energy and enthusiasm, and in the future complete confidence.

Mr. CORBET WOODALL seconded the motion; and it was unanimously carried.

Moved by the CHAIRMAN, and seconded by Mr. R. HESKETH JONES, dividends were declared at the rates per annum of 15 per cent. on the original shares, 7 per cent. on the "B" shares, and 6 per cent. on the preference shares, all less income-tax.

Proposed by Mr. F. H. PILLEY, and seconded by Mr. J. C. BENWELL, a hearty vote of thanks was passed to the Chairman and Directors.

The CHAIRMAN, having responded, moved a vote of thanks to the Engineer and General Manager, the Secretary, and their respective staffs. He spoke of the admirable manner in which the Company were served by all—from the highest to the lowest.

Mr. WILLIAM CASH seconded the motion, which was cordially agreed to.

Mr. HAROLD WOODALL and Mr. PLUMB acknowledged the vote on behalf of themselves and their staffs.

CROYDON GAS COMPANY AND CO-PARTNERSHIP.

Annual Report of the Committee.

The Co-Partnership Committee of the Croydon Gas Company, of which the Chairman of the Company (Mr. Charles Hussey, J.P.) is the Chairman and the Engineer and General Manager (Mr. James W. Helps, M.Inst.C.E.) the Deputy-Chairman, have presented their report, with an abstract of the accounts, for the year ended the 30th of June. It shows that the bonus for the twelve months was at an average rate of 4 per cent.—i.e., 3 per cent. for the first three months, then 4 per cent. for six months, and 5 per cent. for the remainder of the year. The Committee feel that the co-partners as well as the Company are to be congratulated on the favourable trading results which enabled reductions in the price of gas to be made from Michaelmas, 1910, and Lady Day, 1911. It is regarded as further ground for satisfaction that the results of the half year to June have enabled the Directors to announce a further reduction of 1d., to take effect from the 1st of October next, with the result that the bonus from that date will be at the rate of 6 per cent. The Trustees propose to transfer, as at the end of August, "D" stock (carrying dividend as from July 1, 1911) to co-partners, so far as the amounts to the credit of their respective accounts will admit, at £110 per £100, or £5 10s. for each £5, plus stamp duty.

The Committee note with satisfaction that since the establishment of co-partnership by the Company the amounts paid in by co-partners to the credit of their withdrawable accounts amount to £2645 10s. 3d., or more than 60 per cent. of the sum of £4373 5s. 2d. declared as bonus; and, further, that no co-partner has up to the present, while in the Company's service, withdrawn any sum placed to his credit as bonus. The Committee are glad to be able to state that arrangements, kindly sanctioned by the Directors, have been entered into with the Inland Revenue authorities whereby co-partners receiving wages or salaries not exceeding £2 12s. per week, or £135 per annum, can obtain through the Company, without any formalities, repayment of the amounts deducted as income-tax from their dividend warrants. The Committee emphasize the advantages (especially to the younger men) of the facilities for life insurance on specially favourable terms secured to the Company's employees by the arrangement that has recently been entered into with the Provident Clerks' and General Mutual Life Assurance Association.

In conclusion, the Committee again express the hope that each employee of the Company realizes the mutual advantages of the co-partnership scheme, and appreciates the fact that under it he is directly interested both in the economical working and in the development of the Company's business. They hope also that the co-partners realize the encouragement given, and the facilities now open to employees of the Company, for thrift and saving.

The accounts accompanying the report, which are signed by Mr. William W. Topley, the Secretary to the Company, who is the Secretary to the Committee and also one of the Trustees, show that the combined investment and withdrawable accounts from Jan. 1, 1909, to June 30, 1911, stand as follows: Bonus, £4373; savings, £2646; interest, £187—total, £7206. Withdrawn, £859; invested, £1932; held by trustees for co-partners, £4415—total, £7206. The accounts are certified as correct by the Auditors (Messrs. A. L. Savage and F. F. Wood).

INAUGURATION OF THE LIVESEY MEMORIAL HALL.

Interesting Gathering at the South Suburban Gas-Works.

The Livesey Memorial Hall at the works of the South Suburban Gas Company, an illustrated description of which was given in the "JOURNAL" for the 8th inst. (p. 350), was crowded on Friday evening last by the co-partners in the Company and their friends.

Mr. CHARLES HUNT (the Chairman of the Company) presided; and on the platform were Sir Fortescue Flannery, Bart., M.P., Messrs. Aston, Jabez Light (Deputy-Chairman), Robert Morton, W. G. Waller, C. Ross, S. Y. Shoubridge (Engineer), Charles M. Ohren (Secretary), H. J. Heading, F. J. Jones, W. J. Luther, A. C. Baker, E. Peckham, C. J. Carter, E. S. Morris, and F. Watts.

Mr. CHARLES HUNT, in opening the proceedings, said it was a great disappointment that Mr. Morton was not well enough to occupy the chair, because he was one of Sir George Livesey's oldest friends. As all present were aware, they had met to honour the memory of Sir George Livesey, who would be remembered as the founder of the co-partnership system. He (the Chairman) also recollected that Sir George and Mr. Morton were pioneers in the abolition of Sunday labour in gas-works. In 1871, it was abolished at the Old Kent Road and at Nine Elms; and at the latter place he (the Chairman) was associated with Mr. Morton in the movement. Later on he had the satisfaction of introducing the system at Birmingham. They had hoped to have with them that evening Mr. Frank Livesey, a nephew of Sir George; but, unfortunately, he had met with a slight accident, and his doctor refused to allow him to go out. They were met to inaugurate the building in which they were assembled, in memory of the man whose name would long be a household word among gas workmen; and whose name and memory had penetrated even beyond the confines of the gas industry. It was peculiar that they should be meeting for such a purpose, in view of what was taking place all over the country. Whatever might be their opinions politically or otherwise, he was sure they would all agree that the intimidation that was being exercised outside should be met with stern repression. They all knew that the sick fund associated with the South Suburban Gas Company originated with Sir George Livesey; and it stood to-day as evidence that they could do better than the Government proposed by their National Insurance Bill. They had also their superannuation fund; and they knew what had been done, in connection with their co-partnership scheme, to reduce the number of accidents among them. But while Sir George Livesey was not unmindful of the duties they all had to perform, he also recognized that all work and no play made Jack a very dull boy; and in providing the Institute for the benefit of the employees, he (the Chairman) thought they were doing a work of which Sir George would have highly approved. In addition to the large hall in which they were assembled, there was a billiard-room and a library; and outside there was a tennis-ground and bowling-green. With regard to the library, they hoped first of all to make it a technical one; but it was not intended that it should be technical pure and simple. He found himself that the reading of a real novel was a relaxation and good for him; and he did not see that what was good for him could be bad for any of them.

Mr. JABEZ LIGHT, who followed, referred briefly to the memorial established at the Leeds University in memory of Sir George.

Mr. ROBERT MORTON said he was very pleased to be present as one of Sir George Livesey's oldest friends; and he regretted exceedingly that one of their Directors—Mr. Charles Carpenter—was unable to be with them. But he had a letter from Mr. Carpenter expressing his continued absolute belief in the merits of co-partnership.

Sir FORTESCUE FLANNERY, Bart., M.P., said in a few weeks' time there would be the third anniversary of the loss of a man whose passing away removed from the stage of life one of the greatest social reformers of this generation. To his mind, it was one of the most extraordinary combinations of circumstances that at this period, without any pre-arrangement, but entirely by accident, they should be assembled in such large numbers in contrast with what was happening outside—cities in darkness, anarchy, riot, and bloodshed in some of the largest towns in the North of England; industrial war, almost a revolution; class against class—a condition of things which called for the strong hand of repression in order to maintain law. They were assembled that evening, not merely to honour the memory of a great man, but to celebrate one stage in the progress of a movement which he had initiated, and to which they were all proud to belong—namely, co-partnership, without which he believed there would be no remedy for the state of things which was at present upheaving society in England from the top to the bottom. He had been much interested in reading some of the recent speeches of the chairmen of gas companies. Mr. Carpenter, whose absence they so much deplored, said to his shareholders: "I have to report to you that our relationship with our men in all departments and in all branches was never more satisfactory, never more harmonious, than it is at the present day." The Chairman of the Commercial Gas Company had said practically the same thing. Both of these were co-partnership Companies. On the other hand, Mr. Clynes, M.P., in a speech delivered to an assembly of gas workers recently in the North of England, said that "the position of the labourer in the workshop was a tragedy that would have to be remedied. If the labourer had any grievance, he was not listened to, and was treated little better than a brute beast. He did not altogether blame the foreman and the manager. They were the victims of the present system, and were engaged not only to buy labour, but to bully if necessary." This was a description given by a man who was supposed to know, from one point of view at all events, about the condition of labour in the gas trade. Which was the true and right view? Who would say that labour was bought and bullied in any co-partnership system? These words, reprehensible as they were, indicated the great desire that was being manifested by the workers in this country for more equality, and a more reasonable share in the good things produced by labour. There were two courses open to those who guided the destinies of the people of Great Britain. One was to allow of the continuance of the feeling of unrest and dissatisfaction; and the other was to adopt throughout the whole industrial system, with such modi-

fications as might be necessary to suit each individual case, the system of co-partnership, so that every man who laboured should feel that he had a share, not only in the daily reward, but in the ultimate result of the whole of the operations in which he was concerned. This was a large ambition, and it might be that none of those present would live to see it fulfilled; but that it would ultimately come to pass he had no doubt. They were met together, not only to celebrate the great movement of which Sir George Livesey was the originator and pioneer, but to express the love and esteem they felt for the man himself. The hall reflected great credit on Mr. Shoubridge, the architect, and the builders; and it would ever serve to keep alive the memory of one whose name would be cherished, alike by those who knew him and those who had benefited by his labours, with feelings of imperishable gratitude.

Mr. E. S. MORRIS said he deemed it a privilege and an honour to be associated in the management of the South Suburban Gas Company, not so much on account of its success and importance, but chiefly because they were the pioneers in a great field of industrial economics and social reform. It was gratifying to know that the cause of co-partnership continued to make such a steady advance as to justify them in the continued hope that the day would ultimately arrive when organized industry as a whole might adopt some form of co-partnership, and when industrial warfare, such as that now taking place throughout the country, would be impossible. Year by year the example set by the South Suburban Gas Company was being followed by ever-increasing numbers. They did not need to be reminded of the advantages of a system under which capital and labour each received its due reward, and the working man ceased to be a mere wage-earner, and became a partner in a great democratic organization, sharing in the success of the undertaking. Mr. Henry Vivian, the Labour Member for Birkenhead, said, with reference to co-partnership, that it infused into the employee the spirit of hopefulness, workshop patriotism, and that wider interest in life which sprang from an individual feeling that he was a conscious contributor to a great and creditable achievement such as the organization of a large and successful business enterprise. On the occasion of the last annual meeting of the Labour Co-Partnership Association, Mr. Corbet Woodall, in the course of his Presidential Address, conveyed the same idea. He (Mr. Morris) was quite sure that the spirit to which Mr. Vivian referred was infused in every man in the hall. There was no room for class differences in their ranks; their interests were the same, and the goal of their undivided aim was the well-being of the Company as a whole—employer and employed alike. It was because of this unanimity of purpose and solidarity of effort that he ventured with confidence to prophesy the continued success and prosperity of the South Suburban Gas Company. He was convinced that they would regard the hall as a sacred trust, never forgetting that bricks and mortar, and even pictures and busts, were but symbols and tokens, and that the only true memorial to their leader and teacher must still be sought in their lives and the uses they put them to.

Mr. W. G. WALLER, on behalf of the employees, wished to thank the Board for the gift of the magnificent hall, which he said was another instance of the great interest the Board took in the well-being of the employees, and would strengthen that feeling of unity and brotherhood which had been the characteristic of the Company for many years past. The hall would serve to remind them, and those who would follow them, of the untiring goodness of the late Sir George Livesey to the gas industry of the country.

Mr. C. ROSS also briefly thanked the Board.

Mr. F. J. JONES supplied some interesting statistics from the co-partnership books of the Company. He said the bonus on the 31st of January last, at the rate of 6½ per cent., amounted to £3539. The total amount of bonus paid from the commencement in 1894 to 1911 inclusive was £20,453; and the amount of stock held by 503 co-partners represented £23,628. In addition to this, they had on deposit with the Company £514 on withdrawal account, and £274 on trust account—a total of £788. There were 15 co-partners who had purchased or were purchasing houses through the building society.

Mr. W. J. LUTHER proposed a vote of thanks to the Chairman and Board of Directors.

Mr. COLE, in seconding the motion, said the hall would stand as a monument to the generosity of the Board, and would keep fresh in their minds the name of the founder of the policy of co-partnership.

The motion having been carried by acclamation,

The CHAIRMAN, in returning thanks, said he hoped all the employees would make full use of the hall. Sir George Livesey frequently in his addresses referred to the scriptural injunction: "Do unto others as you would they should do unto you;" and he thought it would be a good thing to display this motto in some conspicuous place in the hall.

This closed the business; and the remainder of the evening was devoted to music.

Taking Water from Hydrants.—On Monday last week, James Hampton, a traction-engine driver, was fined 5s. and 14s. costs by the Croydon County Justices for taking water from a street hydrant. The defendant had used a spanner to turn on the water, which he wanted for his boiler. It was explained that the use of spanners wore off the corners of the stopcock, and the real danger was that if a fire occurred the proper appliances might slip, and result in considerable delay in getting water.

Elsecar, Wentworth, and Hoyland Gas Company.—The accounts presented at the recent annual general meeting of this Company showed that the revenue in the twelve months ended June 30 last amounted to £6096, and the expenditure to £4701; leaving a balance of £1395 to go to the profit and loss account. The amount available for distribution was £2740; and a dividend of 10 per cent. was declared, less income-tax. Under the supervision of the Manager (Mr. William Stenton), the quantity of gas manufactured during the twelve months was 35,754,200 cubic feet, against 35,101,700 cubic feet the previous year—an increase of 652,500 cubic feet. The sale of gas went up 1,193,900 cubic feet. There was a decrease of 158,300 cubic feet through ordinary meters; but the prepayment meters showed an increase of 1,340,300 cubic feet, and the public lamps of 11,900 cubic feet. The plant and works were maintained out of revenue.

BECKTON GAS WORKERS.

[From a LOCAL CORRESPONDENT.]

In the midst of the widespread agitation in the industrial world, statements have been published that the men employed at the Beckton works of the Gaslight and Coke Company had also become restive. The foundation for these statements is very slender. During the past week, some of the men in the carbonizing department have held meetings among themselves of a more or less informal character, the end of which was that an application was made for an increase of pay at the rate of 1s. per shift over and above the prices now ruling.

The request was put before the Manager of the works (Mr. J. N. Reeson); and it was arranged that on Sunday morning he should meet the men. As appointed, Mr. Reeson had an interview with the men inside the works; and it is understood that he then informed them that, at the present time, a number of the Directors were away, and nothing could be done; but, when they returned, the facts would be put before them for their consideration.

With such a number of men as are employed at Beckton, the effects of the recent trouble among the men close at hand in the docks and on the wharves were almost certain to drift among them. But there is no cause for alarm. True, a member of the local Council is reported to have said, during the late labour troubles, that they would "have the Beckton men out;" but there are no signs which would indicate that the men are prepared to take this drastic course.

In considering the present position, there are certain important factors which cannot be ignored. Most of the permanent men in the employ of the Company come within the ambit of the co-partnership scheme—a scheme which has been loudly condemned by the local Trade Union officials; and it is inconceivable that the men would strike, and thus surrender their partnership unless they had very good grounds for so doing. Up to the present at any rate, there has been no public agitation which would warrant this assumption. On the other hand, there is now a great deal of what may be called casual labour at Beckton. The men do their day's work, and are paid off; and although their employment may be practically permanent, they are none the less placed on quite a different footing from the men who are permanent servants of the Company. These men are not at all well organized—indeed, not 50 per cent. of them are members of the Gas Workers' Union. Whatever may happen later on, the operation of the co-partnership system and the lack of organization among the gas workers are facts which cannot be gainsaid or overlooked in a review of the situation.

On Sunday morning a public meeting was arranged by the Gas Workers' Union on the piece of vacant land opposite the Central Park, East Ham. The chair was taken by Mr. W. Ryall, the Secretary of the East Ham branch of the Union, and the speakers included Councillor Oakes, J.P., the Deputy Mayor of East Ham, and Mr. W. Lock, of Lambeth, a member of the District Committee. The meeting was unusually well attended—about 1000 men being present.

The CHAIRMAN said the Union had convened the meeting, because they wanted all the Beckton men to come within their ranks; and he made an appeal to them to do so. He had arranged the meeting because he had heard that the men were prepared to come back to the organization which they were responsible for founding. Was it not time that the men should join the organization which "protected" them? He understood that the men at Beckton had that morning held a meeting in "Blackleg Square." Why was it that the men had called the meeting? It indicated that they were dissatisfied.

Mr. W. Lock spoke of the great industrial upheavals which had taken place recently in the industrial world. In the past, the Gas Workers' Union had obtained better pay for the men, in the eight hours' day, than they previously had when they worked ten hours a day. When the men were properly organized, there would be no blacklegs. Though a long way from being properly organized, they would never stop till they had brought that about.

Councillor OAKES, J.P. (a member of the East Ham Bench of Magistrates, a borough in which the Beckton Gas-Works are situate), said it was time that all of them realized the value of trade unionism. Twenty-two years ago it was thought necessary; and it seemed strange that they should have to argue now that it was necessary for men to organize in order to protect their own interest. However, it appeared that it had to be done again; and he hoped that in the new movement things would be done better than had been done in the past. The men in Beckton secured years ago an eight-hour day and certain other improvements; and had they continued members of the organization, the same conditions would have remained that day, and would have been improved upon. If the men joined the organization, they would gain all they were justly entitled to.

The CHAIRMAN said he had just received the information that after all the trouble of going to "Blackleg Square" and interviewing Mr. Reeson, they had come back without anything being decided. What were the men asking for? All they asked for was an extra shilling a day all round. He could assure them that if the men would stick to the Union, the Union would stand by them. He appealed to the Beckton men, because this meeting had been called specially for them. He asked them to once again become members of the Gas Workers' Union; and although much had been done in 1889, more could be done in 1911. The meeting was a great encouragement; for it was the largest they had had for several years.

Swinton and Mexborough Gas-Works Purchase.—At a meeting of the Joint Gas Board of the Swinton and Mexborough District Councils last Wednesday, Alderman J. H. Watson referred to the award of the Umpire in the arbitration proceedings in connection with the acquisition of the undertaking of the Gas Company, as given in the "JOURNAL" last week (p. 433). He said the award had been made soon enough to enable the Board to take over the concern by the 30th of September, and to come into possession for the last quarter of the year. He defended the action of the two Councils in acquiring the undertaking, and said he was convinced that it would be in proper hands and a benefit to the people.

A PUBLIC LIGHTING CONTRACT AT NORTHALLERTON.

Ignoring Suggestions by the Gas Company—A Contract for Electricity Not in Accordance with the Invitation for Tenders.

The Northallerton District Council have just entered into a new contract with the Electricity Company; and a comment on their methods of procedure appears in another part of this issue of the "JOURNAL." In the matter of this new contract, the Council seem to have studiously given the go-by to the Gas Company, both in the terms of their invitation to tender, and in ignoring altogether a communication the Company made to them on the subject. Notwithstanding this communication, the Company heard nothing more from the Council—the only intimation that a new contract (and that for five years instead of two, according to the terms of the invitation) had been entered into being through the channel of the local newspapers. The story is a very interesting one. It opens with the following letter from the Clerk to the District Council:

July 5, 1911.

The Secretary, Gas Company, Northallerton.
Dear Sir,—This Council will be pleased to receive tenders for the town lighting as follows:

- (1) For the whole of the town.
- (2) For the main street and South Parade.
- (3) For the side and back streets.

Sealed tenders, marked "Tender for Lighting," to be sent to me on or before the 15th inst. The Council wish you to quote a price per 100 hours for 16, 32, and 800 candle power.

The Company to provide all plant, and comply with the directions of the Council as to the times of lighting. The Company to light and put out all lamps.

You will, of course, understand that the Council may accept your tender for either No. 2 or No. 3, and not for the other. The contract will be for two years.

(Signed) W. FOWLE.

Referring to this invitation, the Secretary of the Gas Company (Mr. Thomas Harrison), acting upon the instructions of his Board, forwarded the following letter to the District Council:

July 14, 1911.

Gentlemen,—In reply to yours of 5th inst., asking for tenders for the town lighting with 800, 32, and 16 candle power light, we beg respectfully to point out that 800-candle power lights are not suitable for gas lighting, but that a much more satisfactory result can be obtained by distributing the light over the same area—that is, by having a greater number of lights of (say) 100 or 200 candle power per lamp.

We suggested two years ago that your Council would allot a portion of the town, and this Company would provide and fix the latest form of incandescent lamps, for comparison of cost and light. We feel sure that this arrangement would give most satisfaction to you.

We need not remind you that this Company are large ratepayers, and claim your consideration in dealing with this matter.

THOS. HARRISON.

No notice whatever was taken of this communication; and the next that was heard of the matter was after the publication of the following proceedings at a recent meeting of the Council.

Mr. HAMILTON presented the General Committee's minutes for adoption, and stated that the Committee only received one tender for the lighting of the town. It had been decided to adopt the tender from the Electric Light Company for each arc lamp burning 100 hours, 13s.; for each 32-candle power lamp per 100 hours in the main street, 3s.; for each 32-candle power lamp per 100 hours in a side street, 3s. 9d.; for each 16-candle power lamp per 100 hours in any street, 2s. 6d.

The CHAIRMAN (Mr. H. Clidero) stated that a further letter had been received from the Company, to the effect that during the last year of the present contract the whole of the 32-candle incandescent lamps had been replaced by others equal to 45-candle power; thus improving the general illumination of the town and at no extra cost to the Council. If the Company were again favoured with the contract, these lights would be continued. If the Council were prepared to enter into a contract for five years, the Directors would allow a discount of 5 per cent. off the quarterly accounts. Taking the payments for the last five years, this would be a saving of £100, or £20 per annum.

Mr. HAMILTON said it was only after deep consideration that the Committee asked the Council to adopt the contract for five years. It would be a matter of saving £100 in five years. It seemed rather a big step; but it would be a considerable saving to the town. In any case, it would pay the Council to accept the tender for two years, and with the discount for five years.

Mr. JAMESON said it was not possible for the Gas Company to tender under the specifications sent out. In all probability they would have had to instal different plant; and if they had known a tender would have been accepted for five years, they might have submitted one. He did not think the tender for five years should be adopted, even if the rebate were given, as he thought it wrong to tie the hands of members who might come into the Council in future. He moved an amendment that the minutes be confirmed, with the exception that the tender be accepted for two years instead of five years.

Mr. EATON inquired if the specifications for tendering were the same as before, which included one for the main street and another for the side streets. While admitting that the main street was well lighted, many people who lived on the outskirts of the town had good reason to complain of the lighting of the side streets. If the Gas Company had tendered for the side streets, they would have offered to put up incandescent burners, and these streets would be better lighted than they were at the present time.

Mr. HAMILTON, in reply to the question, said the tenders were the same as hitherto.

Mr. WALKER inquired if the tenders had to be sent to the Chairman sealed, and if he had received any.

The CHAIRMAN replied that he had not received any tender. Mr. Fowle spoke to Mr. Hamilton about the tender being left to the Council; but Mr. Hamilton had pointed out that the Committee always dealt with them.

Mr. WALKER asked for the reading of the minute on this.

The CLERK read it; but no mention was made about tenders having to be sent to the Chairman, and opened only in the full Council.

Mr. WALKER said he saw one specification sent out which stated that sealed tenders had to be sent to the Chairman of the Council. If the matter were left over until next month, he could produce the specification which was sent to the Gas Company.

Mr. EATON said he never knew a gas company to quote for 800-candle power. Did anyone else?

Mr. HAMILTON said that when the lighting question was under consideration, 1000-candle lights were mentioned; but, in order that the Gas Company might tender, this was reduced to 800-candle power, and they had tendered for this light.

Mr. JAMESON said the light was not 800-candle power, but was marked 350-candle power, as Mr. Hamilton could discover.

Mr. HAMILTON replied that he was not interested in either Company, but wanted the best lighting for the town.

Mr. WALKER pursued his point about the specification to the Gas Company being different from others, and asked on whose authority the tenders were sent out.

Mr. HAMILTON replied that it was on the authority of the Council. At the last meeting he said the tenders were on the table, if members wished to examine them; and if they did not do so, it was not his fault. The present was not the time to dispute them.

Mr. WOODHEAD remarked that by adopting the tender for five years they would save £100, which amounted to almost $\frac{1}{4}$ d. rate on the year.

Mr. EATON said it was hardly fair to accept a tender for five years when firms were only asked to tender for two.

The CHAIRMAN then put the motion that the tender be for five years, and five voted for and five against it. He then gave his casting vote for the motion.

LEYDEN MUNICIPAL GAS UNDERTAKING.

Report for the Year 1910.

The following particulars of the working of the Leyden Municipal gas undertaking for the year 1910 are abstracted from the full report of the Leyden Municipal Gas and Electricity Works for the year, for a copy of which we are indebted to Heer N. W. van Doesburgh, the Manager of the undertakings.

The constitution of the Leyden Corporation Gas and Electricity Committee is unchanged. The Committee decided last November to increase the wages of all weekly employees by 50 cents. (10d.) The purchase of land for the extension of the works, referred to in the previous year's report, [see "JOURNAL," Vol. CXI., p. 346], was completed. The gas supply of a number of suburbs, mostly by means of high-pressure mains, was undertaken in the course of the year. A contract was made, in conjunction with the Municipal Gas-Works at The Hague, for the supply of 21,000 tons of Westphalian and 4000 tons of English gas coal; and agreements were also made for the sale of the year's production of coal-gas tar and water-gas tar to Paris and Rotterdam firms. The capital expenditure of 771,140 florins (£64,262) is being incurred for extensions of the gas-works and coke plant. The accounts of the gas undertaking show a gross profit for the year of 109,637.52 florins (£9136), and, after paying interest and redemption charges, a net profit of 43,196.22 florins (£3600). The profit is rather lower than in the preceding year.

The carbonizing plant consists at the present time of nineteen beds, each of eight retorts. Some of the settings and portions of the carburetted water-gas plant have been renewed during the year. The new plant for the manufacture of sulphate of ammonia was brought into use on Jan. 15, and the old plant for the concentration of liquor was done away with. On Jan. 27, a fire broke out in the coke-store; but it was soon isolated, and only 12,265 bushels of poor coke were consumed. On March 17, it was discovered that the coal in the large store was overheated. A portion of it was at once carbonized, and the rest removed. A new store was erected during the year, with an electric lift. At the pumping-station, a twin governor was installed in connection with the gas supply to suburbs. In the suburbs of Leiderdorp and Warmond, gasholders of 17,658 cubic feet capacity each were erected; and in the suburb of Rijnsburg, one of 28,253 cubic feet capacity was erected in connection with the arrangements for the supply of gas to these districts. A supply of meters and apparatus for use in these suburbs was also purchased. This work necessitated the laying of a number of new mains in connection with the distributing system. The total length of main now is 48 $\frac{1}{2}$ miles. The average pressure of the gas supply in the centre of the town was 15.4.10ths of an inch.

The coal carbonized in the course of the year amounted to 25,661 metric tons. The average make of gas was 10,833 cubic feet per English ton of coal. The total make of gas was 348,230,134 cubic feet, of which 21.43 per cent. was carburetted water gas and the remainder coal gas. This make shows an increase of 2.97 per cent. on that for 1909. There were used in the production of 1000 cubic feet of carburetted water gas 20.78 lbs. of oil, and 49.7 lbs. of coke. The largest make of gas in a day was 1,456,114 cubic feet, and the smallest 453,811 cubic feet. The gross calorific power of the gas made was 593 B.Th.U. per cubic foot. The gas contained 22.3 grains of sulphur per 100 cubic feet. The unaccounted-for gas amounted to 4.33 per cent., as compared with 3.55 per cent. in the previous year. About 64 per cent. of the total make of gas was sold through ordinary meters at the price of 2s. 7d. per 1000 cubic feet; and 18.66 per cent. through prepayment meters, with which the price was 3s. 1d. per 1000 cubic feet. The receipts from the sale of coke were less than in the preceding year; but the receipts from ammonia and tar were greater.

All over the country the effects of the late long-continued drought are being felt, and measures have been resorted to in order to conserve as long as possible the stores of water. The inhabitants of the Metropolis have the satisfaction of learning that the Water Board have in the reservoirs controlled by them about 7000 million gallons of water; so that there need not have been any fear of a curtailment of the supply even if the drought had continued for some time longer.

BURNLEY CORPORATION GAS UNDERTAKING.

Annual Report of the Engineer.

The Gas Engineer of the Burnley Corporation (Mr. J. P. Leather) has presented to the Gas Committee his report for the year ended the 31st of March. It furnishes the following particulars.

There was an increase of 62,606,000 cubic feet, or 9.04 per cent., in the make of gas compared with the preceding year, when the increase was 3.04 per cent. The total make was 755,184,000 cubic feet, apportioned as follows: Sold, 647,864,468 cubic feet; consumed in the public lamps, 52,756,000 cubic feet; used on the works, 7,921,100 cubic feet; unaccounted for, 46,642,432 cubic feet (6.17 per cent. on the make). There are now 2834 public lamps in the borough, or 59 more than at the close of the year 1909-10. The amount receivable for gas sold by meter (less discounts, allowances, and irrecoverables) was £74,546. Out of the 755,184,000 cubic feet of gas made, 248,865,000 cubic feet, or 32.9 per cent., was oil gas. In the production of coal gas, 46,349 tons of coal were carbonized. This works out to 10,904 cubic feet per ton, compared with 10,339 cubic feet before. For making the oil gas, 633,504 gallons of oil were used, or 2.54 gallons per 1000 cubic feet, against 2.67 gallons before. The average illuminating power of the gas supplied was 18.36 candles; and the sulphur average was 7.66 grains per 100 cubic feet. The figures for the preceding year were 17.67 candles and 11.85 grains.

There was a decrease of 78 in the number of ordinary meters in use, and an increase of 515 in the prepayment meters. The total number of meters in use now is 26,840, of which 13,904, or 51.8 per cent., are of the prepayment class. The amount of money collected from the prepayment meters was £26,359 15s. 2d., which corresponds to 200,292,668 cubic feet of gas. The average number of these meters in use at one time was about 13,640; the average annual consumption of gas per meter, therefore, was 14,680 cubic feet. In 1909-10, the average was only 14,200 cubic feet. There are now 10,997 small breakfast cookers in use with prepayment meters. The business done in the gas-stove department during the year was as follows: 114 cookers and 75 gas-fires were sold direct, and 468 cookers and 6 gas-fires were fixed on the hire-purchase system. The number of cookers on simple hire is 24 less, and of gas-fires 5 less, than reported last year.

Mr. Leather gives the following table showing the total amount of business done since the Gas Committee commenced to let stoves on hire:—

	Cooking-Stoves.	Gas-Fires.	Total.
Sold direct since May, 1883	2,041	1978	4,019
Sold on hire-purchase (purchase completed)	5,872	427	6,299
Do. (purchase not completed)	2,050	113	2,163
Now on hire.	306	147	453
Total	10,269	2665	12,934

The total length of mains laid in the twelve months covered by the report was 5176 yards, and 720 yards were taken up; making a net increase of 4456 yards. There were 497 services laid to new property during the year.

GAS-WORKS EXTENSIONS AT RISCA.

Local Government Board Inquiry.

At the Offices of the Risca Urban District Council last Wednesday, an inquiry was held by Mr. P. M. CROSTHWAITE, M.Inst.C.E., into an application made by the Council to the Local Government Board for authority to borrow £20,000 for the construction of gas-works and extensions of plant.

Mr. F. J. WALMSLEY, the Deputy-Clerk to the Council, explained that the area of the district was 4195 acres. The population in 1901 was 9661, and at the present time 14,149; and the assessable value was £45,637. The outstanding loans were £28,009 under the Sanitary Act, £47,250 under the Gas-Works Act, and £34,750 under the Gas and Water Act.

Mr. G. S. DAVIES, the Gas Manager, said the existing arrangements were insufficient, particularly as the Council had to supply part of another district. The make of gas last year was 23,537,000 cubic feet, and the consumption 18,000,000 cubic feet. The maximum day's output was 104,000 cubic feet; and the gasholder capacity was 7000 cubic feet. The carbonizing plant was just equal to the demand; but they had no stand-by plant. They could turn out 104,000 cubic feet a day continuously, and without inconvenience. They proposed to put in seven new retorts without furnaces. At present they had 24. They would provide two purifiers, which would increase their purifying plant 80 per cent., and two condensers, which would increase this portion of the plant by 60 to 80 per cent. They would put in a new governor, and erect a new gasholder with a capacity of 120,000 cubic feet—an increase of more than 100 per cent. They were also going to instal sulphate of ammonia and gas-compressing plant, erect a governor-house, a retort-house, and a shed for the sulphate plant, together with the necessary stores and offices, and lay a steel main and subsidiary main.

Mr. TREVOR C. GRIFFITHS, Clerk to the Mynyddislwyn District Council, said there were a great many details which would have to be settled. The district for which they were making provision was a part of Monmouthshire that was growing at an enormous rate; and the arrangements would have to be made accordingly. A great quantity of the pipes would be laid in the district over which his Council had control. The Bedwellty Council proposed buying the Blackwood Gas-Works, and as it would not be good policy for the Council to be distributing in Mynyddislwyn, the Council of the latter place were considering the question of buying a portion of these works. The Risca mains, &c., might be purchased by his Council, as well, later on; so they had a right to see that the mains put down were of sufficient dimensions to serve an estimated population for a considerable time to come.

This closed the inquiry.

SKEGNESS DISTRICT COUNCIL AND THE GAS=WORKS.

Proposed Purchase.

At the Monthly Meeting of the Skegness Urban District Council last Tuesday, the Chairman (Mr. Shelley) moved that a Committee of all the members of the Council be appointed to meet in October to consider the advisability of acquiring the gas-works for the benefit of the town. The Local Authority, he said, made a great mistake in 1902 in not obtaining a purchase clause when the Skegness Gas Company applied for a Provisional Order. There should be no monopoly in commodities that were essential for the welfare of the people. He believed the Company was a sound and profitable undertaking, and in his opinion it would be better for it to be in the hands of the town. The increase in the quantity of gas consumed last year was no less than a million cubic feet compared with the previous year. There was a long list of towns which were relieving the rates to a considerable extent by having control of the gas supply. Mr. Ball seconded the motion. Mr. Canning moved, as an amendment, that before the Committee met the Clerk should write to the Company asking if they were willing to sell, and, if so, to state their price. He said that as a Council they were mortgaged as high as they ought to be; but there could be no harm in acquiring a profitable undertaking. The resolution, as amended, was carried unanimously.

MUNICIPAL EMPLOYEES AND NON-UNIONISTS.

A Vigorous Protest against Coercion.

The leaders of the Municipal Employees' Association in Lancashire are engaged in an active campaign which aims at compelling committees of corporations to employ only Trade Union labour in the different departments. At the Albion Hotel, Manchester, a meeting was held last Wednesday night of representatives from Manchester, Salford, Bury, Heywood, Stalybridge, Middleton, Ashton-under-Lyne, Oldham, and other towns, to consider the matter. After reports had been presented from the different places represented, it was resolved to confirm the resolution passed by the Manchester and Salford Municipal employees, that no member of the Association should continue to work with a non-unionist after the 31st inst., due notice to be given to the authorities concerned. Sir Bosdin T. Leech, the Chairman of the Water Committee of the Manchester Corporation, dealing with the subject, says: "Combination for self-defence and self-protection is commendable; but as every virtue carried to excess becomes a vice, so combination in the shape of tyranny, exercised to destroy the liberty of the subject and to take the bread out of the mouths of industrious working people, is both hateful and iniquitous. . . . Toleration is met by tyranny. The Council in the past have not penalized combinations or Trade Unions. The service has been open to all. They have adopted Standing Orders that ensure fair wages being paid in all contracts, and they have agreed that 25s. per week shall be the minimum wage. As a rule, Corporation servants have higher wages and shorter hours than private firms, besides which they have secure situations. An attempt to dictate who shall be employed is now on the carpet. The Council are to be degraded and told by outside agitators whom they shall employ. Old and independent

employees must bow to the caprice of Trade Unionists or be ruined." Sir Bosdin adds that he will be surprised if the Council do not resent the proposed dictation and let it be known that they will protect those who desire to remain outside the Trade Union, and, further, that they will discharge anyone who interferes with the liberty of his fellow-workman. He points out that gangers with 25s. and 30s. per week, if driven into the Trade Union, will be in the difficult position of having to serve their paymasters, the Corporation, and also the Trade Union officials to whom the men will appeal. He says there is no objection to Trade Unionists asking their brethren to join them; but he submits that they have no right to use the argument of force.

NOTES FROM SCOTLAND.

From Our Own Correspondent.

Saturday.

The decision of Lord Ormidale in the action relating to the allotment of shares in the Cowdenbeath Gas Company, given in the "Legal Intelligence" column, is not satisfactory reading, in respect of its proximity upon the evidence and its apparent leaving out of account altogether the circumstance that there was an agreement between the parties, and an agreement which was not as originally framed, but which was amended by the parties after the adventure had run a considerable course. The Judge had already [see "JOURNAL," Vol. CXII., p. 729] decided that, under the agreements, the possibility of new shares being offered to the pursuers was in the contemplation of the parties. But this decision was brought under review of the Second Division, who, while approving of Lord Ormidale taking a proof in the case, were of opinion that it was not necessary to decide finally any of the questions raised [see "JOURNAL," Vol. CXIII., p. 613]. The case was manifestly sent back to Lord Ormidale to ascertain the facts, and to apply his mind to the facts, keeping the agreements in view. As I read the judgment just issued, Lord Ormidale assumes that his interpretation of the agreements when he gave his previous decision was acquiesced in, and that he did not require to give further consideration to these documents. I do not say he is wrong in such an assumption; but it would have been more satisfactory, to my mind, if he had brought out clearly how far the agreements were or were not respected in what was done. I am not familiar with the agreements, and so cannot say how the case would be affected by taking them into consideration; but, as the decision has been given, it appears to me that it does not exhaust the matter. The agreements appear to lie at the foundation of the case—in fact, I incline to the opinion that, had there been less of the formal and legal agreement, and more of the commercial transaction as between man and man, the likelihood is that there would have been no necessity for the unfortunate litigation which has arisen.

Bailie Taylor, the Convener of the Gas Committee of the Greenock Corporation, speaking on the gas accounts for the year, stated that they showed a balance of £6330; and that it was recommended that the price of gas be reduced to ordinary consumers by 2d., making it 2s. 7d. per 1000 cubic feet, and for power purposes by 3d., making it 2s. 3d. The price would be 1d. lower than it had ever been. The quantity of gas manufactured was the largest on record. Bailie Taylor spoke very highly of the labour and skill of the Manager—Mr. J. M'Leod. He moved the adoption of the rates proposed, and that the Gas

GAS COMPANIES' STOCK AND SHARE LIST.

Referred to on p. 475.

Issue.	Share.	When ex-Dividend.	Dividend or Dividend & Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.	Issue.	Share.	When ex-Dividend.	Dividend or Dividend & Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.
£			p.c.				£ s. d.	£			p.c.				£ s. d.
1,551,868	Stk.	Apl. 12	5	Alliance & Dublin Ord.	82-85	..	5 17 8	4,940,000	Stk.	May 12	9	Imperial Continental	180-183	..	4 18 4
374,000	Stk.	July 14	4	Do. 4 p.c. Deb.	93-95	..	4 4 3	1,285,000	Stk.	Aug. 16	3½	Do. 3½ p.c. Deb. Red.	90-92*	..	3 16 1
250,000	5	May 12	7	Bombay, Ltd.	64-65	..	5 3 8	561,000	Stk.	Aug. 16	10	Liverpool United A.	210-212*	..	4 14 4
50,000	10	Feb. 24	15	Bourne-) 10 p.c. . .	29-30	+ ½	5 0 0	718,100	"	"	7	Do. B.	160-162*	..	4 6 5
311,810	10	"	7	mouth Gas-) B 7 p.c. .	16½-17	+ ½	4 2 4	306,083	"	June 30	4	Do. Deb. Stk.	102-104	..	3 16 11
75,000	10	"	6	and Water) Pref. 6 p.c.	14½-15	..	4 0 0	75,000	"	June 15	6	Malta & Mediterranean	42-44	..	6 3 1
380,000	Stk.	Aug. 16	13	Breutford Consolidated	256-261*	+ 2½	4 19 7	560,000	100	Apl. 1	5	Met. of) 5 p.c. Deb.	100-102	..	4 18 0
330,000	"	"	10	Do. New	198-203*	..	4 18 6	250,000	100	"	4½	Melbourne) 4½ p.c. Deb.	100-102	..	4 8 3
50,000	"	"	5	Do. 5 p.c. Pref.	120-122*	+ ½	4 2 0	511,920	20	May 31	3½	Monte Video, Ltd.	12½-13½	..	5 5 8
206,250	"	June 15	4	Do. 4 p.c. Deb.	97-99	..	4 0 10	1,775,892	Stk.	July 28	4½	Newcastle & Gateshead Con.	102-104	+ 1	4 4 2
220,000	Stk.	Mar. 10	11	Brighton & Hove Orig.	217-220	..	5 0 0	529,705	Stk.	June 30	3½	Do. 3½ p.c. Deb.	87-89	..	3 18 8
246,320	"	"	8	Do. A Ord. Stk.	157-160	..	5 0 0	55,940	10	Mar. 10	7	North Middlesex 7 p.c.	15-16	..	4 7 6
490,000	"	Apl. 12	11½	British	44½-45½	..	5 3 5	300,000	Stk.	Apl. 27	8	Oriental, Ltd.	138-140	..	5 14 4
120,000	Stk.	June 30	4	Do. 4 p.c. Deb. Stk.	94-96	..	4 3 4	60,000	5	Apl. 12	8	Ottoman, Ltd.	6½-7½	..	5 10 4
109,000	"	Aug. 16	6	Bromley A 5 p.c.	113-115*	..	5 4 4	31,800	53	Aug. 16	13	Portsea Island A	132-136*	..	5 1 0
165,700	"	"	4½	Do. B 3½ p.c.	85-87*	..	5 3 6	100,000	50	"	12	Do. C	117-122*	..	4 18 4
82,278	"	"	5½	Do. C 5 p.c.	103-105*	..	5 4 9	398,490	5	May 31	8	Primitiva Ord.	74-7½	..	5 6 8
55,000	"	June 30	3½	Do. 3½ p.c. Deb.	82-84	..	4 3 4	796,980	5	June 30	5	Do. 5 p.c. Pref.	5½-5½	..	4 10 11
250,000	Stk.	"	4	Buenos Ayres 4 p.c. Deb.	95-97	..	4 2 6	488,900	100	June 1	4	Do. 4 p.c. Deb.	97-99	..	4 0 10
100,000	10	"	—	Cape Town & Dis., Ltd.	2-3	..	—	312,650	Stk.	June 30	4	River Plate 4 p.c. Deb.	95-97	..	4 2 6
100,000	10	"	—	Do. 4½ p.c. Pref.	4-5	..	—	250,000	10	Mar. 24	9	San Paulo, Ltd.	21½-22½	..	4 0 0
100,000	Stk.	June 30	4½	Do. 4½ p.c. Deb. Stk.	80-83	..	5 8 5	115,000	10	"	6	Do. 6 p.c. Pref.	12-12½	..	4 16 0
157,150	Stk.	Aug. 16	5	Chester 5 p.c. Ord.	107-109*	+ ½	4 11 9	125,000	50	July 1	5	Do. 5 p.c. Deb.	49½-50½	..	4 19 0
1,513,280	Stk.	"	5/9/4	Commercial 4 p.c. Stk.	111½-113½*	+ ¼	4 16 1	135,000	Stk.	Mar. 24	10	Sheffield A	237-239	+ 1	4 3 8
560,000	"	"	5½	Do. 3½ p.c. do.	105½-107½*	..	4 19 3	209,984	"	"	10	Do. B	237-239	+ 1	4 3 8
475,000	"	June 15	3	Do. 3 p.c. Deb. Stk.	76-78	+ ½	3 16 11	523,500	"	"	10	Do. C	237-239	+ 1	4 3 8
800,000	Stk.	May 31	4	Continental Union, Ltd.	89-92	- 1	4 7 0	70,000	10	June 15	7	South African	8½-9½	..	7 7 4
200,000	"	"	7	Do. 7 p.c. Pref.	135-137	..	5 2 2	6,129,895	Stk.	Aug. 16	5/9/4	South Met., 4 p.c. Ord.	116½-118½*	+ ½	4 12 2
492,270	Stk.	"	5½	Derby Con. Stk.	122-124	..	4 8 9	1,895,445	"	July 14	8½	Do. 3 p.c. Deb.	78½-80½	..	3 14 6
55,000	"	"	4	Do. Deb. Stk.	104-105	..	3 16 2	209,820	Stk.	Aug. 16	8½	South Shields Con. Stk.	150-152*	..	5 11 10
840,150	10	July 28	10	European, Ltd.	18½-19½	..	5 2 7	605,000	Stk.	"	5½	S'th Suburb'n Ord. 5 p.c.	117½-119½*	..	4 14 9
16,160,600	Stk.	Aug. 16	4/14/8	Gas-) 4 p.c. Ord.	105½-106½*	+ ½	4 8 8	60,000	"	"	5	Do. 5 p.c. Pref.	115½-117½*	..	4 5 1
2,600,000	"	"	3½	light) 3½ p.c. max.	83-85*	..	4 2 4	117,058	"	July 14	5	Do. 5 p.c. Deb. Stk.	121-123	..	4 1 4
4,062,235	"	"	4	and) 4 p.c. Cou. Pref.	101-103*	..	3 17 8	502,310	Stk.	May 12	5	Southampton Ord.	108-110	..	4 10 11
4,531,705	"	June 15	3	Coke) 3 p.c. Con. Deb.	78½-80½	..	3 14 6	120,000	Stk.	Aug. 16	7½	Tottenham) A 5 p.c.	144-147*	+ ½	4 17 0
258,740	Stk.	Mar. 10	5	Hastings & St. L. 3½ p.c.	95-97	..	5 3 1	483,940	"	"	5½	and) B 3½ p.c.	114-116*	+ ¼	4 17 0
82,500	"	"	6½	Do. do. 5 p.c.	—	..	—	149,470	"	June 15	4	Edmonton) 4 p.c. Deb.	96-98	..	4 1 8
70,000	10	Apl. 27	11	Hongkong & China, Ltd.	17½-18	..	6 2 2	182,380	10	June 15	8	Tuscan, Ltd.	8½-9½	..	8 13 0
131,000	Stk.	Mar. 10	7½	Ilford A and C	147-150	..	4 18 4	149,900	10	July 1	5	Do. 5 p.c. Deb. Red.	96-98	..	5 2 0
65,780	"	"	5½	Do. B	119-122	..	4 16 3	236,476	Stk.	Aug. 16	5	Tynemouth, 5 p.c. max.	113-115*	+ ½	4 6 11
65,500	"	June 30	4	Do. 4 p.c. Deb.	94-96	..	4 3 4	255,636	Stk.	Feb. 24	6½	Wands-) B 3½ p.c.	143-145	+ 2	4 14 10
200,242	Stk.	Mar. 10	6	Lea Bridge Ord. 5 p.c.	120-122	..	4 18 4	85,766	"	June 30	3	worth) 3 p.c. Deb. Stk.	71-73	..	4 2

Prices marked * are "Ex. div."

† Next dividend will be at this rate.

Committee consider the question of disposing of the balance. Mr. Pater-son, in seconding, pointed out that there had been an increase of 576 consumers during the year. Bailie Robinson moved that the reduction to the ordinary consumers be 3d. He considered that if they wanted continued prosperity they must have cheap gas. Bailie Williamson suggested that the whole matter of the surplus be taken back by the Committee, for the reason that the question should be dealt with as a whole. Bailie Mitchell said that the penny-in-the-slot consumers had been ignored. He agreed with the suggestion of Bailie Williamson. The proposals of the Committee were eventually adopted by twelve votes to seven.

On June 27 last, a short summary was given in this column of the accounts for the year of the Arbroath Corporation gas undertaking. A fuller statement is now presentable. It has been already stated that the gas manufactured during the year amounted to 103,516,900 cubic feet—an increase of 5,003,500 cubic feet over the previous year. It may now be added that the quantity of gas made per ton of coal carbonized was 9848 cubic feet—an increase of 169 cubic feet upon the previous year. The quantity of gas sold was 95,843,689 cubic feet—an increase of 3,755,357 cubic feet. Gas sold to ordinary consumers showed an increase of 671,557 cubic feet; to prepayment meter consumers, an increase of 3,155,200 cubic feet; and to engine proprietors, a decrease of 72,100 cubic feet. The total amount received for gas sold was £13,650—an increase of £563. Allowing for gas used on the works, &c., amounting to 2,718,438 cubic feet, there remained 4,954,773 cubic feet unaccounted for, equal to 4.78 per cent. of the manufacture. The number of cookers, grillers, and gas-rings now fixed for consumers free of cost is 4476—an increase of 130. In addition, there were 74 gas-radiators hired to consumers; and 53 gas-fires for heating rooms were sold and fixed. The gas-stove capital account stood at May 15 in the following position: Estimated value at May 15, 1910, £4896; expended during the year on radiators and cookers, £467 (£5363), less 10 per cent. for depreciation, amounting to £536, and leaving the value at May 15 last, £4827. After allowing for depreciation upon cookers, the gross profit for the year was £5136; and after paying interest and annuities, and the sums payable to the Harbour Trustees and to the sinking fund, there remained a net balance of £2274. Placing this to the suspense account would reduce it to £1909. Making allowance for the rebates to large consumers for the past year, which had not yet been ascertained, and also the amount which would be required for new pipes, a new pump, and extraordinary repairs, the Manager—Mr. A. C. Young—estimated that, at the present prices, there would be a balance of profit at May 15 next of £2426. Having regard to the fact that the capital debt on the works had been reduced since May, 1902, from 18s. 2d. to 11s. 6d. per 1000 cubic feet of gas accounted for, notwithstanding that a large amount incurred in the purchase of cookers and prepayment meters had been paid off, irrespective of all the new plant laid down at the works since 1902, and taking into account the progress made during the past nine years in the reduction of the capital debt as compared with the actual value of the gas-works, the Manager was of opinion that a reduction of

2½d. per 1000 cubic feet might now be recommended. This reduction, as already stated, would make the prices of gas: To ordinary consumers, 2s. 6d.; to prepayment meter consumers, 2s. 11d.; and for gas-engines, from 2s. 1d. to 2s. 3½d. per 1000 cubic feet, according to the quantity consumed. The Gas Committee, considering the very satisfactory financial position of the gas undertaking, unanimously agreed to recommend that the reduction in the prices of gas proposed by the Manager should be adopted. The Manager further submitted for the consideration of the Committee the expediency of obtaining statutory powers for a further reduction in the illuminating power of the gas to 14 or 15 sperm candles. At present, the candle power is 20, to which it was reduced by the Burgh Gas Act of 1899. The proposal was favourably entertained, and was continued for consideration. When the accounts came before the Town Council last Tuesday, Mr. G. R. Wallace, the Convener of the Gas Committee, said that the Manager's report was highly gratifying. The quantity of gas sold during the year was almost 4 million cubic feet more than in the previous year. The prices now proposed to be charged were as low as in many towns situated quite close to the coalfields. Everything showed careful and efficient management at the gas-works. If all went well, the Committee would be able to make a further reduction next year. The whole of the minutes reflected the shrewd, able, and businesslike way in which the works were managed by Mr. Young. He moved approval of the minutes. This was seconded by Provost Alexander, and was unanimously agreed to.

There is something more than usually gratifying in the annual report by Mr. S. Dickie, the Manager of the Dumfries Corporation Gas Department, in that, it being his first annual report, it is of a highly satisfactory nature. The quantity of coal carbonized was 11,238 tons, the average cost of which were 13s. 8½d. per ton. For enriching, 8658 gallons of benzol was used. The average cost of coal and benzol per ton was 14s. 0.33d. In the preceding year, 11,442 tons of coal and 12,320 gallons of benzol were used, at an average cost of 14s. 3.11d. per ton. The quantity of gas made was 113,676,000 cubic feet, an average yield of 10,115 cubic feet per ton of coal—a total increase of 2,106,000 cubic feet and of 357 cubic feet per ton of coal. Gas sold, including that used in the works, amounted to 107,061,906 cubic feet—an increase of 1,886,093 cubic feet. Unaccounted-for gas was equal to 5.81 per cent.—about the same as in the preceding year. Mains and services had been repaired and renewed at a cost of £474. Meters had been tested, and, where necessary, repaired or replaced, at a cost of £558. The sulphate plant continued to give every satisfaction; excellent results having been obtained from it during the year. Though the coal carbonized was about 200 tons less, there had been 26 tons more sulphate made; and the sulphate produced was of a high quality, and met with a ready market. The net sum received for sulphate was £1539—an increase of £437. There was a net profit in the sulphate department of £763. During the early part of last winter, stoking machinery was erected. It had been in operation for six months, and had given every satisfaction. Though less coal was used, there was an increased make of over 2 million cubic feet of gas, and an average

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yield per ton of coal which had not been exceeded during the past twenty years. A new coal-store had been completed. The reserve fund amounts to £1526. In the estimates prepared for the current year, a probable balance was stated, after providing for interest, sinking fund, and reserve fund, of £1180. This, in Mr. Dickie's opinion, would allow a reduction of 2d. in the price of gas, and leave a prospective balance of £316. The Gas Committee agreed to recommend that the price of gas be reduced by 2d. per 1000 cubic feet; that Mr. Dickie's salary be increased by £50 a year; that the present collector be appointed cashier, at an increase of salary of £10; and that the Council advertise for a collector. These recommendations have yet to come before the Town Council.

In the Wishaw Town Council on Monday, Provost Thomson stated that he had gone over the burgh accounts with the Burgh Chamberlain, and he was very pleased to be able to report that everything was in a very satisfactory condition. The Council would be gratified to learn that, as regarded the Gas Department, the balance on hand a year ago was £267, and it was now £923—a betterment of £656. He thought it was only right to state that the Convener of the Gas Committee and the Gas Manager deserved the appreciation of the Council for their carefulness in bringing about this result.

The Town Council of Airdrie have reduced the price of gas to 2s. 6d. per 1000 cubic feet to ordinary consumers, and to 2s. 8d. to prepayment meter consumers—a reduction in both instances of 2d.

Councillor Gordon, of Peterhead, is under a misapprehension when he regards critical remarks upon the accounts of the gas undertaking by the Auditors as disclosing something which requires remedying. He evidently does not understand the ways of auditors and of the Scotch Office. At the meeting of the Town Council on Monday, he asked the Convener of the Gas Committee who made the valuation of the stocks in the gas-works at the 15th of May last; and when the Council would have the opportunity of discussing the report by the Auditors on the financial position of the gas undertaking. He considered the state of matters disclosed to be very serious indeed. He complained that the Gas Committee had deferred consideration of the Auditors' report until the Secretary for Scotland should comment upon it, which, to his mind, was indefinite. Bailie Birnie, the Convener of the Gas Committee, replied that the stocks were valued by the gas-works officials. As to the second part of the question, the minute of the Committee contained all the information they were prepared to disclose.

Berwick Water Supply.—The condition of the Berwick water supply, which has been the subject of repeated reports and correspondence with the Local Government Board, has at length reached a crisis; the Board having taken action under the Public Health Act and issued a default order, declaring that the insufficient and unwholesome water supply in the Tweedmouth district is a danger to the health of the inhabitants, and ordering the Berwick Town Council to provide a proper supply within six months.

CURRENT SALES OF GAS PRODUCTS.

[For Table of "Tar Products Prices," see p. 504.]

Sulphate of Ammonia.

LIVERPOOL, Aug. 19.

The market has again been disturbed by strikes, and prices have been somewhat irregular. On the whole, however, values have improved slightly, and the nearest closing quotations are £14 2s. 6d. per ton f.o.b. Hull, £14 3s. 9d. per ton f.o.b. Liverpool, and £14 5s. per ton f.o.b. Leith, delivery as soon as the strikes are over. There has been a fair amount of inquiry in the forward position, and £14 5s. per ton has again been paid for September-December delivery, as also for January-June, 1912. At the close, an advance is being asked, but so far it is not reported to have been paid.

Nitrate of Soda.

There is no alteration to report in this market, which remains quiet, and 9s. 10½d. per cwt. for 95 per cent. and 10s. for refined quality are still the quotations.

LONDON, Aug. 21.

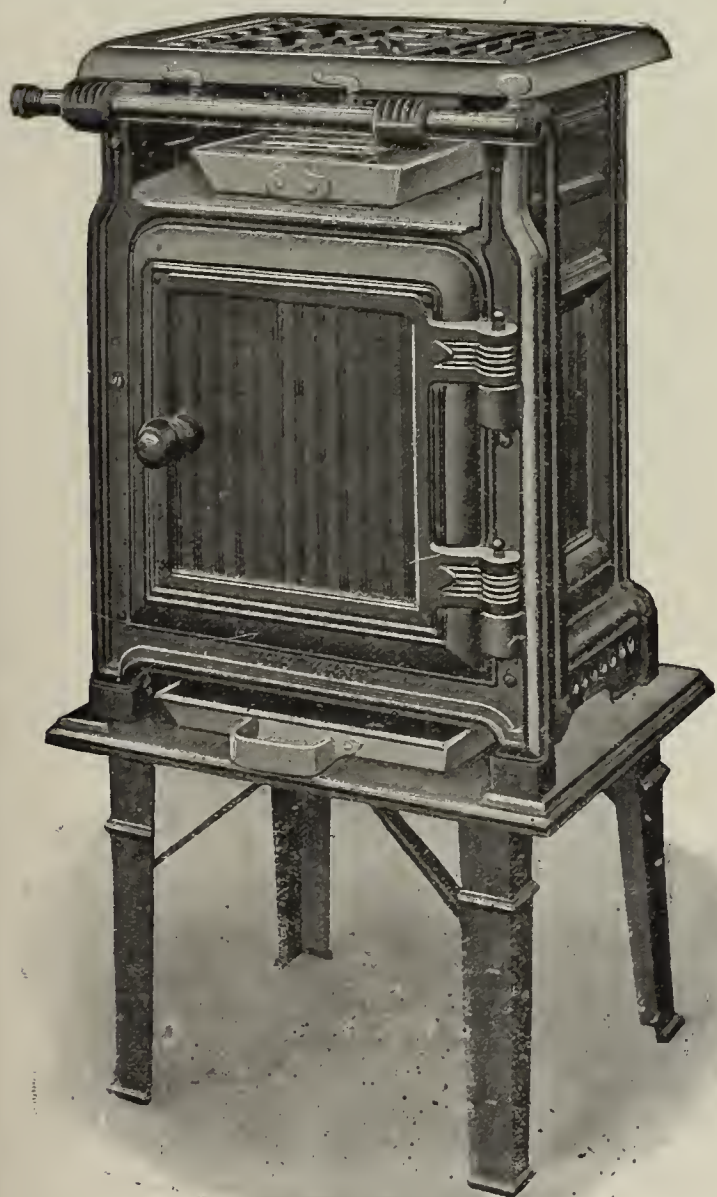
Tar Products.

The markets for tar products are firm all round. Pitch is very steady, although there is not any actual advance in price during the last week. Benzol is still very firm, particularly for prompt delivery. Solvent naphtha is quiet; and there are sellers at low prices for both prompt and forward delivery. Heavy naphtha is quiet for prompt, but is firm for forward. Creosote is firm for both prompt and forward delivery. Carbolic acid is still firm; but there does not seem to be quite so much demand for it as was the case a week or ten days ago. Naphthalene is steady; and there is an inquiry for salts beginning for the winter trade.

The average values during the week were: Tar, 21s. to 25s., *ex* works. Pitch, London, 40s. 6d. to 41s. 6d.; east coast, 40s. to 41s. 6d.; west coast, Manchester, 39s. 6d. to 40s. 6d., f.a.s.; Liverpool, 40s. 6d. to 41s., f.a.s.; Clyde, 40s. to 41s., f.a.s. Benzol, 90 per cent., casks included, London, 9½d. to 10½d.; North, 9½d. to 9¾d.; 50-90 per cent., casks included, London and North, 9½d. to 9¾d. Toluol, casks included, London, 10d.; North, 9½d. to 9¾d. Crude naphtha, in bulk, London, 4d. to 4½d., North, 3½d. to 3¾d.; solvent naphtha, casks included, London, 11d. to 11½d.; North, 10d. to 10½d.; heavy naphtha, casks included, London, 11½d. to 1s. 0½d.; North, 10d. to 10½d. Creosote, in bulk, London, 2½d. to 2¾d.; North, 2d. to 2½d. Heavy oils, in bulk, 2½d. Carbolic acid, 60 per cent., casks included, east coast, 2s. to 2s. 3d.; west coast, 1s. 11d. to 2s. 2d. Naphthalene, £4 10s. to £8 10s.; salts, 42s. 6d. to 45s., bags included. Anthracene, "A" quality, 1½d. to 1¾d. per unit, packages included and delivered.

Sulphate of Ammonia.

This article has been very firm throughout the past week, and prices close with an advance and a slight upward tendency. The



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principal Gas Companies quote £13 15s. for 25 per cent. usual terms; and it is believed they have very little to sell even at this figure. Outside London makes are quoted £13 12s. 6d. In Hull, the quotation is £14 to £14 2s. 6d., the latter figure having been paid for a good make. In Liverpool, £14 2s. 6d. to £14 5s. is asked; and it is reported that £14 2s. 6d. has been paid for October-June. In Leith, £14 6s. 3d. to £14 7s. 6d. is asked, and £14 5s. has been paid for October-March. In Middlesbrough, £14 2s. 6d. is said to have been paid.

COAL TRADE REPORTS.

Northern Coal Trade.

There has been in the Northern coal trade the irregularity which set in when the fear of a national railway strike was known, and which influenced prices considerably. Best Northumbrian steam coals grew firmer, and may now be quoted at about 11s. 3d. per ton f.o.b.; second-class steams are 9s. 3d. to 10s.; and steam smalls are 5s. to 6s. But some of these quotations are nominal, with variation according to the time that delivery is expected to be given. The output has been restricted in the closing days of the week. In the gas-coal trade, some producers make shipments over their own lines and staiths, and there was less interference with their production in consequence. Durham gas coals vary in price. Second-class coals are from 9s. 6d. to 9s. 9d. per ton f.o.b.; best Durhams are from 10s. 10d. to 11s.; and "Wear specials" are from 11s. 4½d. to 11s. 6d. The home demand is growing. That for export is fair, and would be stronger if it could be met, but the difficulties of transport have of late been great. In coke, the market is firmer. Good gas coke is still rather scarce, and is quoted at about 14s. 6d. to 14s. 9d. per ton f.o.b. in the Tyne or Wear.

Scotch Coal Trade.

Trade has been fairly active, with prices well maintained. All classes of coal for shipment are in good demand. The labour troubles are affecting transport, but not prices as yet. Steam coal is in request, more so than washed stuffs and smaller sorts. Prices may now be quoted at: Ell, 9s. 3d. to 10s. 3d. per ton f.o.b. Glasgow; splint, 9s. 6d. to 9s. 9d.; and steam, 9s. 3d. to 9s. 6d. The shipments for the week amounted to 381,441 tons—an increase upon the previous week of 52,717 tons, and upon the corresponding week of 35,336 tons. For the year to date, the total shipments have been 9,884,255 tons—an increase upon the corresponding period of 132,982 tons.

Gas Consumption by Cooker Users in Oldham.

Up to now, the Gas Committee of the Oldham Corporation have supplied cookers without making any stipulation in regard to the quantity of gas to be consumed by the users. It has now, however, been deemed necessary to impose something like a sliding-scale of consumption; and the General Manager of the Gas Department (Mr. Arthur Andrew) has suggested that anyone having a gas-cooker fixed of which the list price is less than 10s. should undertake to consume 8000 cubic feet of gas per annum (this being the present average), or else pay a fine of 6d. per 1000 cubic feet; when the list price of the cooker is under 20s., the consumption to be 10,000 cubic feet; when it is 20s. and under 30s., 12,000 cubic feet; 30s. and under 40s., 14,000 cubic feet; 40s. and under 50s., 16,000 cubic feet; and when 50s. and under 60s., 18,000 cubic feet. In the case of special list prices above 50s., the consumption is to be 20,000 cubic feet per annum. In each case, the fine of 6d. per 1000 cubic feet would be imposed when the specified consumption was not reached. The scale would apply alike to consumers of gas and electricity having gas-stoves in use. The suggestion came before the Committee at their meeting last Wednesday, and was adopted. The result of the decision, if the Council adopt the new scale, is that the consumer will have to undertake to use a minimum quantity of gas annually for all purposes according to the cost of the cooker. He will also have to pay to the Corporation the cost of any damage or injury by fire or otherwise which the stove may sustain while in his possession—reasonable wear and tear in the use only excepted. The Corporation are to be at liberty to remove the stove at any time without notice. The Electricity Committee have passed a resolution expressing regret that the decision was come to without conferring with them on the matter.

Mitcham and Wimbledon Gas Company.—The accounts which the Directors of this Company will present at the half-yearly general meeting next Tuesday show that the revenue for the six months ended the 30th of June was £76,749, and the expenditure £61,907; leaving a balance of £14,842 to go to the profit and loss account. After providing for all charges, the sum available for distribution, including the balance brought forward, is £18,225; and the Directors recommend the declaration of the statutory dividend under the sliding-scale at the rate of 5½ per cent. per annum (less income-tax). They state that the Company's business continues to expand satisfactorily in all branches. A further reduction in the price of gas has been made from Midsummer last—viz., from 2s. 10d. to 2s. 8d. per 1000 cubic feet.

Barnet Gas and Water Company.—The half-yearly meeting of this Company will be held next Tuesday, when the Directors will report that the balance standing to the credit of the profit and loss account amounts to £30,885, out of which they recommend the declaration of a dividend for the past half year at the rate of 8 per cent. per annum on the "A" and "C" stocks; 7 per cent. per annum on the "B" stock; and £5 12s. per cent. per annum on the "D" capital. The Engineer (Mr. F. J. Bancroft, M.Inst.C.E.) reports that the works are in good repair and condition. The contractors are still proceeding with the erection of the buildings and machinery at Tyttenhanger; and the Directors state that, by means of a temporary plant, sufficient water was obtained from this source to enable them to maintain a full supply during the recent drought. The sinking of the well at North Mimms is also still proceeding.

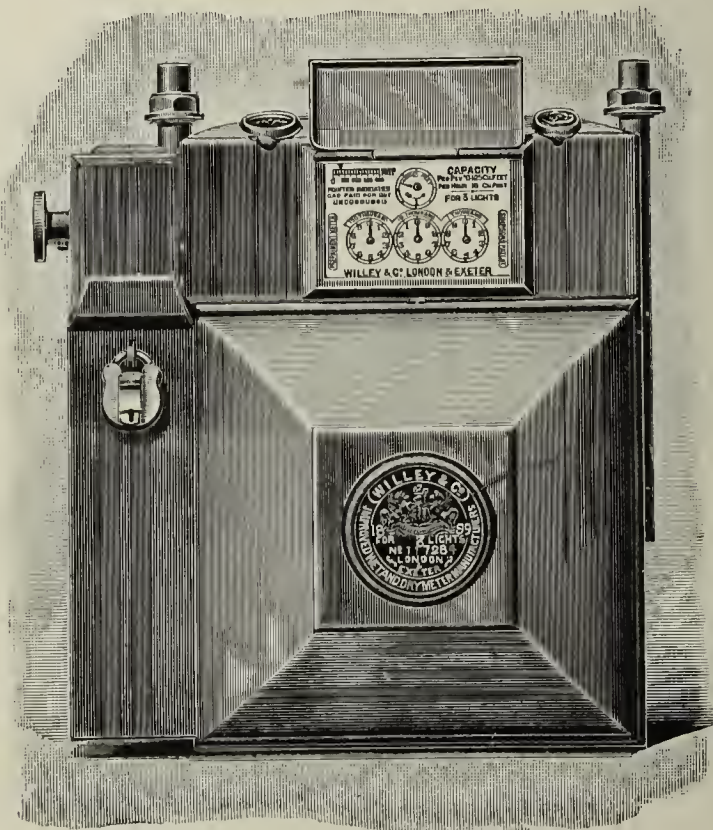
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Important Water Scheme for Blackpool and the Fylde.—In the course of the proceedings at the meeting of the Bowland District Council at Clitheroe on Monday last week, reference was made to a Bill to be promoted to provide a new reservoir and water-works for Blackpool and the Fylde, at an estimated cost of about £2,000,000. It is proposed to construct a large reservoir at Dalehead, near Slaidburn, which is in the area of the District Council, and forming the Yorkshire part of the Clitheroe Union. The site is at the head of the Hodder Valley, and all the water from the range of hills stretching almost to Lancaster in one direction and Bentham in the other, and including some very fine springs, will, it is said, be taken. It was stated at the meeting that the whole of the inhabitants of the Hodder Valley would probably oppose the scheme, as it meant interfering with their water supply.

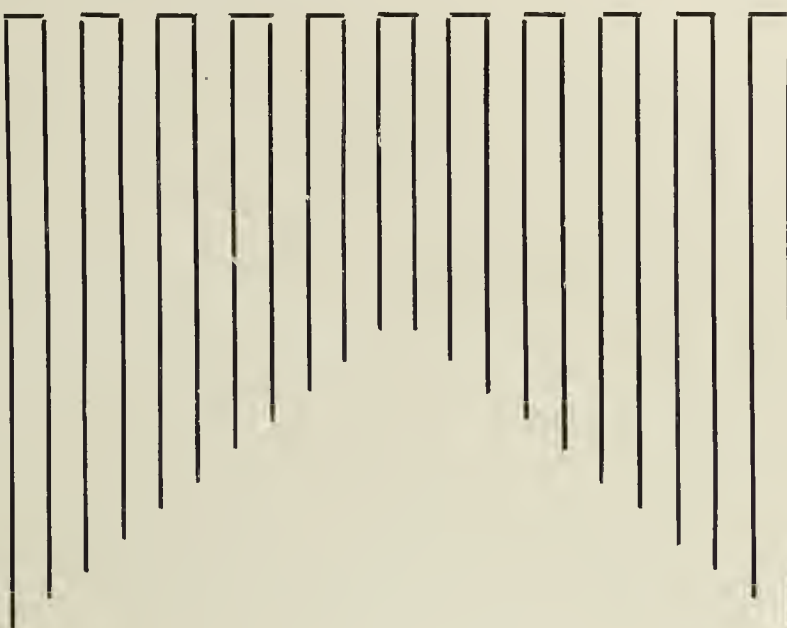
South Essex Water-Works Company.—At the half-yearly general meeting of this Company on Monday last week, the Chairman (Mr. C. C. S. Fooks) stated that they were going on very satisfactorily, and were again declaring their maximum rates of dividend. When the Dagenham well was finished, which they believed would be in about twelve or fifteen months, they hoped their expenditure would to a certain extent come to an end, and that they would then only have to incur the moderate outlay necessary for coupling-up existing mains and putting down new distributing plant. Their expenditure in the past half year was £11,495 to earn a gross revenue of £28,747, against £11,915 for the corresponding period of last year to earn a gross revenue of £27,430. The works were in an efficient condition, and they had water enough and to spare. He concluded by moving the adoption of the report and the payment of the dividends recommended; and it was carried.

Rossendale Union Gas Company's Increased Sales.—In the report of the Directors of the Rossendale Union Gas Company, they state that the sales of gas for the past half year showed an increase of 9.57 per cent. compared with the corresponding period of 1910. The income was £24,203, and the expenditure £18,011; leaving a profit of £6192. The statutory dividends on the several classes of shares, ranging from 5 to 10 per cent., are to be paid. The Directors also refer to the reduction in the price of gas, which came into operation on the 1st of July—viz., 1d. per 1000 cubic feet to ordinary consumers, and 3d. per 1000 cubic feet on gas used for engines and stoves. The price for purposes other than illumination is now 2s. 6d. per 1000 cubic feet, less 2½ per cent. discount. Consumers for lighting who use more than 500,000 cubic feet per quarter are charged 3s., and less than this quantity 3s. 1d., with the usual discount in each case of 2½ per cent. if the account is paid within a month.

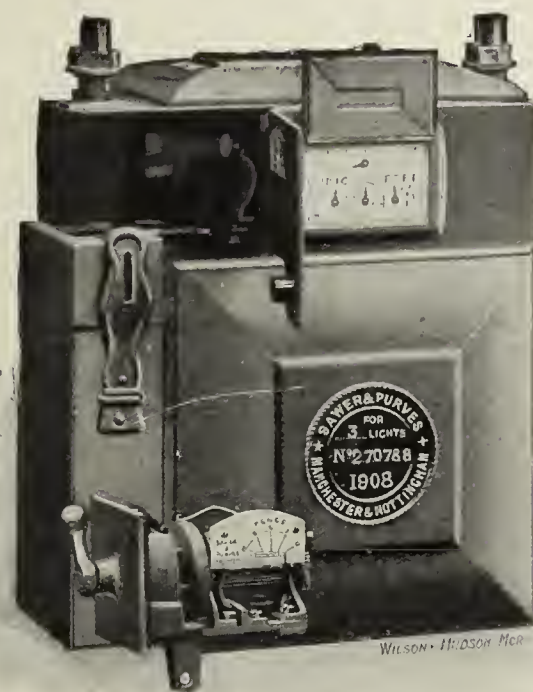
Income-Tax on Transfers to Special Purposes Funds.—In the course of the proceedings at the recent half-yearly general meeting of the Aldershot Gas, Water, and District Lighting Company, reported elsewhere, the General Manager and Secretary (Mr. R. W. Edwards) stated that there had been a little controversy between himself and the authorities of the Inland Revenue with regard to the transfers from the revenue account to the special purposes fund being subject to income-tax. "We being," said Mr. Edwards, "among the very first companies with this particular clause, the point had not been settled in income-tax law, and it has taken a little time to settle the question. A good deal has passed between myself and the Inland Revenue, and the Company have taken advice otherwise than my own; and they are now convinced that, for the present, possibly the Inland Revenue ruling was correct—namely, that the transfer from revenue to the special purposes fund is subject to tax. But, on the other hand, I should say that the Inland Revenue admitted that any expenditure from the fund should be free from income-tax. You will see, therefore, that it is pretty well as broad as it is long."

Brighton and Hove Gas Company.—At the half-yearly general meeting of this Company next Friday, the Directors will report an increase of 39,876,900 cubic feet, or 6.37 per cent., in the quantity of gas sold in the six months ended the 30th of June, compared with the corresponding period of 1910; and the returns from residuals were higher by £2263. The half-year's profits, including a sum received for interest, amount to £34,103, to which is added £19,755 brought forward; making a total of £53,859. After charging interest on debenture stock, &c., and appropriating £1800 to the capital redemption fund, and £2968 to the special purposes fund, a sum of £45,979 is available for distribution. The Directors accordingly recommend the declaration of dividends for the half year at the following statutory rates per annum—viz., 6 per cent. on the "B" preference consolidated stock; 4 per cent. on the "C" preference consolidated stock; 11 per cent. on the original ordinary consolidated stock; and 8 per cent. on the "A" ordinary consolidated stock. This appropriation will require £23,580, and leave a balance of £22,399 to be carried to the credit of the profit and loss account for the current half year.

Water Scheme for Ilington.—The Newton Abbot Rural District Council having applied to the Local Government Board for authority to borrow £4900 for the purpose of providing a supply of water for the parish of Ilington, the matter was inquired into a few days ago by Dr. A. W. Brightmore, one of the Board's Inspectors. The principal source of the present supply is a stream, which is liable to pollution; and it is proposed to obtain water from several underground springs, and to construct a reservoir to hold 50,000 gallons, which would be rather more than four days' supply for a population of 600 at 20 gallons per head. Mr. S. Segar, the Council's Engineer, admitted that the gaugings of the springs had shown a disappointing falling-off, and that the present yield of 9000 gallons a day was insufficient. Objection was raised to the scheme on the ground that owners of property had been called upon to provide water supplies at their own expense, and now they were asked to sanction an additional supply which would involve a rate of 1s. 6d. in the pound; making, with the present rates, 5s. 9d. The scheme was characterized as both extravagant and premature. The Chairman of the Parish Council (Mr. H. H. Bickford) said the feeling was in favour of an improved supply; but the outlying hamlets were against the scheme. At the close of the inquiry, the Inspector visited the source of the proposed supply, and went over the line of the works.



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Leakage of Paraffin Into a Well.—An escape of paraffin from tanks at the pumping-station of the Portland Water-Works at Upwey, Dorset, early last week, rendered Portland's 17,000 inhabitants temporarily waterless. Some gallons of paraffin escaped into the lower well; rendering the water supply undrinkable. The whole of the water at the works—estimated at 100,000 gallons—had to be pumped to waste before drinking water was obtainable.

Leatherhead Water Company.—The receipts for the six months ended the 30th of June of the Leatherhead and District Water-Works Company amounted to £5011, and the amount available for distribution at the recent half-yearly meeting was £3117. The dividends declared were at the rate of 10 per cent. on the original shares, and of 7 per cent. on the remainder. These dividends absorbed £2050; and left £1067 to be carried forward. Since 1901, the water-rentals have increased from £4897 to £8995; and the quantity of water pumped from 131 million gallons to 220 millions.

Reductions in Price.—The Directors of the Cowdenbeath Gas Company, Limited, have fixed the following as the rates per 1000 cubic feet of gas to take effect on and from the reading of the meters next month: Ordinary lighting purposes, 3s. 9d.; heating installations, 3s. 4d.; trading purposes, 2s. 11d.; power, 2s. 6d. In the case of prepayment consumers, the dividend will be increased from 2s. 6d. to 3s. 4d. in the pound. The reduction is 2½d. per 1000 cubic feet for ordinary purposes and 7½d. for power. The Gorebridge Gas Company have reduced their price 5d. per 1000 cubic feet—from 5s. 10d. to 5s. 5d.

Burst Water-Main near Rhayader.—Early on Sunday morning, the 13th inst., one of the mains conveying water from the Elan Valley reservoir to Birmingham burst. The accident occurred on the Builth Road, and about half-a-mile out of Rhayader. After the bursting of the pipe, the ground rose rapidly, and the force of the water swept away tons of soil, and large pieces of pipe were carried into the field below. Two of the mains convey, on an average, 24 million gallons of water per day to Birmingham. The efficiency of the scheme was again proved; for, although the burst caused a decrease in the delivery, the people of Birmingham were fairly adequately supplied from a large emergency reservoir outside the city.

Tarapaca Water-Works Company.—At an extraordinary meeting of this Company on Monday last week, the Chairman (Sir Robert Harvey) said they had already reduced the original capital of £400,000 by £80,000; and by the return of £2 per share now proposed to be made, it would be reduced to £240,000. For 23 years shareholders had been receiving practically the same dividends; and so far this year there had been no diminution in the earnings. But the Municipality had

continually endeavoured to force the hands of the Government to provide a supply of water in opposition to the Company's; and sooner or later they would have to face a reduction in price to meet the situation. With a return of capital, they should be in a position to defy any opposition and still pay a good dividend. He moved a resolution for reducing the capital by returning £2 per share on each of the 40,000 shares; and it was carried.

We have received from the Provincial Incandescent Fittings Company, Limited, of Manchester, their "Block Light" and "Pifco" catalogues for the season 1911-12. Most of the illustrations in the former are of new goods either registered or patented or otherwise protected. The other catalogue, the size of which has been increased by twenty pages, contains 300 more numbers than that of last year, and 250 new blocks representing the latest innovations in connection with incandescent gas lighting.

The Horstmann Gear Company, Limited, of Bath, find they were fully justified in moving to their new and larger factory, for the influx of orders for controllers, &c., for the coming lighting season has been beyond their anticipation. Large consignments have, we are informed, been despatched to Australia, New Zealand, America, and the Continent of Europe; while their home trade has been well sustained. A repeat order from the Liverpool Corporation for 250 controllers has just been received (making 750 required this year); while large orders are being executed for Aldershot, Worthing, and other places.

The "Daily Telegraph" last Thursday contained the following story under the heading of "Red Tape Prevents Arrest:" William Hawkins, of 69, Fortescue Road, Mitcham, who gave himself up at Tooting Police Station, was remanded at Croydon yesterday by the County Magistrates, on a charge of stealing a quantity of gas belonging to the Mitcham and Wimbledon Gas Company. His wife, who was first arrested, had been on bail since July 17; but her discharge was granted on Tuesday—the prosecution offering no further evidence in her case. Hawkins is alleged to have connected pipes with the Gas Company's service-pipe in his house in such a way as to prevent the amount of gas consumed being registered. Mr. Cubison, representing the Gas Company, told the Bench that the man was traced to one of the War Office departments, and would have been arrested but for a gross piece of red-tapeism. They were unable to discover the head of the department in which the prisoner was working; and although the detective officer went to the head clerk, he was told he could not enter the department unless the head went with him. When the head arrived about an hour later, the prisoner had disappeared, leaving his tools behind him. Somebody must have told him he was wanted.

TAR PRODUCTS PRICES.

Representative manufacturers give the following as fair current values for the week ending Aug. 19. Prices are net, and they include the usual packages and delivery f.o.b., f.a.s., or f.o.r., as customary.

Article.	Basis.	London.	North-East Coast.	East Coast, Yorks.	West Coast.	
					Liverpool.	Manchester.
Tar, crude	per ton	—	20/- 25/-	20/9 24/9	—	21/- 23/6
Pitch	"	42/6	39/- 40/-	40/-	40/-	39/-
Benzol, 90%	per gallon	-11¼	-9½ -10	-9	-9¼	-9¾
Benzol, 50-90%	"	—	-10	-9½	-8½	-8½
Toluol, 90%	"	—	-10	-10	-10	-10
Crude naphtha, 30%	"	—	-4½	-4	-3¾	-3¾
Light oil, 50%	"	—	-3½	-3½ -4	-3½	-3½
Solvent naphtha, 90-160	"	—	-10 -10½	-10	-10	-10
Heavy naphtha, 90-190	"	—	-11	-11½	-11¼	-11¼
Creosote in bulk	"	-2¾	-2 ⅞	-2	-2½	-2½
Heavy oils.	"	—	-2½ -2 ⅝	-2¼	-2¾	-2¾
Carbolic acid, 60's.	"	—	2/1	2/3	1/11	1/11½
Naphthalene, crude drained salts	per ton	—	43/9	41/3	47/6	47/6 50/-
" pressed	"	—	60/-	63/-	60/-	60/- 72/6
" whizzed.	"	—	—	—	70/- 72/6	65/- 75/-
Anthracene	per unit	-2	-1½	-1½	-1¼	-1¼

NOTICES TO CORRESPONDENTS, ADVERTISERS, AND SUBSCRIBERS.

No notice can be taken of anonymous communications. Whatever is intended for insertion in the "JOURNAL" must be authenticated by the name and address of the writer; not necessarily for publication, but as a proof of good faith.

COPY FOR ADVERTISEMENTS for the "JOURNAL" should be received at the Office NOT LATER than TWELVE O'CLOCK NOON ON MONDAY, to ensure insertion in the following day's issue.

Orders for Alterations in, or stoppages of, PERMANENT ADVERTISEMENTS should be received by the FIRST POST on SATURDAY.

Wanted, For Sale, and Tender Advertisements, Six Lines and under, 3s.; each additional Line, 6d.

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All Communications, Remittances, &c., to be addressed to WALTER KING, 11, BOLT COURT, FLEET STREET, LONDON, E.C. Telegrams: "GASKING, LONDON." Telephone: P.O. 1571a Central.

WANTED, FOR SALE, CONTRACTS, &c., ADVERTISEMENTS IN THIS WEEK'S "JOURNAL."

Appointments Vacant.

CHEMICAL ASSISTANT (MANTLE FACTORY). No. 311.

WORKING MANAGER. Liverpool Corporation Gas-Works. Applications by Aug. 30.

FOREMAN (TAR-WORKS). No. 5438.

JUNIOR ASSISTANT. Cambridge Gas Company.

JUNIOR CLERK. Melton Mowbray Gas-Works.

STOKER. Halesowen Gas-Works.

Plant, &c. (Second-Hand), for Sale.

METERS. No. 5424.

PIPES, MOUTHPIECES, &c. J. Adams and Sons, New-castle-on-Tyne.

PURIFIERS, CONDENSER, SCRUBBER, WASHER, STATION METER, &c. Lisburn Gas Department. Tenders by Sept. 16.

PURIFIERS, &c. Louth Gaslight Company.

TENDERS FOR

Carbon (Retort). No. 5440.

Incandescent Gas Lighting Installation.

SALFORD EDUCATION COMMITTEE.

Lead and Compo. Pipe.

RHONDDA U.D.C. Tenders by Aug. 31.

Roof (Galvanized).

RHONDDA U.D.C. Tenders by Aug. 31.

Tar.

RHONDDA U.D.C. Tenders by Aug. 31.

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It is also used for the enrichment of Gas.
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Recording Thermometers.
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Long Distance Recording Tachometers, &c., &c.

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WANTED, a Foreman for a Small

Tar-Works.

Apply, by letter, stating Experience and Wages
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Apply, by letter, to Box 311, W. H. SMITH AND SONS'
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Apply, by letter, stating Age, Experience, and Salary
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GASLIGHT COMPANY.

WANTED, by the above Company, a

JUNIOR ASSISTANT to the Engineer. Must

be a good Chemist, capable of making the necessary
Tests in the Works, including Photometry.

Salary, £80 per Year.

Applications, stating Age, Qualification, and Ex-
perience, with copies of Testimonials, to be addressed to
JAS. W. AUCHTERLONIE, Engineer and Manager, Gas
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WANTED, a Working Manager.

Applicants must be good Carbonizers, tho-
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Works Routine, together with keeping ordinary Gas-
Works Day Books, and have Practical knowledge of Main
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Salary, £100 per Annum, with House, Coal, and Gas
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FOR SALE—One Set of 4 Purifiers, 10 feet Square, 10-inch Connection and Valve, in Good Order. Replaced by larger. Can be viewed on Application.

PHILIP ALLISON,
Secretary.

Aug. 16, 1911.

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LISBURN URBAN DISTRICT COUNCIL.

THE Gas Committee of the above Council invite OFFERS for the Purchase of the undernoted PLANT, which is to be ready for Removal early in December, owing to its being replaced by larger plant.

- Four Cast-Iron PURIFIERS 9-feet square, with Centre Valve and 8-inch Connections.
- One Cast-Iron CONDENSER, consisting of Ten 8-inch double pipes 18 feet high with Bottom Box. 8-inch Connections.
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- One Round STATION METER, 5000 feet per hour, 6-inch Connections and Bye-Pass.

The above Plant may be inspected, and any further Information obtained, on Application to the Gas Manager.

Tenders, endorsed "Old Plant," to be sent to the undersigned on or before Sept. 16, 1911.

T. M. WILSON,
Town Clerk.

Town Hall, Lisburn,
Dated this 17th day of August, 1911.

RHONDDA URBAN DISTRICT COUNCIL.

(GAS AND WATER DEPARTMENT.)

THE Council are prepared to receive TENDERS for the following:—

- 1.—For the Supply of LEAD and COMPO. PIPE and BLOCK TIN for the Six Months ending March 31, 1912.
- 2.—For the Purchase of the Surplus GAS TAR made at the Two Gas-Works (Porth and Ystrad), for a term of One Year from the 1st of November, 1911 (or for such longer Term as may be contracted for with the consent of the Council). The Tar will be loaded free into Contractor's and Council Tank-Waggons. The Purchaser will be required to enter into an Agreement with the Council for the due performance of the Contract.

Specification and Form of Tender may be obtained upon Application to the undersigned.

No Form of Tender other than that issued by the Council will be considered.

Tenders to be addressed to the Chairman of the Gas and Water Committee, endorsed "Tender for Lead and Compo.," or "Tar," as the case may be, and Delivered at my Office not later than Thursday (Ten a.m.), Aug. 31, 1911.

The Council do not bind themselves to accept any Tender.

OCTAVIUS THOMAS,
Engineer and Manager.

Gas and Water Offices, Pentre,
Rhondda, Aug. 14, 1911.

RHONDDA URBAN DISTRICT COUNCIL.

(GAS AND WATER DEPARTMENT.)

THE Council are prepared to receive TENDERS for the following:—

- CONTRACT No. 53.—GALVANIZED ROOFS at the Porth and Ystrad Gas-Works.
- Plans and Specification may be seen, and Form of Tender obtained, on Application to the undersigned upon depositing the sum of One Guinea, which will be returned after the Council have entered into a Contract upon the Tenders received, provided that he shall have sent in a *bona-fide* Tender, and shall not have withdrawn same.

The Contractor will be required to pay the Standard rate of Wages recognized in the district.

Tenders to be addressed to the Chairman of the Gas and Water Committee, endorsed "Contract No. 53," and Delivered at my Office not later than Ten a.m. on Thursday, Aug. 31, 1911.

The Council do not bind themselves to accept the lowest or any Tender.

OCTAVIUS THOMAS,
Engineer and Manager.

Gas and Water Offices, Pentre,
Rhondda, Aug. 14, 1911.

COUNTY BOROUGH OF SALFORD. (EDUCATION COMMITTEE.)

TENDERS invited, by Sept. 11, for a COMPLETE INSTALLATION of INCANDESCENT GAS LIGHTING at the Robert Hall Street Council School, Salford.

Copies of the Drawing, Specification, and Forms of Tender (for which a charge of One Guinea will be made, and which will be returned) may be obtained on Application to the Gas Engineer, Gas Offices, Bloom Street, SALFORD.

SALES BY AUCTION OF GAS AND WATER STOCKS AND SHARES.

MESSRS. A. & W. RICHARDS beg to notify that their SALES BY AUCTION of NEW CAPITAL ISSUED UNDER PARLIAMENTARY POWERS, and of STOCKS and SHARES belonging to EXECUTORS and other PRIVATE OWNERS in LONDON, SUBURBAN, and PROVINCIAL GAS and WATER COMPANIES, take place PERIODICALLY at the Mart, TOKENHOUSE YARD, E.C.

Terms for Issuing New Capital, and also for including other Gas and Water Stocks and Shares in these Periodical Sales, will be forwarded on Application to MESSRS. A. & W. RICHARDS, at 18, FINSBURY CIRCUIS, E.C.

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Manufacturers of GAS RETORTS, GLASSHOUSE FURNACE & BLAST-FURNACE BRICKS, LUMPS, TILES, and every description of FIRE-BRICKS. Special Lumps, Tiles, and Bricks for Regenerative and Furnace Work.

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MIRFIELD GAS COAL

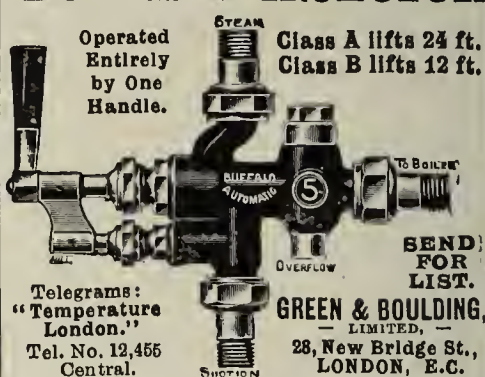
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Sperm Value 878.85 lbs. per ton.

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NEWBATTLE CANNEL.

Highest Results in Gas, & Excellent Coke.

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— LIMITED, —

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NEWTONGRANGE, MIDLOTHIAN.

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Manufacture and keep in Stock at their Works (also large Stock in London)

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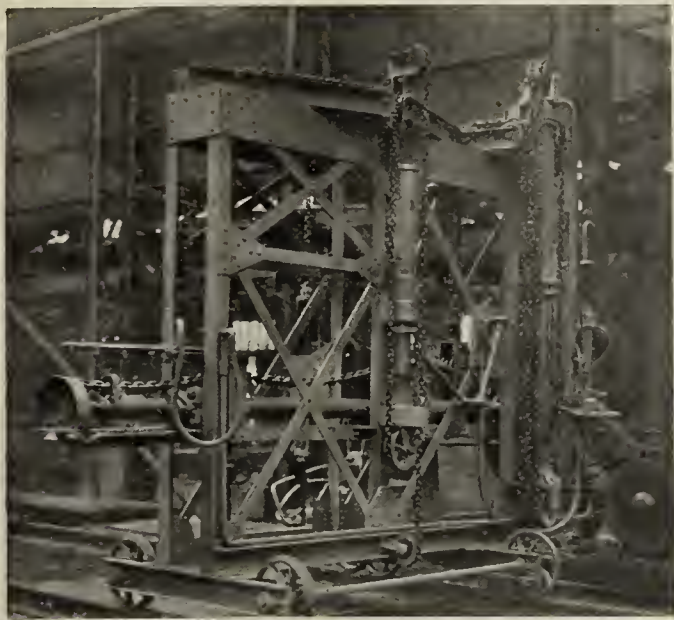
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Every Skein of equal weight and length.
The Lead Wool Joint is built up evenly all the way
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Lead Wool requires no melting and can be used in
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GAS REGULATION on the TOP of the LAMP.

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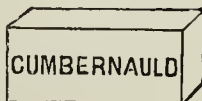
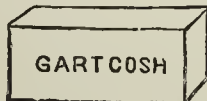
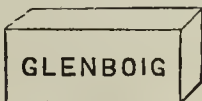
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GAS-RETORTS, FIRE-BRICKS, BLOCKS, &c. &c.

The SPECIAL BRICKS used in the Construction of Gas Furnaces for Heating Retorts.

The GLENBOIG BRICKS, BLOCKS, AND RETORTS combine, in the highest degree, the qualities of not melting, and not splitting, when subjected to the highest heats and most sudden changes of temperature, and are, in consequence, found to be economical, even in districts where the local bricks can be had at half the price.

Undernoted we give a Table of Analysis and Physical Characteristics of a sample of Glenboig Fire-Clay by J. T. Norman, London; and, in submitting a report from a responsible and reliable public analyst, we would here draw attention to the unreliable character of some recently published analyses where a manufacturer selects not only his own samples, but also those of his competitor, and has them treated by a private analyst. SUCH STATEMENTS ARE ALTOGETHER UNTRUSTWORTHY.

ANALYSIS OF GLENBOIG FIRE-CLAY.

By JOHN T. NORMAN, Esq., F.C.S., &c., The City Central Laboratory, LONDON.

THE GLENBOIG UNION FIRE-CLAY CO., LTD., GLENBOIG, SCOTLAND.

28, LEADENHALL STREET,

LONDON, E.C., September 21st, 1909.

DEAR SIR,

I have completed the investigation of the samples of Clay received from you on the 10th inst., and now beg to report the results.

CHEMICAL ANALYSIS.

	Raw.	Fired.
Silica, free	3.03	3.49
Silica, combined	43.20	49.77
Alumina	36.55	42.10
Ferrio oxide	1.80	2.08
Titanic oxide	1.30	1.50
Lime	trace	trace
Magnesia	trace	trace
Alkaline oxides	trace	trace
Sulphates as trioxides	0.92	1.06
Loss on Ignition	13.20	—
	100.00	100.00

PHYSICAL RESULTS.

Density	2.65
Volume weight	1.90
Porosity	15.4 %
Linear shrinkage at 100° C.	3.70 %
" " " 1050° C.	4.76 %
" " " Total	8.46 %
Volume shrinkage at 100° C.	10.7 %
" " " 1050° C.	12.6 %
" " " Total	23.3 %
Plasticity	20.0 %
Fire Stability	1850° C. equiv. 8362° F.

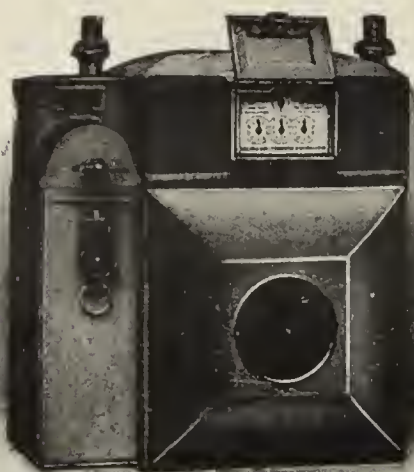
(SEGER CONE 36.) (New Scale CONE 38.)
(Signed) J. T. NORMAN.

This Clay is remarkable for its high percentage of Alumina and for the almost complete absence of ingredients tending to lower the refractory properties; its fire stability is extremely high. For some years past I have been urging clients who are working the Clays of the Coal Measures to search for such a material, but you are the first to discover a supply. The possession of this Clay places you in a unique position amongst the manufacturers of refractory goods throughout the world, and I have no doubt will, if duly exploited, enable you to drive out of the market the large quantities of foreign fire-bricks which are being poured into this country for use in the construction of bye-product ovens and for other purposes. —I am, yours faithfully.

JOHN T. NORMAN.

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GAS METER MAKERS.



**Prepayment
Dry Meters in
Tinplate Cases.**

Thousands of our
Meters in use by the
largest Gas Companies
and Corporations and
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**COMPLETE
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PHENIX STEAM TAR OR LIQUOR PUMP
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"A" TYPE EXHAUSTER SET
"J" TYPE COMBINED EXHAUSTER SET
HIGH PRESSURE RAISING
PLANTS - A SPECIALITY
GAS VALVES ALL DESCRIPTIONS
COKE BREAKING PLANTS
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4 TO 5 H.P.

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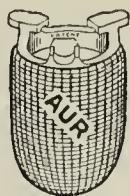
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These Welsbach Mantles are the finest that
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most powerful, but the finest quality of light.

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BRITISH MADE MANTLES.

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2 ply Ramie thread, single
knitted for “C” and “Gem”
and for Welsbach Kern
Burners Nos. 0, 1, 2, 3 and 4.

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Double Knitted Ramie
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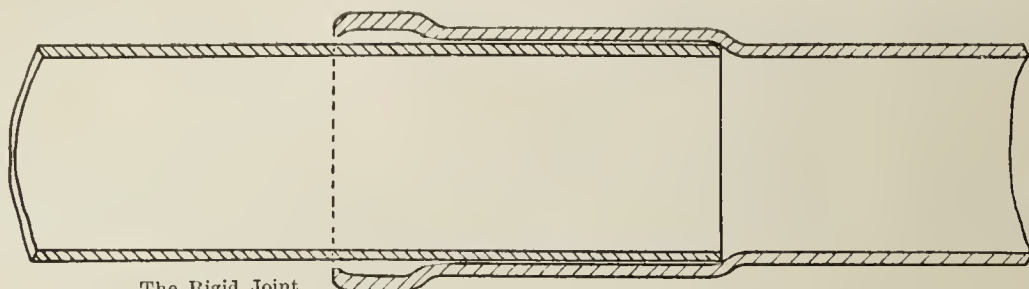
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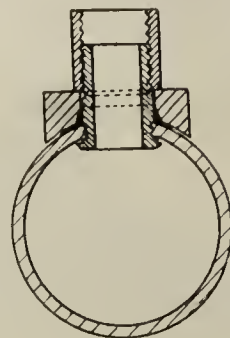
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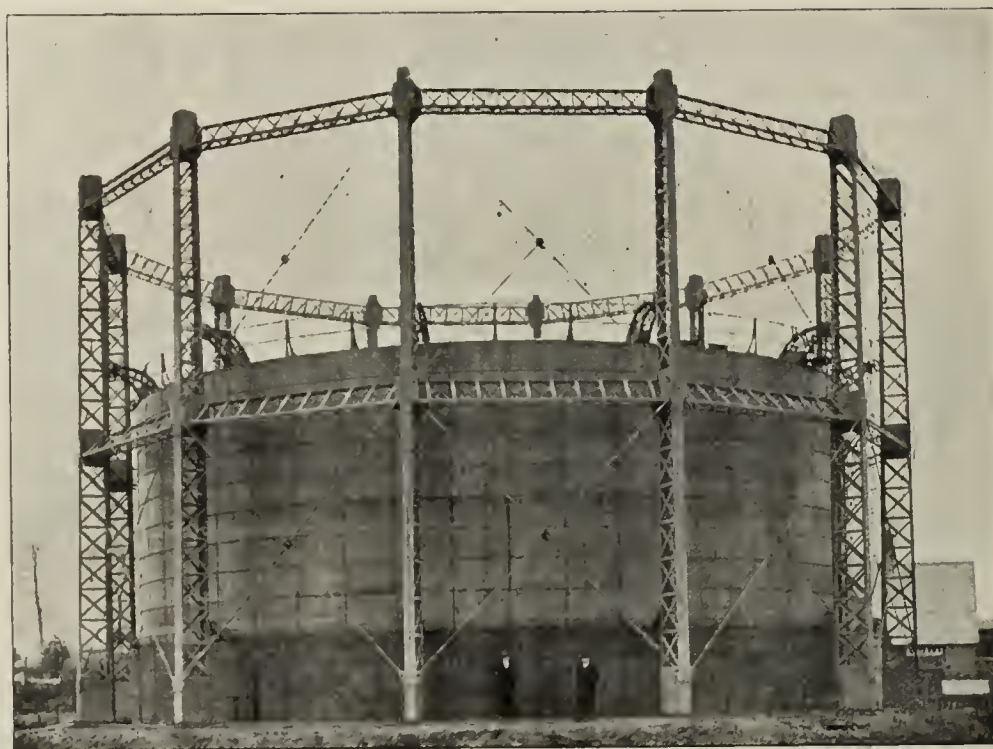
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IN STOCK AND PROGRESS.
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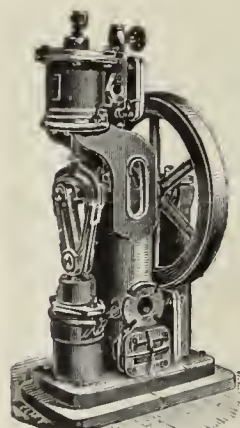


Fig. 708. "SINGLE RAM"
STEAM-PUMP.

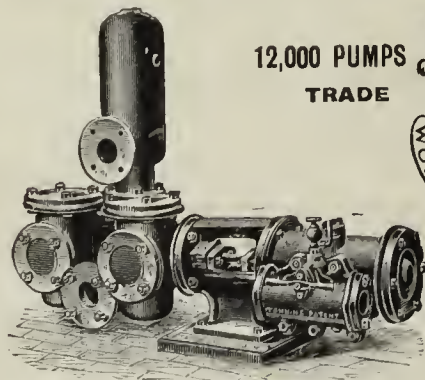


Fig. 598. "CORNISH" STEAM-PUMP FOR
BOILER FEEDING, &c.

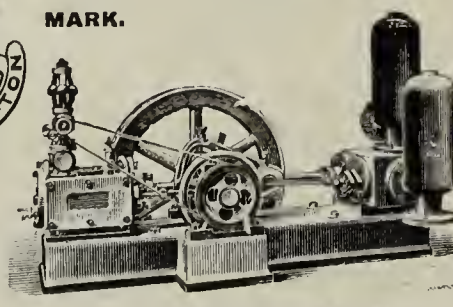


Fig. 685. "RELIABLE" STEAM PUMP FOR:
TAR AND THICK FLUIDS.



Fig. 712. "DOUBLE-RAM"
STEAM-PUMP.



"CYCLONE" TAR EXTRACTOR.

No Steam.
No Moving Parts.
No Power.

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LIMITED,
BIRMINGHAM, ENGLAND.

IMMEDIATE DELIVERY FROM STOCK.
UNBREAKABLE.
EASILY ERECTED. LIGHT FOR SHIPMENT.



PATENT PRESSED STEEL TANKS.

MADE FROM FLANGED PLATES 4 FT. SQUARE.
ANY CAPACITY IN MULTIPLES
OF 4 FT. LENGTH, WIDTH, OR DEPTH.

HUMPHREYS & GLASGOW'S CARBURETTED
WATER-GAS PLANTS.

Aggregate capacity of Plants supplied,
263,500,000 cubic feet daily.

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for BRICKWORK, RETORTS, and
CONVEYING PLANT for the . . .

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VERTICAL, INCLINED, HORIZONTAL, & SEGMENTAL
RETORTS**

Of High Grade Quality, apply to

MOBBERLEY & PERRY OF STOURBRIDGE,

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who are also Manufacturers of "Best British" (B.B.) Fire-Clay Goods.

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**LATEST RESULTS
FROM YORKSHIRE COAL:**

14,236 CUBIC FEET OF GAS,

15.35 CANDLE POWER,

548.2 B.T.H.U's.

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LARGE RETORT GOVERNORS.

ENCLOSED
COUNTER
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TYPE.



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Tay Works, Bonnington,

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For Over a Century

KING-HARRISON'S *Gas Retorts and* *Fire=Clay Goods*

HAVE STOOD THE GREATEST TEST
AND
NEED NO GUARANTEE.

In order to meet the modern requirements of Gas Engineers, we have thoroughly overhauled our Laboratory and Analytical Department. We employ a **RESIDENT CHEMIST**, who is daily occupied grading and testing all clays.

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GEORGE K. HARRISON, LTD.,

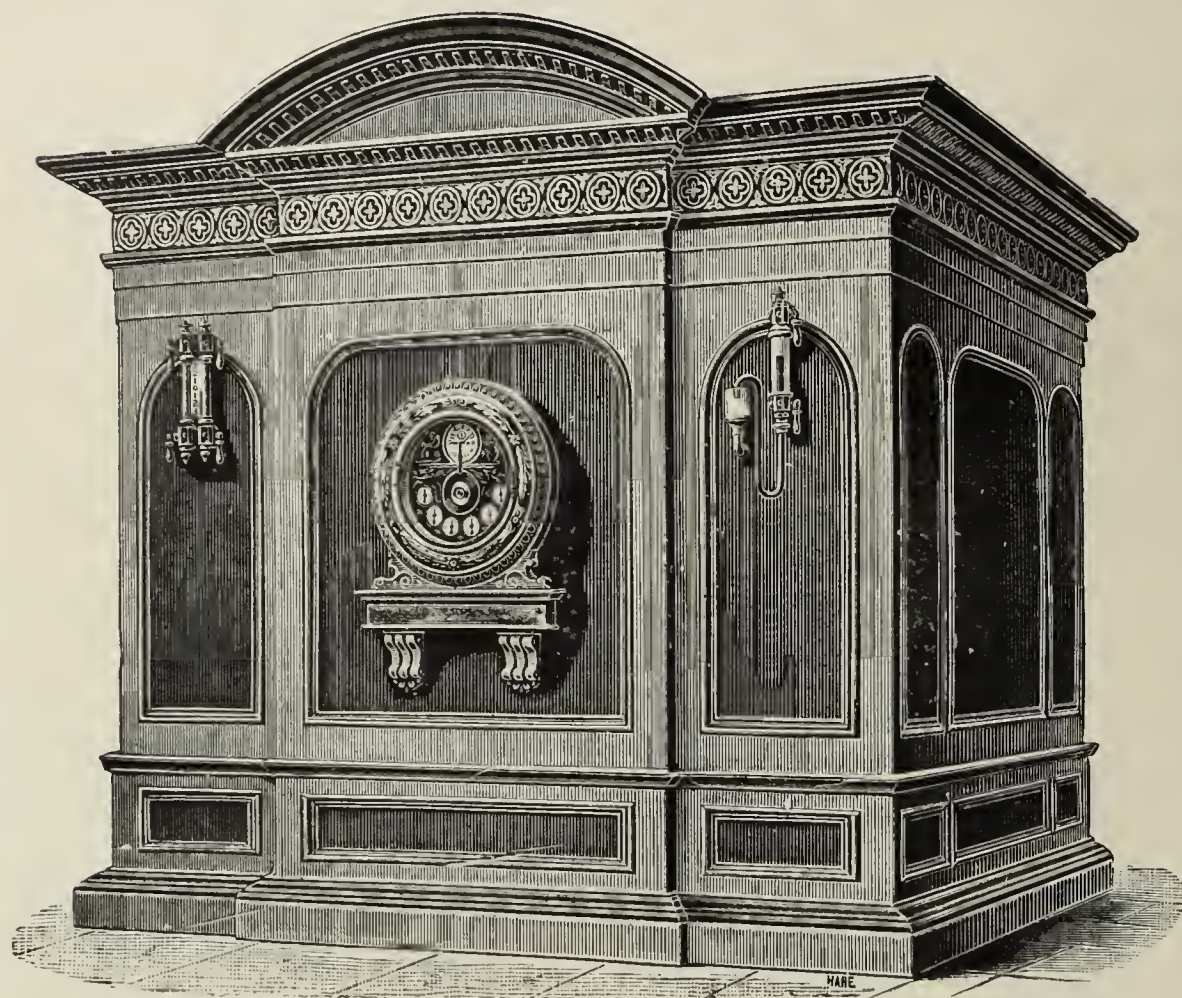
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DRAKES LIMITED HALIFAX.

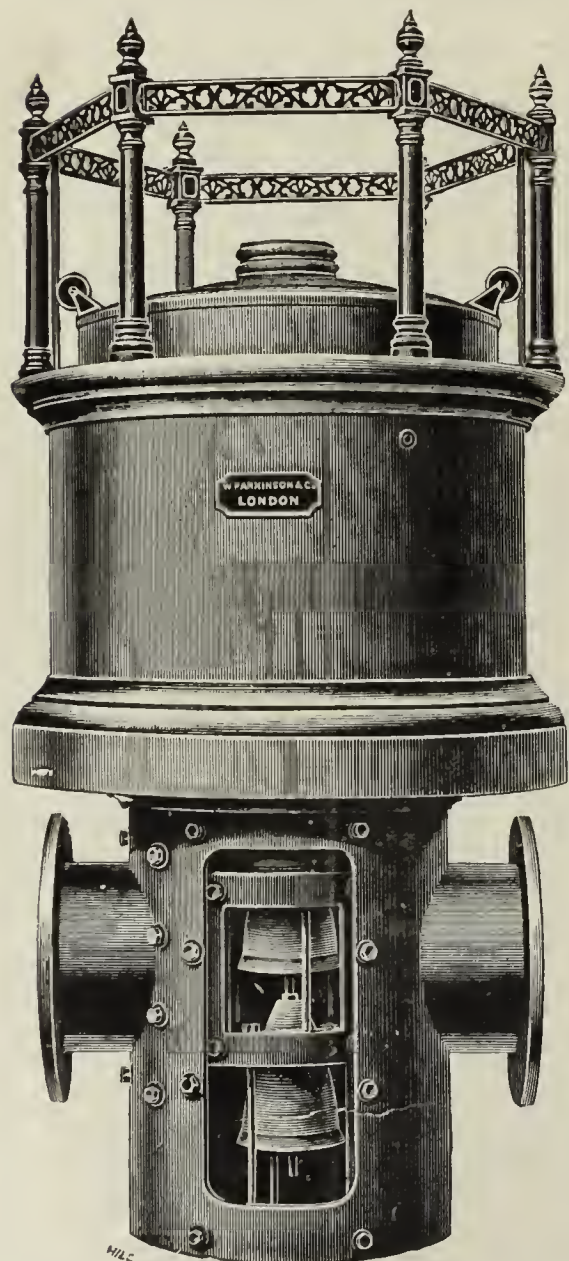
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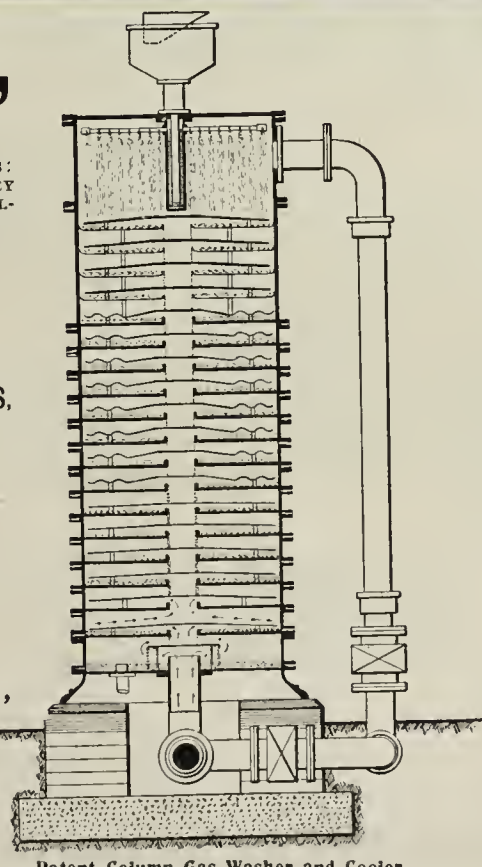
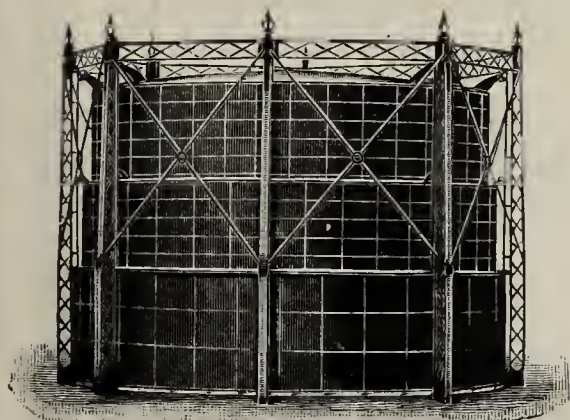
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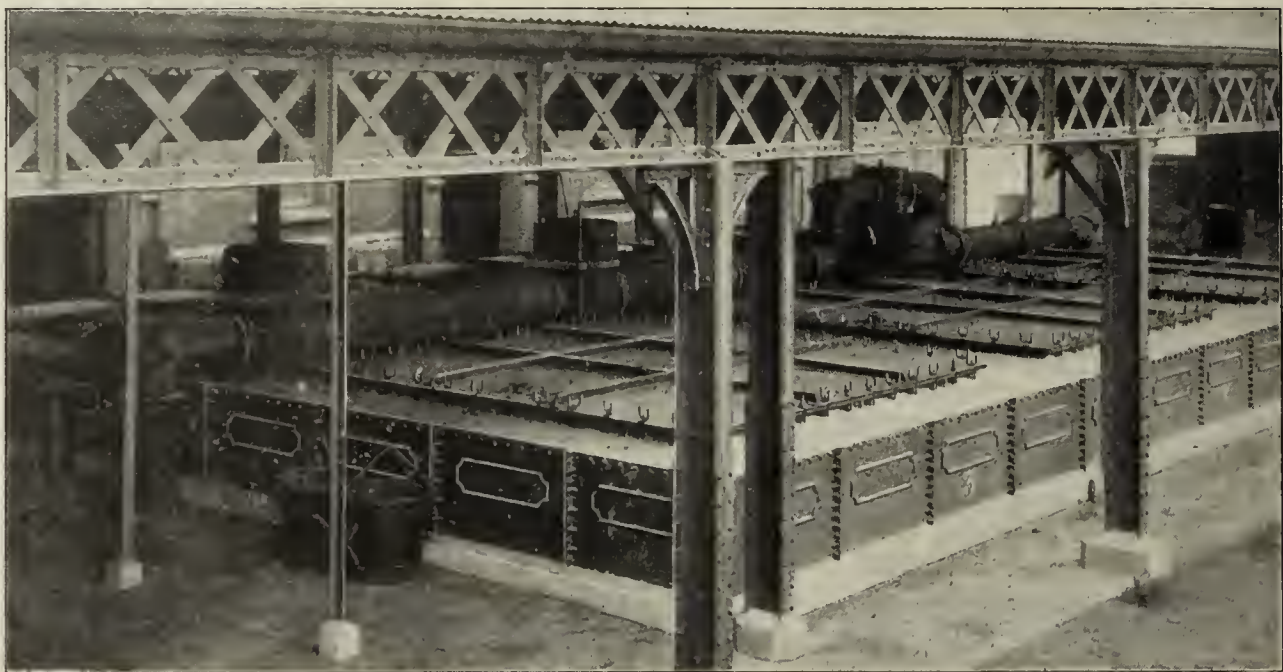
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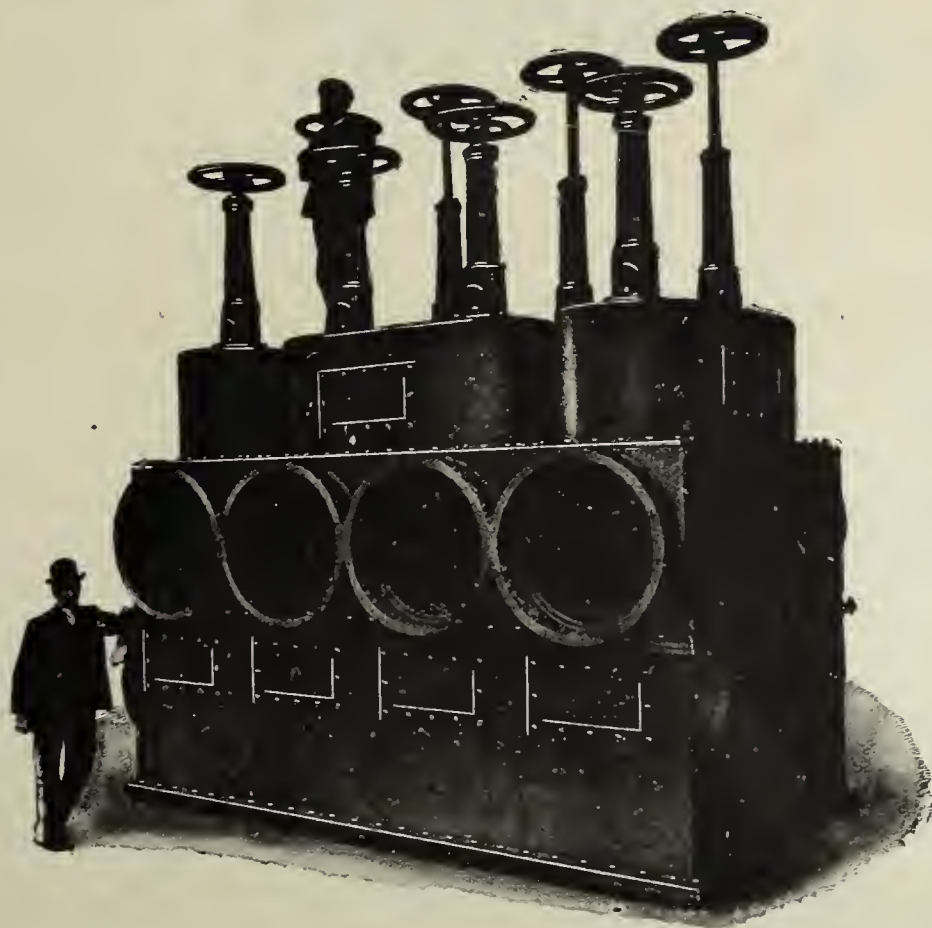
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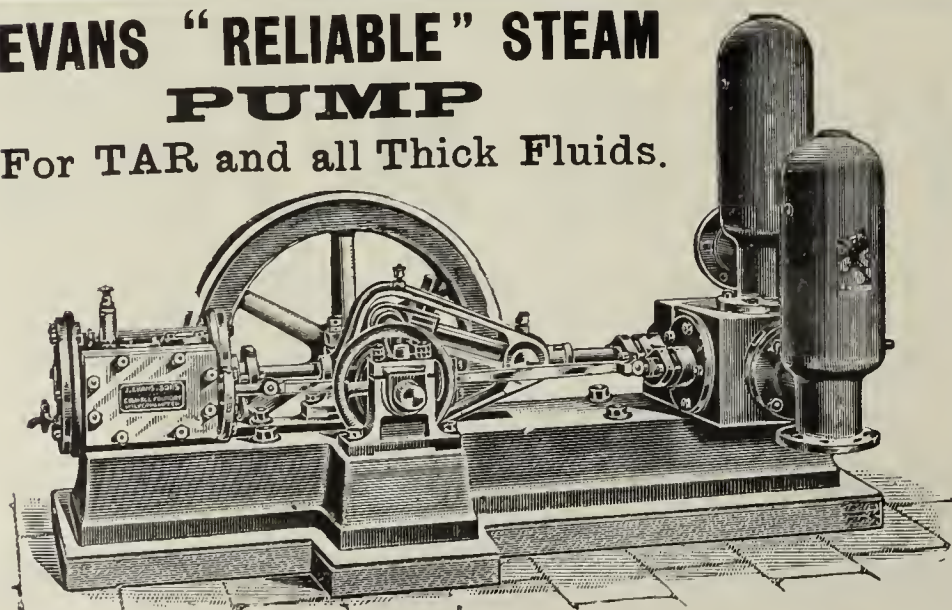
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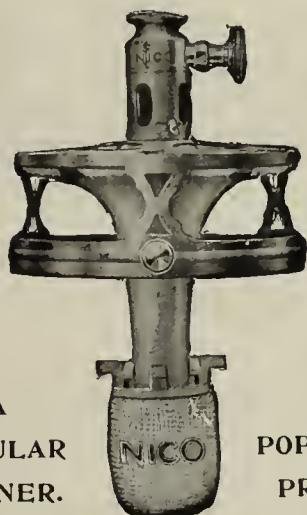
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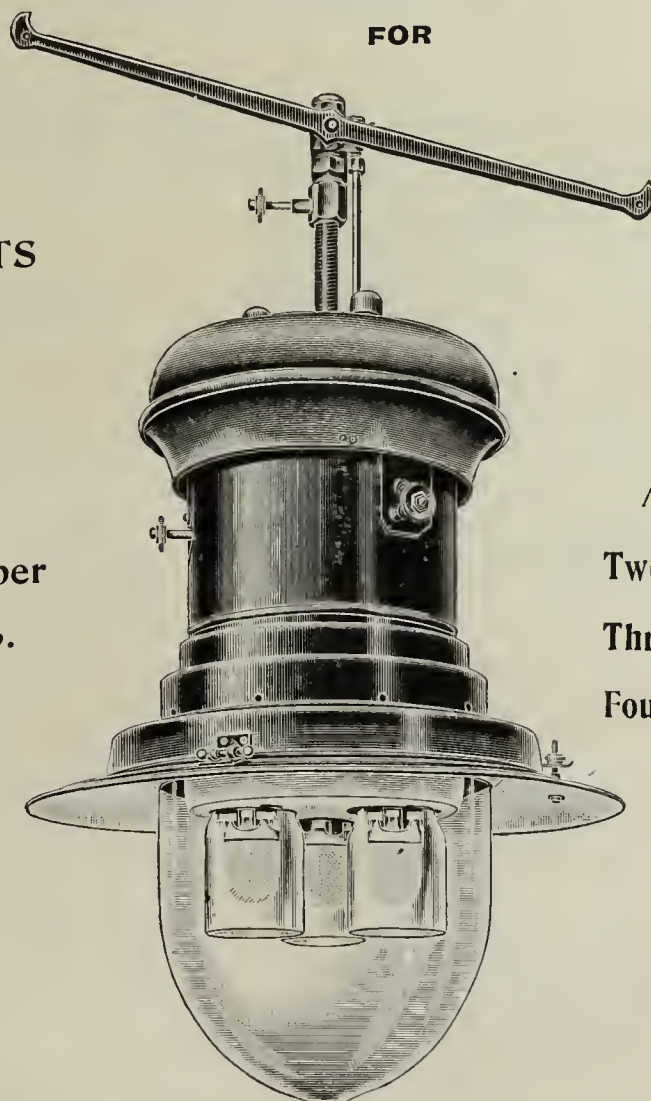
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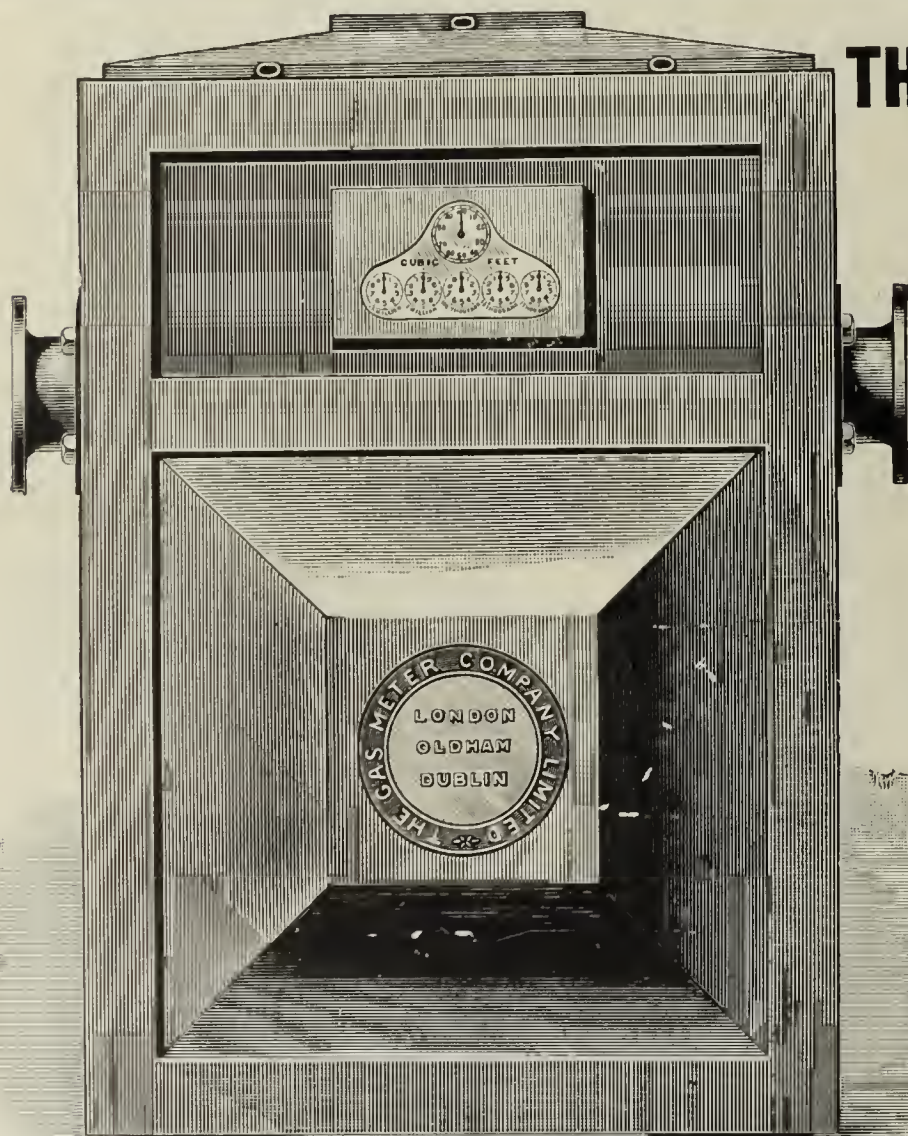
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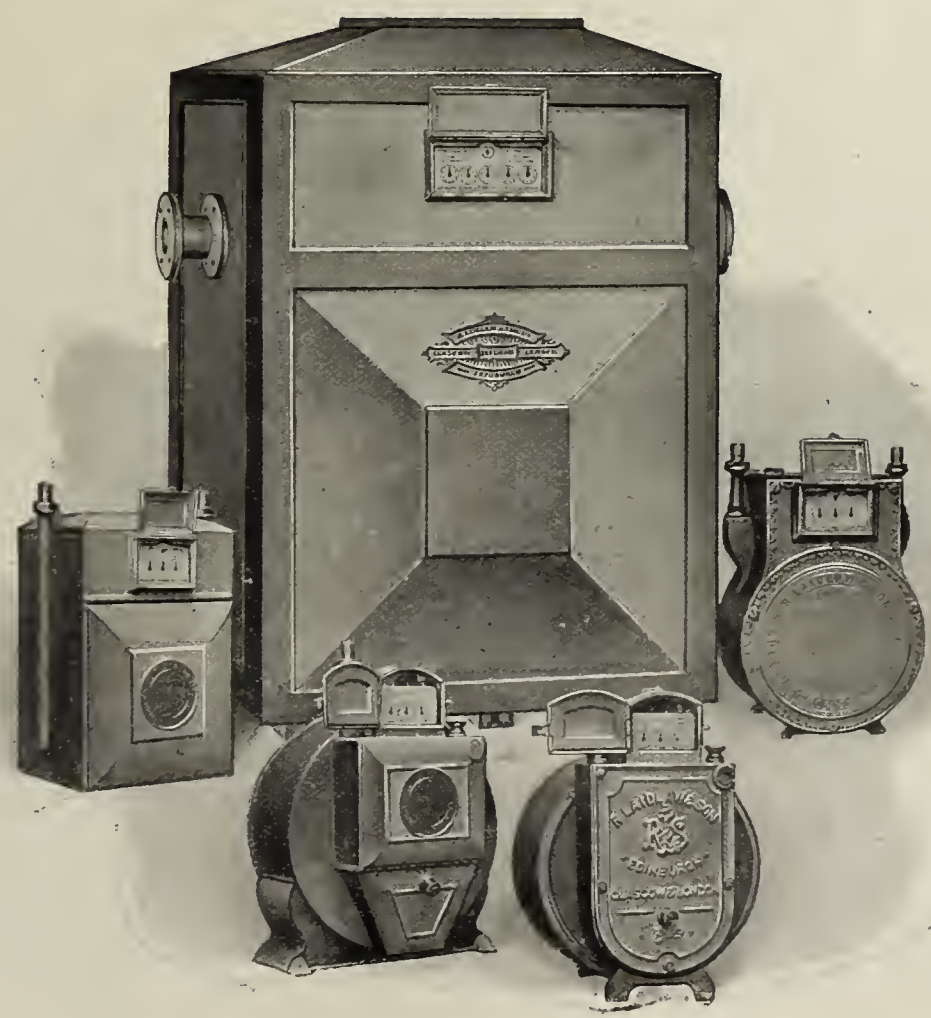
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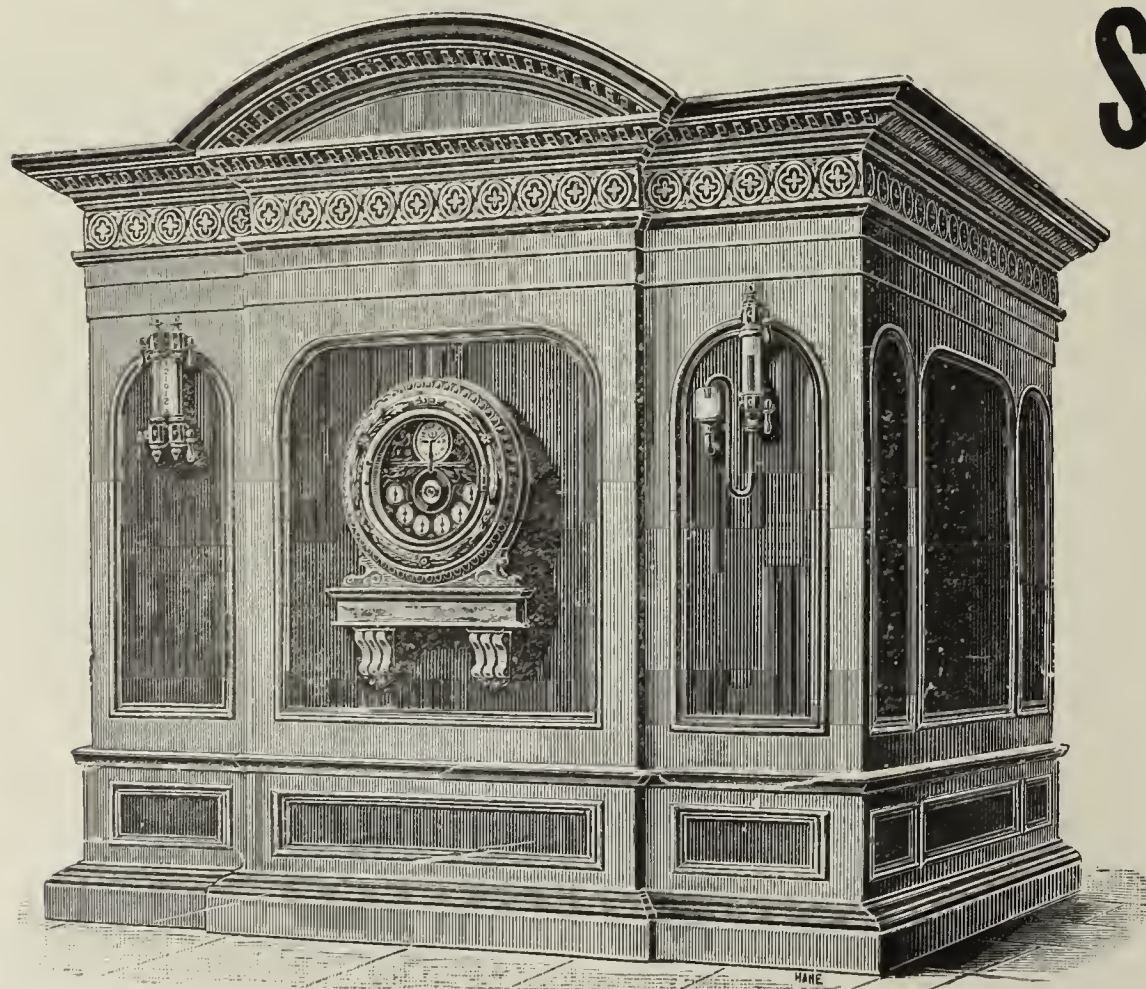
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OFFICE: 11, BOLT COURT, FLEET ST., LONDON.

VOL. CXV., No. 2520.—TUESDAY, AUGUST 29, 1911.

EDITORIAL NOTES—GAS, &c.

Gas Legislation in the Present Session.

THE reflections that appeared last week on the gas industry's legislative work, pave the way for a review of some of the features of the session's proceedings (such as they were) in connection with private gas legislation. There was really little that invited anyone to the Committee rooms to take part in, or to witness, contest. It was nearly all flat, and miserably so. Here and there, however, there were solid fights against attempts by county councils to unrighteously impose upon gas undertakings fresh and unjust obligation; and the resistance in every case was successful. There were also little skirmishes before the Unopposed Bills Committee with Government departments, that sought to restrain the conferring upon gas undertakings of certain protection—protection with justice at its roots—enjoyed by the electrical industry, and for which recent sessions have created precedent in the gas industry. In every case Mr. Alfred Emmott's Committee stood between the gas industry and bureaucratic interference, and did the right thing. Parliament can be just as well as inconsistent in its decrees; and perhaps its inconsistencies in Private Bill legislation stand out with undue prominence simply because they are abnormal.

In reviewing the work of the session, we shall confine ourselves to the general rather than launch out upon detail. The Bills and Provisional Orders promoted, considering the majority of them referred to comparatively small undertakings, sought a fair amount of capital. But in several instances, chiefly in the process of agreement, the amount of the capital originally asked for was modified—somewhat considerably in cases. In relation to capital, the Chairman of Ways and Means (Mr. Emmott) recently made an important announcement when dealing with the Provisional Order of the Milford Haven District Council—an announcement which, if it amounts to a definite resolve, means that the Local Government Board and the parliamentary authorities will be clashing, to gain supremacy, the one their prescriptive rights, and the other the superior and supervisory rights of Parliament. For long, it has been parliamentary usage, in connection with gas and other Bills promoted by local governing bodies, to grant certain capital powers with, in addition, such other sums as may be subsequently approved by the Local Government Board. The authorities have now discovered that this somewhat ancient liberty means unlimited capital powers, and enables municipal authorities to keep away from parliamentary supervision and power revision for an unconscionable length of time; and therefore they have determined, or appear to have determined, that they will no longer allow unrestricted powers of the kind, but will in future define a maximum sum, based upon the computed requirements over a number of years. The point has so recently been discussed in our columns, that we will leave it at the statement of the fact as a significant incident in the session. Another general matter is that in all cases in which the "Metropolitan" No. 2 burner and reductions of illuminating power have been requested, they have been granted by Parliament. It was so in the case of the application of the Liverpool Corporation (who led the opposition against the jointly promoted Standard Burner Bill of 1909) for the use of the "Metropolitan" No. 2 burner for testing the gas supplied from their Fazakerley works. It was so, too, in the case of the contested Preston Order. But in this instance, the prescribed standard illuminating power was reduced by 4 candles; and the unusual standard price conditions in the Company's Act of 1894 were levelled-down to 3s. 4d. But the Company have never paid anything beyond their standard dividends, so that the change of standard price is little more than a paper one. On the other hand, the application to Parliament has given the Company several pieces of good fortune, one of which was unpremeditated by them at the time of the promotion.

It was the bestowal, voluntarily on the part of the Hon. T. H. Pelham, acting for the Board of Trade, of a redemption fund to extinguish £100,000 of unproductive capital.

Welcome though this was, it illustrates inconsistency on the part of Parliament. The Gaslight and Coke Company and the Brighton Gas Company have redemption funds; and the Preston Company have now one unsolicited. But the Enfield Company, who requested Parliament to allow them to institute such a fund to a defined amount, for putting an end to capital unrepresented by tangible value, had their request rejected by the Unopposed Bills Committee. It is singular that custom should so largely influence statesmanship; and that it should be allowed to perpetuate the existence, instead of providing for extinguishing, unrepresented capital, which claims perpetual interest or dividend from present and future gas consumers. Another instance of inconsistency is found in the proceedings on the Chapel, Whaley, and District Gas Bill. There is ample precedent for allowing new issues of stocks and shares to be first of all offered to employees and consumers; we can, in fact, go back a full decade—to the South Metropolitan Act of 1901—and trace precedent for this healthy provision in the interests of the furtherance of co-partnership (the principles of which are found in the sliding-scale and profit-sharing) between a gas industry and its consumers and employees. But in the Chapel, Whaley, and District Bill, the Unopposed Bills Committee would not allow the provision, for the reason that the Speaker's Counsel (Mr. Ernest Moon, K.C.) has discovered that it is repugnant to the Standing Orders of Parliament, which provide that all new capital must be submitted to public auction. It is curious that this should be raked up in this fashion now, and the useful provision be refused, after so much precedent.

In regard to territorial matters, the Gaslight and Coke Company have obtained power to annex the area of the Barkington Gas Company and that of the Chigwell, Loughton, and Woodford Gas Company, in pursuit of their policy to obtain fresh breathing-places and, ultimately, to produce further economies by providing a larger load for Beckton. Centralization of manufacture, within the limits in which economy can be secured, has been accepted as a principle in the legislation of latter times. It is seen in the cases of the amalgamation of the West Ham Company with the Gaslight and Coke Company, of the Caterham and Carshalton Companies with the Croydon Company, and of the Crays Company with the Bromley Gas Company, as well as in the fusion of several Essex Companies in 1910. Many other instances could be named. Yet we find Parliament consenting to the Margam District Council severing itself from Aberavon (instead of overcoming present difficulties and grievances by, say, forming a Gas Board), and establishing the uneconomy of separate neighbouring undertakings. We see, too, the Cudworth District Council, who have been purchasing gas in bulk from the Barnsley Gas Company, now being allowed to construct gas-works of their own. With such divisions the best gas opinion does not agree, unless there is something radically wrong, and irremediable, to justify it. Another territorial matter refers to the works extension scheme of the Swansea Gas Company. In a Bill of much importance to the future of the concern and of the gas consumers of the borough, the Company sought manufacturing powers over certain lands long nursed by them with this object in view; but part of the land has had to be relinquished in the cause of peaceful relations with the Corporation. The latter, however, were, one way and the other, hard bargainers to satisfy; and over the Bill there was one of the sternest fights of the session.

Reference to these various matters reminds that there has not been much in the way of purchase projects this session. In the Cannock Company's Provisional Order, the Local Authority and the Company agreed upon the insertion of a purchase clause. In the case of the non-statutory Company operating at Ashborne, the District Council asked for the insertion of a purchase clause; but a Committee of the House of Lords rejected it. The counsellors of local

authorities dealing with non-statutory gas companies, when the latter are applying for statutory powers, have always taken it as a foregone conclusion, and have advised, that the authorities have only to ask for a purchase clause, and they will receive it. That notion has been knocked on the head before; and in this Ashborne case, the House of Lords refused to recognize any right created by custom. It is, to say the least, a ridiculous proposition that a non-statutory company who have been doing well for a locality should be expropriated when asking Parliament to empower them to do better under such control as the latter may deem it desirable to impose. Unless Parliament protects non-statutory companies against this form of ending their career, it will have the tendency to keep such concerns from applying for full statutory powers. The Sidmouth Gas and Electric Light Company had a suspensory clause, operative for a year, dropped into their Bill; but unless terms are arranged, the local authority, if they come to Parliament next session asking for purchase powers, will have to fight the Company. The session saw the further dissolution of the Mid-Oxfordshire Company by powers to purchase being conferred on interested local authorities. Other general points of interest will be referred to next week.

Vertical Retort Working.

ALTHOUGH the vertical retort-settings at the Cologne Gas-Works were described long since in our columns, additional interest will have been found by many of our readers in the translation of an article (given last week) by Dr. F. Leisse, Chemist at the works, from the fact that the distinguished Engineer and Manager there is Herr Prenger, the President of the German Association, who not a few British gas engineers had the pleasure of meeting during the formal visit to this country of German gas engineers and chemists last autumn. Value, too, is to be found in the article from the point of view that it is a record of independent experiences and results during four years' working, and that they are confirmatory of figures previously received from Germany. But we cannot say that they are more than confirmatory. Good as the results are, they are the common experience of our German friends who have adopted the Dessau system. It is clear that the results are only presented to show the drift of experiences from the horizontal and inclined working as followed at Cologne to the Dessau vertical settings; and it will be conceded that on every point Herr Prenger has, by the adoption of Dessau settings, secured advantage within the limits of his experiences. Basing comparison on cubic feet or the calorific valuation of the gas, there is a substantial gain.

But greater interest is to be obtained from various collateral benefits to which Dr. Leisse draws attention. There is, for instance, the improvement in the make of sulphate of ammonia. A production equivalent to 28 lbs. per ton of coal carbonized is a result that few gas engineers can claim to have attained in horizontal working, though, as we were pointing out the other week, a yield with horizontal working of 27.3 lbs. of sulphate at the South Suburban Gas-Works last half year closely challenges the Cologne figure. Another point is that, with the vertical retorts, naphthalene washers are no longer necessary. A striking comparison is the reduction, in both the crude and the purified gas, of cyanogen and sulphur. It follows that the lessened sulphur content of the crude gas must be a relief to the purifying plant, and so must produce economy in that department. The composition of the gas, too, shows a low percentage of carbonic acid and nitrogen; and the tar, of free carbon. In making comparisons, there is a too general disposition to confine attention to gas made; but whatever the systems of carbonization that are being compared—whether the modern method of working horizontals, inclines, or vertical settings—the comparison should be carried further than the mere question of gas production, as the economical aspects of manufacture in these days do not by any means end there.

Again, the question of wear and tear is frequently referred to. At Cologne, experience runs over four years; and the matter of wear and tear forms one of the features of the article published last week. It will be seen that, as has been generally claimed is the case for verticals, the cost of maintenance at Cologne has been low, particularly if we eliminate those replacements of external fittings that required experience to prove whether or not they were of sufficient strength. The main parts of the settings and the retorts have given an excellent account of themselves. In these days, to get a truly comparative figure in regard to

maintenance, the basis of per 1000 cubic feet production is the fairest one upon which to work.

It will be seen from a short article in another part of the "JOURNAL" to-day that Messrs. Duckham and Cloudsley are putting in a further installation of the Woodall-Duckham continuous system of carbonization at the Poole works of the Bournemouth Gas and Water Company; and from this plant it is quite hoped in time to reproduce the excellent published results in regard to make of gas, calorific power, fuel, and other points derived from the working of the system at Lausanne. A point to be noted is that we calculate that the area the new house will occupy will work out to only 2.3 square feet per 1000 cubic feet of productive capacity.

A Statistical Examination.

THE past half year will stand well for results in the records of British gas undertakings generally; but the conditions in and about London, where competition with electric supply is perhaps as keen as, if not keener than, elsewhere, are especially interesting. The percentage increases in consumption have been extraordinarily good compared with recent years; and so, too, have the markets for residual products. The fixed capital charges per 1000 cubic feet—owing to the increase of production per ton of coal handled, the increase of business, and the excellent provision in connection with wear and tear and depreciation—are descending. Prices of gas are lower than twelve months since; and in most cases further reductions have been resolved upon, or are under contemplation. The half year gave very luxuriant growth in consumption, in comparison with the first half of 1910. Percentage increases do not by any means represent volumes; but to save large figures, we will give the percentage returns of eight of the principal companies. The two smallest companies obtained the largest percentage increases: Croydon, 8.3 per cent., and Wandsworth 8.3 per cent.—both the same. Tottenham came next with 6.2 per cent.; and the order of succession of the other five is: Brentford, 5.1 per cent.; South Suburban, 5 per cent.; Gaslight and Coke, 4.7 per cent.; Commercial, 3.4 per cent.; and South Metropolitan, 2.6 per cent. In the case of six of the companies, the ordinary prices were lower in the past half year than in the corresponding one. The Croydon price was 2s. 7d., compared with 2s. 8d.; Wandsworth was 1s. 9d., as against 1s. 10d.; Tottenham was 2s. 3d., compared with 2s. 4d.; Brentford was 2s. 7d., as against 2s. 9d.; Gaslight and Coke was 2s. 7d., compared with 2s. 8d.; Commercial was 2s. 4d., as against 2s. 6d. In seven of the companies, we have settlement or prediction of further reductions. The South Suburban is already working on a 2s. 4d. price; at Michaelmas the Brentford price is coming down 2d. to 2s. 5d.; and Croydon recede by 1d., to 2s. 6d. at the same time. Broad hints have been thrown out by the Chairmen of the Gaslight and Coke Company, South Metropolitan Company, Tottenham Company, and Wandsworth Company that an additional reduction in each case may be looked for within quite immediate months. This is all extremely satisfactory.

The influence of residual products, though in the past half year the price of coal was generally rather more than in the corresponding half of 1910, is seen by calculating the average receipts for the secondary products per ton of coal carbonized. In the case of the Gaslight and Coke Company, they were equivalent to 11s. 2d. per ton, compared with 9s. 8½d. in the first half of 1910; the South Metropolitan Company, 10s. 3d., as against 8s. 11¾d.; Commercial, 12s. 1d., compared with 10s. 3¾d.; Brentford, 10s., as against 9s. 4d.; Tottenham, 9s. 9d., compared with 8s. 8d.; South Suburban, 11s. 5½d., as against 9s. 11¼d.; Croydon, 13s. 10¾d., compared with 12s. 2½d.; and Wandsworth, 12s. 1¾d., against 11s. 2¾d. While there was the general increase in consumption (though at lower prices), it will be seen from these figures that residuals rendered excellent service to income, and to the net cost of coal. As to the fixed capital employed per 1000 cubic feet, this—through increased production per ton of coal, additional business, and good attention to depreciation—in all cases exhibited a reduction. So it follows that the charges for dividend and interest likewise declined fractionally per 1000 cubic feet. The total capital charges per 1000 cubic feet, based on the past half-year's figures, are as follows (the sums in parenthesis being those for the corresponding half of 1910): Gaslight and Coke, 11s. 3d. (11s. 9¾d.); South Metropolitan, 7s. 10¼d. (8s. 0¾d.); Commercial, 8s. 10d. (9s. 1¼d.); Brentford, 7s. 10¾d. (8s. 1½d.); Tottenham, 8s. 3¼d. (8s. 6½d.); South Suburban, 8s. 1d.

(8s. 7d.); Croydon, 10s. 1d. (10s. 10d.); and Wandsworth, 6s. 6½d. (6s. 8¼d.). Wandsworth holds an enviable position in this regard and in the price of gas. But concerning the figures generally, it may be said that all is well, business flourishes, and the trend of affairs is in the right direction.

The Oil Market.

FOR some time past now, gas companies have been able to fill their oil requirements at comparatively low cost. Prices kept at easy figures for contract supply even while the coal market made an upward move at the contract-making period of 1910. Now prices for coal have receded under current contracts to about those that ruled for 1909; but we know of oil contracts that have been entered into at a slightly higher figure than was the case under the last contracts. There seems no reason why oil should not continue at moderate rates for a long period—all efforts to boom it notwithstanding. The predictions are that oil for fuel purposes is going to have an immense future. It may have; but the time is not quite so near at hand as most people think. Its use for ocean-going steamers and on railways and in large factories for steam-raising is talked about and written about at large. Its extensive use for oil-engines is likewise paraded freely before the investing public. But shipowners, railway companies, and manufacturers know that, if all that is predicted were to come to pass, the price of oil would not remain at low and tempting figures.

Beyond price, there are other practical questions that come into the reckoning. Admittedly, oil has many advantages compared with solid fuel. It is easy to handle without manual labour; and the storage-room required is less not only in respect of bulk, but on account of its higher heating value. But the whole of the advantages are not on the side of oil. Special storage tanks and handling arrangements are required for oil; while solid fuel only demands the ordinary handling arrangements and accommodation. Users of large power units look with some little uncertainty upon committing themselves to a form of fuel that cannot very well be substituted—more especially if a ship, factory, or other place is equipped only for its use. Oil supplies, too, cannot be picked up just anywhere; and there is the further practical consideration that manufacturers quite appreciate that the efficiencies of which they hear so much, and which are obtained under the refinements of expert testings, are not likely to work out in actual practice. Under these circumstances, there does not seem much likelihood of anything revolutionary happening, with great rapidity, in connection with the utilization of oil as fuel. The change will proceed at a more decorous pace than some of the oracular penmen of the City foretell.

On the other hand, in Russia, Asia Minor, Persia, Mexico, Malay, New Zealand, and other places, new oil companies lately formed are quite busy prospecting, well-sinking, and arranging for transport. The extraordinary life that there has been in the oil world in seeking for new sources of supply has been largely instrumental in causing those who, in the main, have hitherto held the fortunes of the oil market in the hollows of their hands, to keep prices low. They object to an extension of competition; and some of the new companies—especially those whose seats of operation are not well served in the matter of transport—may depend upon having a somewhat ugly time of it owing to the objections to their birth and existence on the part of those already in possession. Significant of what can be done is to be found in the present position of the Scottish mineral oil trade. So difficult have some of the companies found the disposal of their output of refined oil that they have been under the necessity, report runs, of selling large quantities to their most active competitors, the Standard Oil Company. However, it seems, reviewing the whole position, that there will not be any extraordinary extension in demand that will not be counterbalanced by extensions of supply; and therefore, under these circumstances, so far as one can see, there need not be any apprehension of convulsive or permanently upward price movements in the oil market within reasonably measurable time.

The Efficiency and the Margin.

The vitality of the gas industry, in meeting demands and competition, appears to have no bounds. In the efficiency of its appliances, it has made remarkable strides forward—always at the opportune moment. We cannot, in fact, tell where efficiency

is going to end in either its lighting or its heating appliances. Between the potential energy of gas and that which is usefully employed, there is still a good margin upon which to work. In connection with the gas cooker, for example, our electric competitors only give us credit for utilizing about 12 per cent. of the actual heating power of the gas employed. We know they are wrong; but the figure gives greater point to our argument. On the other hand, in the electric cooker, they claim that 80 per cent. heat efficiency is secured. At these respective efficiencies, they say, costs work out about equal. If they were right as to the efficiencies, then they show that the makers of gas cooking appliances have before them the not impossible problem of how to effectually kill electric cooking stoves by bringing into play some of the 68 per cent. difference between the efficiency of the gas cooker and the electric cooker. They also show that the latter cannot hope to exceed by anything very appreciable, whatever is done, the so-called 80 per cent. efficiency of the present. The electric cooker has only 20 per cent. between current performance and absolute perfection before it utilizes every available heat unit of electricity; while gas has 88 per cent. If we believed in the figures as to present efficiency (we know they are not true for gas), we should still stand for a flight of gas in efficiency that would leave electricity at the borders of the cooking field fretting over and anathematizing the fate that makes it such a poor generator of heat units, without some combustible to assist it—such as a hotel, a music hall, or (it is not particular) anything that will burn.

Forty Candles per Cubic Foot.

Not only in cooking is there a large margin upon which to work. In lighting, we have had some startling developments—developments that have placed the gas industry in a position far superior to its competitors in both economy and efficiency. We cannot predict where it is all going to end. We have not by far exhausted the heat energy of gas in producing light. Fresh achievement is recorded to-day. Using low-pressure gas—an admixture of coal and carburetted water gas of about 15-candle power—a lamp has been invented that gives, on photometric trials made by (as we can vouch) an independent gas tester, 42 candles per cubic foot consumed per hour. A representative of the "JOURNAL" has seen the lamp at the show-rooms of the New Inverted Company, and has there investigated its merits, which form the basis of an article in another part of the "JOURNAL" to-day. High-power sources of light have taken hold of the public for outdoor lighting and for the illumination of large interiors; and the fancy has to be catered for. In this lamp the gas industry has a fresh addition to its offensive and defensive weapons. Let our electrical friends perfectly understand that this 42 candles per cubic foot is procurable by suspending the lamps on the ordinary supply-pipes, and that there is no fiction about the efficiency. A pennyworth of gas at 2s. 6d. per 1000 cubic feet (with the reductions that prosperity has enabled the companies to make, we shall have to begin to talk of lower prices than this in and about London), using this lamp, will give a light of 500 candles for two and three-quarter hours, or larger units in proportion; and little for maintenance except an occasional renewal of the mantles. For such a lamp there is a field of incalculable vastness.

Leading the Way.

The Wandsworth and Putney Gas Company are well ahead in lowness of gas prices of all the Metropolitan and Suburban Gas Companies. They are, in fact, the leaders in this matter, though all their neighbours have been beating their own records lately in the rate at which they have made reductions, which, as they have proceeded, have found the Companies securing more financial solidity than ever. The price that has been ruling in the Wandsworth district during the past six months has been 1s. 9d., and lower still for power purposes. Yet, after the eloquent tale of the past half-year's working had been before the Board, and the employees had received their first payment under the co-partnership scheme, the Chairman of the Company (Mr. H. E. Jones) was, last Tuesday, at the meeting of the proprietors, almost bemoaning the fact that the Board did not reduce the price, while they were about it, to 1s. 8d. However, from his confident words, with the safeguard attached that they are subject to nothing coming along to mar the present prospect, it is gathered that 1s. 8d. is the price that is in the Directors' mind as the one that

will rule before many more months have fled. We congratulate the Directors and the officials, Mr. H. O. Carr (the Engineer) and Mr. Charles W. Braine (the Secretary), on the 8·3 per cent. increase in consumption last half year, on the lowness of the capital account (rather more than 6s. 6d. per 1000 cubic feet of gas sold), and on the success that has attended the first year's working under the co-partnership system. The proprietors are to be complimented upon the extraordinary position of the Company among the Metropolitan and Suburban gas undertakings, and upon the increase of their dividends, in consequence of the price reductions.

Co-Partnership and Labour Unrest.

Attention is drawn in an article which is appearing in the September issue of "Co-Partnership" to the fact that, while the industrial world seems to be in a sea of troubles, the great gas companies who have adopted the co-partnership principle are in a very contented mood. The substantial benefits of the system to the men—which fully justify this feeling of contentment from their point of view—and the gains to the companies concerned, are emphasized by points from the reports and accounts of different undertakings. It is remarked that, in the case of the South Metropolitan Company, the payment to the co-partnership account for the twelve months ending June 30 was £43,043; and at the end of this period the Company held £28,756 as deposits of workmen's bonuses and savings. The South Suburban Company for the same period credited £3418 to the co-partnership account; and the workmen's superannuation fund stood at £10,349. The co-partnership account of the Gaslight and Coke Company for the twelve months was £32,545. In the withdrawable account 6460 employees are credited with £11,454; while in the trust accounts 9257 employees have £21,091. Co-partners' interest in the Company now amounts to £103,581—made up of £43,180 of stock costing £45,752, and acquired through the co-partnership scheme; £34,153 in the trust account; and £23,675 in the withdrawable account. As to the Commercial Gas Company, in the withdrawable account the half bonus for the past year for 1234 employees was £3258; and the balance at June 30 was £12,326. In the trust account, the half bonus to 1205 employees was £3215; and the withdrawals included £471 owing to termination of service by 81 employees. The balance of the trust account was £8043; and the total of the profit-sharers' interest in the Company was £49,350. Attention is also drawn to the efforts being made by those interested in various co-partnership companies to secure exception from the operation of the National Insurance Bill. It is added that, with regard to the accident aspect of the matter, the Directors of the South Metropolitan Company give testimony to the spirit in which the work is performed, as shown in the diminution of mishaps. Figures quoted prove that, while the number of workmen employed increased from 3664 in 1898 to 5933 in 1910, the number of accidents fell from 299 during the former year, to 221 in the latter. In 1898, slightly more than 8 men per 100 employed met with accidents; whereas the average for 1910 was well under 4 per 100. The writer sums up with the statement that the example quoted is only one of many instances of what can be accomplished under co-partnership; and what is true of accidents applies equally well to all the branches of gas undertakings. Waste can be reduced, materials economized, business increased, and work carried out well and expeditiously.

High-Pressure Gas Supply in a Mexican City.

The city of Guadalajara, the second largest in the Republic of Mexico—with its 120,000 inhabitants, its Archbishop's Cathedral, Government Palace, and University—and the chief seat of the cotton and woollen manufactures of the country, has until quite recently lacked what people all over the world have come to regard as one of the necessities of civilized life, a good supply of coal gas. This, however, was furnished in the spring of the present year, from works designed by Mr. W. A. Aldrich, of Grand Rapids, Michigan, who sent to "Progressive Age" a description of them, accompanied by some interesting particulars in regard to the supply. These will be found in another part of the "JOURNAL;" and they may be commended to the attention of our readers. There are certain features of this undertaking which may be briefly indicated. In the first place, as soon as Mr. Aldrich had visited the city, it was decided to adopt the high-pressure system of distribution. This was a bold resolution, in

view of the fact that the people to be supplied were ignorant of the use of gas, and would not know what to do in case of any slight mishap. It was felt at the outset that the system, in which there are no "dead-ends," would be subject to a trial such as it would not have to undergo anywhere else; but Mr. Aldrich says the plant has been in operation for nearly three months without a single complaint. He seems to have been confident that there would be a general demand for gas. So before the mains were laid, the owners or occupiers of premises were canvassed for permission to put in services free of charge; and many consented. This work was done as main-laying went on—thus obviating the subsequent disturbance of the sidewalks. A specially interesting section of the article is that in which Mr. Aldrich describes the domestic arrangements in Guadalajara, and how the people welcomed the advent of gas-stoves to relieve them of the labour attending the existing primitive methods of obtaining heat. Of course, the consumers, or rather their servants, required educating up to the use of the more modern appliances; but by means of a monthly magazine, and the holding of an evening school for salesmanship, the gas business has been established on a firm basis. There are nearly 300 consumers; and Mr. Aldrich says that when he left the city orders were a month in arrear. This shows what enterprise, foresight, and tact can accomplish under conditions which to some might have appeared, from the character and habits of the people to be dealt with, unpromising of success.

Scheme for Agricultural Research.

A scheme that seems of far-reaching importance was announced last Saturday. The Board of Agriculture and Fisheries have been in communication with the Development Commissioners with the view to formulating a scheme for the promotion of agricultural research and local investigations in England and Wales. The issue of the conference is the Treasury have sanctioned the allocation of funds, to be distributed by the Board, for these purposes up to the maximum of £50,000 per annum, when the scheme is in full operation. It is hoped no mistake is being made by us in foreseeing benefit in this for sulphate of ammonia. Research, among other things, is to be devoted to matters of scientific and economic importance; and these comprise plant nutrition and soil problems. Grants are also to be made to certain universities, university colleges, and agricultural colleges in England and Wales, for the purpose of enabling them to supply scientific advice to farmers on important technical questions, and to carry out investigations into problems of local interest which can be more conveniently studied on the spot than at one of the research institutions. There is a matter here upon which the Sulphate of Ammonia Committee must keep an eye, to ascertain in what way they can be the channel of assistance in all this investigation and research work.

Proper Thanks at Lowestoft.

Hidden under the newspaper words "mysterious outbreak," and the safe formula of fire brigades "cause unknown," are without doubt many fires due to the fusing of electric light wires. Similarly without doubt there are numerous fires which occur through this cause—known to so occur—in smaller property that do not get the same amount of publicity as when a fire takes place at (say) a Carlton Hotel, a well-known drapery or other emporium, a music hall, or in some public building. A fire occurred in the dwelling of Mr. S. Richards, of Suffolk Road, Lowestoft, on the 7th inst., and probably nothing would publicly have been heard of the matter beyond the immediate neighbourhood of the house, had not Mr. Richards felt constrained, through the "Eastern Daily Press," to thank all and sundry who promptly and voluntarily took part in saving his property. His letter was as follows:

I shall be glad if you will allow me space to thank those who during the absence of myself and family from home yesterday, extinguished the outbreak of fire caused by the electric light wire fusing in one of the bedrooms, and also for the attendance of the police and fire brigade. Had it not been for the prompt action of Mr. R. K. Thompson (Stage Manager of the Hippodrome), there is no doubt that the fire would have been more serious.

It is not a comfortable thing to return home, after one's house has been shut up a short time, and find that a fire has happened meantime, necessitating the house being broken into. That is, however, a risk one runs by having on the premises a system of lighting with the innate capacity for fire-raising.

GAS STOCK AND SHARE MARKET.

(For Stock and Share List, see p. 557.)

THE tendency of the markets on the Stock Exchange last week was wavering and uncertain, yielding from time to time to variable gusts from different quarters. But, anyhow, they showed improvement, in that they were not uniformly bad. In brief, the good fairies were the firmness of Consols and the progressive pacification in the industrial war; and the bad ones were Americans and the resurrected Morocco bogey. The opening on Monday was cheerful; the trend of events since the close being rather encouraging. Prices hardened, though there was not much actual dealing. Later on, doubts arose as to whether the settlement of the strike was going on well; and this, coupled with Continental selling, set things back. But Consols rose; and Rails were a little better. Tuesday was dull and languid, but brightened up a bit in the afternoon. Consols were steady; Rails were variable; and Americans weaker. The general position was much the same on Wednesday. On Thursday, the continued extreme inactivity caused most markets (not Consols) to droop for lack of support. On Friday, after some hesitation, a more or less general improvement set in. A more hopeful view was taken in regard to the strike settlement; and foreign affairs were regarded with less apprehension. Consols advanced $\frac{1}{8}$; Rails closed at better figures; and the Foreign Market was firm. Americans were, however, a weak spot. On Saturday, Government issues were strong, and Consols closed at $78\frac{3}{8}$ (rise of $\frac{3}{8}$ in the week); but the rest were not so good—Americans setting the fashion. There was little change in the rates ruling in the Money Market for short loans. Discount hardened somewhat, and then went back again. Business in the Gas Market offered nothing to complain about in regard to activity when measured by the August low-pressure scale; but it was all in comparatively few issues. Movements in quotation were all indicative of increasing strength under the elevating influence of higher dividends. In Gaslight and Coke issues, the ordinary was quite active, and was steadily dealt in at $106\frac{1}{2}$ to $106\frac{3}{4}$ —a rise of $\frac{1}{4}$. The secured issues were quiet; the maximum realizing from $83\frac{3}{4}$ to $84\frac{1}{2}$, the preference $101\frac{3}{4}$ and 102 , and the debenture 79 . South Metropolitan was quiet and firm, changing hands at $116\frac{3}{8}$ to $117\frac{1}{4}$. In Commercial, there was nothing done. Among the Suburban and Provincial group, British was marked at $45\frac{1}{2}$ (a rise of $\frac{1}{2}$). This was all the London business; but Brighton and Hove and Wandsworth advanced their quotations. On the local Exchanges, Liverpool "B" was done at 162 ; an "odd lot" of Newcastle at 104 (a rise of 1); and all three Sheffield issues rose in price. In the Continental companies, Imperial was unchanged at 181 free to $182\frac{1}{2}$, ditto debenture changed hands at $90\frac{1}{4}$, Union at 88 and 89 (a fall of $\frac{1}{2}$), ditto preference at $135\frac{1}{2}$ free, and European at 19 to $19\frac{3}{8}$. Among the undertakings of the remoter world, Bombay made $6\frac{11}{16}$, Oriental 139 and $139\frac{1}{2}$, Primitiva $7\frac{5}{8}$ and $7\frac{7}{8}$, ditto preference $5\frac{1}{4}$ and $5\frac{3}{8}$, and San Paulo $21\frac{7}{8}$.

ELECTRICITY SUPPLY MEMORANDA.

One of the Tender Spots—Interest from the Seat of Electrical Commercialism—Gas a "Superfluity"—The Delicate Electric Meter the Main Obstacle to Compulsory Testing—Absorption of the Gas Industry Proposed.

DEFENDER of the electrical faith, and Chairman of the Electricity Publicity Committee, Mr. H. B. Renwick, has written to the Press pointing out that the statement that a recent fire was caused by the fusing of an electric wire is without foundation. Some of the electrical journals, by the way, do not seem to have been aware that there had been a fire at the Carlton Hotel, until Mr. Renwick's letter brought it to their notice. The assertion that the statement "is without foundation" seems rather strong. Mr. Renwick's sources of information are two. In the first place, he says that the Company who supply the hotel with electricity have made a thorough investigation, and give full assurance that there is no evidence whatever to connect the fire with any electrical source. Naturally! It is quite possible that there was not any direct or existing evidence when the Company's representatives got upon the scene, seeing that the electrical system could not have been intact after the fire. In the second place, he points out that the official report of the London Fire Brigade on the occurrence gives the "supposed cause" of the fire as "unknown." This statement is hardly justified. There was an ample report of the inquest on the victim of the fire in the "Daily Telegraph" for Aug. 14. One of the witnesses was Superintendent W. J. May, of the London Fire Brigade. He was asked whether he could say what was the cause of the outbreak; and he replied that there had been a short-circuit of the electric wires, but whether this was what originated the fire, he could not declare. But the Directors of the Carlton Hotel appear to have been fairly well satisfied as to the cause, inasmuch as the day succeeding the fire, they issued a statement which commenced: "The fire which occurred in the Carlton Hotel, in the Haymarket, yesterday evening, is believed by the management to have originated owing to a short-circuit in the service lift." From this it would appear that the management of the hotel do not agree that the "supposed cause" of the fire is "unknown;" evidently, too, they hold an

opinion contrary to that of the Electric Supply Company, that there is "no evidence" as to the cause. And certainly their feeling must be that Mr. Renwick is a bit too dogmatic when he says that the cause assigned "is without foundation." There was the service lift; and there were the electric wires. A little boy in the street could not have thrown a cigarette end up into that lift. There is no occasion to use matches in the lift. To say the least, the pointer of the indicator is set with remarkable stubbornness in one direction.

There are a few points in the annual report of the Marylebone electricity department that are interesting and informative. We had been under the impression that Mr. A. Hugh Seabrook must have had a big and satisfactorily long experience with electric cooking to have given him the vast amount of assurance that he displayed in an article upon which comment was made in the "Memoranda" last week. It seems that, all told, he had only, at the date of his report, seventeen electric ovens in use—a number that can hardly be sufficient to go round, at the rate of one apiece, the households of the members of his own staff and those of the members of the Electricity Committee of the Borough Council. The next point that is striking is the increase of $14\frac{1}{2}$ per cent. in the units disposed of during the year. There has been much congratulation over this increase; but it requires a little analysis to get to its inner meaning. It is found that the total consumption of electricity for all purposes during the year was 12,336,956 units, as compared with 10,776,459 units the preceding year—an increase of 1,560,497 units. Of this increase, private lighting contributed 704,429 units, public lighting (municipal patronage) 654,583 units, and power and heat 201,485 units. Thus we find that the increase from the public lamps was within 50,000 units as great as the increase from private lighting. The $14\frac{1}{2}$ per cent. total increase is therefore constituted as follows: Private lighting, 6.5 per cent.; public lighting, 6.1 per cent.; and power and heat, 1.9 per cent. Therefore, 8.4 per cent. is the only increase apart from public lighting; and nearly 2 per cent. of the 8.4 per cent. represents low-priced units. We wish that, in the figures before us, the revenue from public lighting—£13,769—was separated, in order to show the receipts for current and the payments for maintenance. In connection with the Sales and Publicity Department of the undertaking, the total expenditure for the year was £19,171; while the receipts amounted to £16,959. Thus the department shows a net financial loss or cost of £2212. Mr. Seabrook apparently keeps a good staff in connection with this department, seeing that salaries amount for the twelve months to £4208. It seems that a veritable mountain of trouble occurs with the consumers; and with this trouble the apparently big and well-paid staff has to cope. No less than one-third of the whole time of the members, it is observed, is spent in settling account queries and complaints. That is the only rendering we can give to the following statement: "An idea of the importance of this part of the department's work can be gathered from the fact that for quite a month at the end of each quarter, practically the whole of the staff is employed in settling account queries and complaints." It is manifestly a very expensive and time-absorbing job to keep the electricity consumers of Marylebone "satisfied," even under the management of Mr. Seabrook and his retinue from West Ham.

The article that appeared in the "Electrician" recently, entitled "Can it be Possible?" has brought a letter to our contemporary from a correspondent who found the article refreshing during this season of "wasp stings and empty bottles." Far be it from us to suggest any connection between the "empty bottles" and the wild words that he forwarded to our contemporary, fortunately perhaps for his own reputation under the *nom de plume* "Relay." There is only one point in it to mention here. In these days when the waves of prosperity roll towards, and break over, the gas industry, and opportunities for fresh business have been richly opened up, it is perhaps good that we should have, no matter how weak the pen producing it, our feelings of satisfaction mixed with a fair proportion of humility. To this end perhaps the following piece of fiction extracted from the letter in question will contribute: "With regard to their many desperate attempts to find fresh outlets for gas, the vendors of this superfluity are finding that their opportunities are becoming fewer daily; and it only requires a combined forward move on the part of all concerned in the electrical industry to co-operate as you suggest, and keep in close touch through the medium of the technical press. The necessity for this vigilance is shown by the latest move on the part of the gas undertakings. Even in the past their tactics have oftentimes been more vindictive than competitive; their real aim, wasp-like, being to damage their opponent at the cost of greater damage to themselves." "Relay" does not know the character of the gas industry, nor is he aware that the business in the "superfluity" is putting on flesh daily.

The electrical industry is beginning to pay special attention to the question of the compulsory testing of electric meters. They see the cloud of a movement to this end in the electrical firmament; and they do not like it. The London County Council and the Manchester City Justices are again urging legislation for the compulsory testing of electric meters; and the weakest part of the case in opposition is that the electrical industry can show no just cause why the electric meter should be exempt from an independent official test any more than weights and measures used in the sale of other commodities. The only excuse they can produce is that the meters themselves will not stand it; and therefore the excuse supplies a very good reason why consumers of electricity should have a greater desire for testing and certification. It is not the fault of

the consumers that electricity meters are what they are. An article on the subject has appeared in the "Electrical Times," with points in which we agree, and with points in which we disagree. In the first place, while there are provisions in the Electric Lighting Act of 1909 for meters being certified, there are no provisions for the compulsory and independent testing of meters and the compulsory use of tested and independently certified meters; so that it is not very wrong to say, as was said recently in the Manchester City Council, that there is "as yet no Act of Parliament to regulate the testing and sealing of electricity meters." The first objection of our contemporary is that the compulsory, independent testing of meters, "like each new item of social reform, means saddling the community—or the electric portion thereof—with another batch of officials." The question is then asked, "Can the electricity supply undertakings support them?" The argument leads up to the finding that the larger ones could do so, but not the smaller ones. In the case of gas undertakings, the very smallest is not allowed to have a meter in use that has not been officially certified, stamped, and sealed. The first expense of doing this is included in the initial cost of the meters; subsequent tests and certification are, of course, another matter. But indirectly (except in cases where the consumer himself desires the re-certification of a meter, and it is found correct within the statutory limits, then the charge falls upon him directly) the gas consumers, through the gas undertaking, have to bear the expense of meter-testing, just the same as they do all other charges incidental to the provision of the supply of gas.

This brings us to the strongest objection that can be urged against the testing of electric meters; and this very objection, at the same time, offers the strongest possible reason for electricity consumers claiming a proper and independent test. Says our contemporary: "Let it be remembered that a train journey would be distinctly inadvisable after this extra special testing and sealing; the instrument should go straight into store, or else to the customer's premises. Alternating current meters might perhaps withstand a railway journey after testing and sealing, but, in the case of mercury and commutator meters, even the *short carriage from testing room to consumer's house may often spill a little mercury, or otherwise derange the delicate mechanism.*" This is quite bad enough when the testing is done at the works." If the consumers were to read this statement as to the susceptibility of these meters to derangement, the electric meter would be even more suspect than it is at present; and they would naturally ask what reliance, under such liability to defect, can they have in meters when fixed. It may be agreed that our contemporary has not overdrawn the point as to the weakness and delicacy of the electric meter. It is distinctly also agreed that if there is to be official certification and sealing of meters, that the testing authority must not be municipal, or rather must be independent of the electricity undertaking, or those under whose management it falls. Otherwise, there would be a most heterogeneous state of affairs, which would drive the meter-makers mad, and boost-up the price of meters. It comes to this, that to get electricity meters tested in the same way that gas-meters are, under independent control, and regulations and conditions laid down by a central authority, there would have to be an independent testing institution in every town, the upkeep of which "would certainly be comparable with £1000 per annum." This is surely a stretch of the imagination. Besides gas-meters being compulsorily tested, every statutory gas undertaking has to compulsorily maintain a testing-place—some of them several—for the testing of the gas to see that it complies with the parliamentary standards. The electricity supply industry is not subjected to penal testing in every particular the same as is the gas industry. The gas industry—indirectly the gas consumer—has to bear the expense of it all; and there is not much trouble over it. But on the main point, "an electric-meter is not a gas-meter; it is nothing like it." We agree; and therein is found the greater reason why electricity consumers require more protection in the matter of the measuring instrument than gas consumers. Just think over it; and the truth of this will be seen, unless abnormal density prevails. If the testing of electricity meters is made compulsory, a way will be found to overcome the difficulties. There is no will in the electricity industry to have meters compulsorily and independently tested; and therefore the proper way is difficult to discover. If, however, a central authority were charged with the duty of finding a way, the electricity supply industry would quickly enough desire to assist, lest a greater misfortune came upon it, through the terms of the test itself.

A curious contribution to the "Electrical Review," by "Metropolitan," is headed "Future Practice in Electricity Supply: Possible Amalgamation of Gas and Electrical Interests." We have carefully read the article; and, examining the author's arguments from our standpoint, it would appear that the only escape for the electricity industry from irretrievable disaster is to allow the gas industry to absorb it. "Metropolitan" thinks it should be the other way about. He finds no room nor necessity for both electricity and gas in the world; and having looked deep down into the yet unbroken future [wonderful man!], he concludes that "the enormous improvement in electric supply, and the increase in the applications of electricity, within the past few years clearly prove that gas as an illuminant and agent of motive power must sooner or later become extinct." How very shocking! We have looked carefully round, and fail to find the "clear proof" of this. But we read on: "In the domestic world electricity is now able to assume the supremacy for lighting, heating, cooking, &c." We must have been asleep lately, without even knowing it. "The

only obstacle in the way of a fight *à outrance* with the gas industry is the short-sighted policy of supply undertakers in their methods of charging for energy used." Well, really, we had imagined that every method of charging for electricity that could possibly be devised had been tried; but seemingly we were mistaken. "Metropolitan" becomes rational when he says that, "considering the huge amount of capital, public and private, invested in gas undertakings, it is probable that the fight we are now entering upon will not be allowed to finish, and the possibility of amalgamation must be considered." This mentor, prophet, or whatever he is, has it all cut-and-dried. Light, heat, and power are to be through the uneconomical process of electricity supply; the gas undertakings are to be taken over; the gas is to become a bye-product, and utilized for the generation of electricity; and the present big markets for what are now called the residual products will continue to be satisfied. We rejoice to think that this chimerical scheme will not come off. The gas industry is not standing still; and the day is not yet when it will consider the possibility of being forced to surrender into the hands of the electricity industry. Sooner or later, "Metropolitan" remarks earlier in his article, gas as an illuminant and agent for motive power "must become extinct;" later on he says it is probable "the fight we are entering upon will not be allowed to finish." Which is it to be? for the statements are contradictory. If he is confident about the ultimate extinction of gas, then better let the still thriving industry die a natural death. Meantime, perhaps, he will consider the other side of the scheme, as to whether it would not be more economical for the electricity industry to transfer itself to the gas industry. Such an arrangement would relieve the electrical industry from the ever-expanding difficulties that the still-developing resources of the gas industry presents to its progress. The absorption of the gas industry would be a big and revolutionary proceeding; and the world would be the poorer for the direct loss of its services. We are not given to prophesy as a rule; but we will venture to predict that "Metropolitan" will not be here to assist at the obsequies of the gas industry.

PERSONAL.

Mr. A. McNAIR, the Manager of the Thornhill Gas Company, has been appointed Manager of the Langholm Gas Company.

Mr. H. KING HILLER, who has been on a professional visit to the United States and Canada, for the purpose of investigating the possibilities of a new natural gas field in the Far West, has returned to England, reaching home last Sunday week.

Mr. D. V. HOLLINGWORTH, F.C.S., of Salford, the Vice-President of the Manchester and District Junior Gas Association, has succeeded in getting a first-class certificate in Honours in the last examination on "Coal-Tar Distillation and Intermediate Products" held by the City and Guilds of London Institute.

OBITUARY.

The death occurred on the morning of the 13th inst. of Mr. GEORGE LANGLEY, who for more than thirty years was Clerk to the West Ashford Board of Guardians and the Rural District Council. In the sixties, deceased, in association with Mr. Edward Norwood, inaugurated the Charing (Kent) Gas Company.

We regret to announce the death, last Sunday evening, of Mr. RAPHAEL HERRING, who had for many years held the position of Resident Engineer of the Dover Gas Company. Deceased had been in failing health from the beginning of the year—his heart being the principal source of trouble; and latterly he had been practically an invalid. He joined the Southern District Association of Gas Managers in 1888, and the Gas Institute in 1894; and he was a member of the Institution of Gas Engineers at the time of his death. He read a paper "On a Rapid Method for Increasing the Yield of Gas from Ordinary Retort-Settings" before the first-named Association in 1891. He had been thoroughly identified with the gas undertaking at Dover, and took keen interest in the welfare of the workmen and in the success of their reading and recreation room, founded in 1888, of the Committee of Management of which he was the President. Our readers will, we are sure, unite with us in expressing sympathy with his son, Mr. W. R. Herring, and the family in their bereavement.

The death occurred on Monday last week, from heart failure, at his residence, "Eversley," Hornsey Lane, Highgate, of Mr. FREDERICK LENNARD. Deceased was in his 62nd year. He was for more than forty years associated with Messrs. S. Pontifex and Co., lighting engineers, formerly of 22, Coleman Street, E.C., and now of Regent Buildings, Euston Street, N.W. During the past twenty years he had been sole proprietor of the business, in which he is succeeded by his two sons, one of whom, Mr. F. W. Lennard, is well known to many gas engineers. The late Mr. Lennard carried out many large contracts for gas companies, municipal authorities, &c., notably installations of public lighting. He was a Director of the Barnet, Harpenden, and Grays Gas Companies, and for many years was Auditor of the first-named Company. He was a member of the Society of Engineers; also of the Evening Star Lodge. He leaves a widow, two sons, and three daughters. Until recently he was Vicar's Warden of the Parish Church, Hornsey, and was associated with several charities. The interment took place at Highgate Cemetery last Friday.

IN THE LABOUR WORLD.

Gas and Electricity Works Protection during Strikes and Riots.

DURING last week, progress in producing pacification in the labour world continued to be made; and before the end of the week, tranquillity was fairly well restored. But this recent attempt to create a stoppage of the nation's work, and to commit the whole country to general inconvenience, waste, and worse, has left the disquieting feeling that the country will be able to have less dependence than ever upon labour dominated by Trade Unions that are, in turn, directed by Socialists of the most pronounced and extreme types. Paradoxical as the statement may appear, the most certain thing in the future is that a greater uncertainty than before the events of the past few weeks will exist in the

labour world. However, we will not anticipate trouble, beyond doing all possible to be prepared for it.

As was shown in our columns last week, a little of the influence of unrest had penetrated among gas workers in various places, and the opportunity was being taken by the Gas-Workers' Union to endeavour to foment trouble at Beckton, and to get back into the ranks of the Union the men who have found a better way of improving their positions than by being members of a militant and socialistic organization. Not much good has so far come to the Union from their efforts to stir up strife. At Manchester and Salford, things have returned to their normal conditions; and nothing more has yet been heard of the pressure that the unionist organizations have brought to bear upon the Gas Departments to get rid of non-unionist labour. At Sheffield, the Gas Company have received the demands for higher wages; and the question is now under consideration. [But with the collapse of



Lieutenant Trench in Command of the Fifth Northumberland Fusiliers at the Birkenhead Gas-Works.



A Transport Waggon at the Birkenhead Corporation Gas-Works.



A Convoy of Scots Greys leaving the Gas-Works with Coke for the Electric Tramway Generating Station.

present trouble in these large industrial centres, the purely local threatenings among gas-works labour may be said to have almost vanished.

Last week allusion was made to the stoppage, and afterwards partial stoppage, of the service of the Liverpool Corporation Electricity Station through the strike in the city. Electricity supply and strikes do not agree. The former is a weak point in the service of a city or town, seeing that the men employed in connection therewith have it within their power to swiftly discontinue the service. Labour in this country was taught that by Paris; and the Government in this country during the recent railway strike, and following the Liverpool experience, determined that the principal electric power stations in London should be protected by furnishing them with military custodians. It is right that there should be protection of the kind for both gas and electricity works when disorder is trying by all—including foul—means, to obtain the mastery. Nothing worse could happen than that London

during the hours of darkness, and at such a disturbed time, should be deprived of its means of gas and electric lighting. Fortunately, the stronger protector of the community against anything of the kind is the one that is used more generally.

We have mentioned Liverpool, and what the rebellious ones there succeeded in doing in cutting off the supply of electricity. There were statements flying around that an attempt would be made to get the gas workers out in sympathy. But, as we said last week, the Liverpool Gas Company's workers are all of them loyal and trustworthy; and the citizens can to-day realize how much they owe to the Company's men. Across in Birkenhead tumult likewise reigned; and in order that the gas men should not be molested, military protection was given to the gas-works. It was a novel sight to see this military invasion of a normally peaceful industrial centre. Rightly, believing photographs of the event would interest us, Mr. T. O. Paterson, the Engineer and Manager of the works, has forwarded a few. In the interest, our

readers are able to join by the reproduction here of three of the photographs.

In connection with this matter, we referred last week, as we have referred on previous occasions, to the fact that electricity stations are not protected, as are gas and water works, by the Conspiracy and Protection of Property Act, 1875. The Finance Committee of the Liverpool Corporation have been considering the question of asking for an extension of this protection to all municipal concerns; but no resolution has been passed. The "Electrical Times" has also called attention to the point, and claims that protection should be extended to electricity stations. Gas and water works do not desire any exclusive property in the security afforded by the Act, more especially seeing that they are both further protected by having storage upon which to temporarily fall. The public service that has no similar means of storage is altogether weaker; therefore if the electricity industry can succeed in obtaining an amendment of the Act so as to include their stations, the gas industry will congratulate them.

QUALITY OF LONDON GAS.

Second Quarter of the Year.

THE following is our customary summary of the results of the official testings made in the testing-places controlled by the London County Council in respect of the second quarter of this year—i.e., the thirteen weeks ended July 1—with the corresponding figures for the second quarters of the years 1909 and 1910. The similar results for the first quarter of the year were given in the "JOURNAL" of May 23, p. 511.

Illuminating Power.

Table I. gives the averages of the results of all the testings of illuminating power. Though the past quarter's figures are lower than those for the corresponding quarter of last year, they are a

TABLE I.—Averages of all the Testings of Illuminating Power for the Second Quarter of the Year [Candles].

Company.	No 2 "Metropolitan" Argand.			Flat-Flame.		
	1909.	1910.	1911.	1909.	1910.	1911.
Gaslight and Coke Company . . .	16.75	15.14	15.00	11.69	9.07	8.75
South Metropolitan Company . . .	16.64	16.00	15.81	11.03	10.35	10.08
Commercial Company . . .	14.90	14.73	14.61	9.24	8.74	8.47

little higher than those for the first quarter of this year. The Gaslight and Coke Company have worked with a larger margin in hand over the prescribed illuminating power of 14 candles than the Commercial Gas Company, who likewise supply a mixture of coal gas and carburetted water gas. The South Metropolitan Gas Company, with coal gas alone, naturally have a still greater margin in hand. The minimum results for the testings made with the No. 2 "Metropolitan" argand burner in the last quarter were: For the Gaslight and Coke Company, 13.80 candles; for the South Metropolitan Company, 14.11 candles; and for the Commercial Company, 13.55 candles. There has therefore been no question during the quarter of either of the Companies being liable to incur a forfeiture in respect of deficiency of illuminating power, since their liability thereto does not begin until the value falls to 13½ candles. The minimum results of the flat-flame testings were: For the Gaslight and Coke Company, 6.86 candles; South Metropolitan Gas Company, 8.14 candles; Commercial Gas Company, 7.51 candles.

Calorific Power.

Table II. gives a summary of the results of the testings for calorific power made during the second quarters of the three years. The last quarter's figures do not differ substantially from

TABLE II.—Summary of Testings of Calorific Power (Gross and Net) for the Second Quarter of the Year [Calories per Cubic Foot].

Company.	Average.			Maximum.			Minimum.		
	1909.	1910.	1911.	1909.	1910.	1911.	1909.	1910.	1911.
Gaslight and Coke—									
Gross	145.3	137.5	138.4	155.8	154.8	148.6	132.2	128.3	130.0
Net	130.0	122.2	123.3	139.4	139.4	132.4	117.5	113.4	114.3
South Metropolitan—									
Gross	149.7	147.2	145.3	159.0	158.0	154.8	139.6	135.8	134.7
Net	132.8	131.0	129.5	142.6	140.9	139.4	124.8	121.0	120.2
Commercial—									
Gross	140.9	138.1	137.2	151.1	159.4	151.7	130.0	118.3	124.0
Net	126.0	123.3	122.3	136.5	143.0	132.5	115.2	106.1	110.0

those for the first quarter of the present year; and it may therefore be assumed that they represent the calorific standard to which the Companies are working in order to supply consumers with the most useful gas producible under the obligations in respect of price and quality imposed upon them by the Metro-

politan Gas Acts. But while the average and even the minimum returns for testings of illuminating power have shown an appreciably higher value than is required by Statute, it is noteworthy that the minimum of 110.0 calories net per cubic foot reported on one occasion for the gas supplied by the Commercial Company is below the standard of 112½ calories accepted by the Gaslight and Coke Company in their Act of 1909 as the figure below which the gas should not fall without the Company becoming liable to incur a forfeiture. In another weekly report also, a return of 112.1 calories net is made for the Commercial Company's gas. It is obvious, therefore, that the standard of calorific power by which the Gaslight and Coke Company assented provisionally to be bound is too high for a gas undertaking which has merely observed hitherto a standard of illuminating power of 14 candles.

Sulphur.

The average and maximum results obtained in the testings for sulphur during the second quarters of the three years are given in Table III. The fall in the proportion of sulphur in the coal gas

TABLE III.—Summary of Testings of the Sulphur in London Gas for the Second Quarter of the Year [Grains per 100 Cubic Feet].

Company.	Average.			Maximum.		
	1909.	1910.	1911.	1909.	1910.	1911.
Gaslight and Coke Company . . .	35.7	35.0	33.9	58.8	59.3	56.1
South Metropolitan Company . . .	46.2	32.8	26.3	107.3	68.6	44.1
Commercial Company	35.8	28.9	29.8	72.2	52.7	51.6

supplied by the South Metropolitan Company, to which attention has already been directed [see "JOURNAL," Vol. CXIV., p. 511], has continued into the second quarter of the present year; and the Company now take pride of place in London in respect of freedom of their gas supply from sulphur. The returns from the other two Companies, however, also show commendably low figures in this respect.

Weak Evasion of the "Electrician."

The "Electrician" has got very angry with us, and the omniscient gentleman or prophet whose sayings have recently received a little attention from us in the "Electricity Supply Memoranda" has evidently been ordered to stop his predictions for a time, and to turn on a vein of choice invective. He has complied, and has left uppermost the impressions of pusillanimity and evasion, has libelled us by construing banter as "vulgar personalities," and has brought ridicule upon the "Electrician" by making that the excuse for not replying to a question that was addressed to it on Aug. 15 (p. 409). An extract from this last piece of hysterical composition in our contemporary will afford additional amusement to our readers, and will save further comment on our part:

"We are now invited to take up the cudgels on behalf of the Berry Construction Company, about whose 'Tricity' cookers, at Preston, we ventured (without asking the permission of the 'Journal of Gas Lighting') to give a few figures. . . . Not content with a wild prancing around the hot plate of discussion, our contemporary endeavours to escape the grilling figures by 'abusing' the author of a testimonial to the 'Tricity' cooker. The insinuations are that the testimonial was influenced by the Berry Construction Company, and that Mr. Haynes, the householder in question, was not satisfied with cooking the meat but 'cooked' the figures well. Vulgar personalities were also indulged in at the expense of Mr. Haynes. These tactics are unworthy of our pugilistic contemporary, whom we have never until now had to accuse of hitting below the belt. It must not wonder that the Berry Construction Company and Mr. Haynes maintain a dignified silence as the best 'response' to such attacks. Mr. Berry is by no means 'coy.' We advise the 'Journal of Gas Lighting' to cultivate its old sporting style and get in, if it can, a few heavy body blows on the 'Tricity' cooking proposition. It will not then be necessary for it to turn from the Berry Construction Company to us for an explanation of the difference between gas and electrical heat."

Our contemporary has here shown a grand capacity for reading into things something that is not there; but the exercise of this capacity may sometimes prove dangerous. The paltry excuse made for evasion is as weak as the statement that we indulged in "vulgar personalities at the expense of Mr. Haynes."

Manchester and District Junior Gas Association.—The Council of the Association have arranged a picnic to Chester next Saturday. The programme includes a visit to Eaton Hall and an inspection of the private gas-works and power station on the estate. Mr. J. C. Belton, the Engineer of the Chester Gas-Company, has arranged to meet the party on their arrival, and explain the model gas-works.

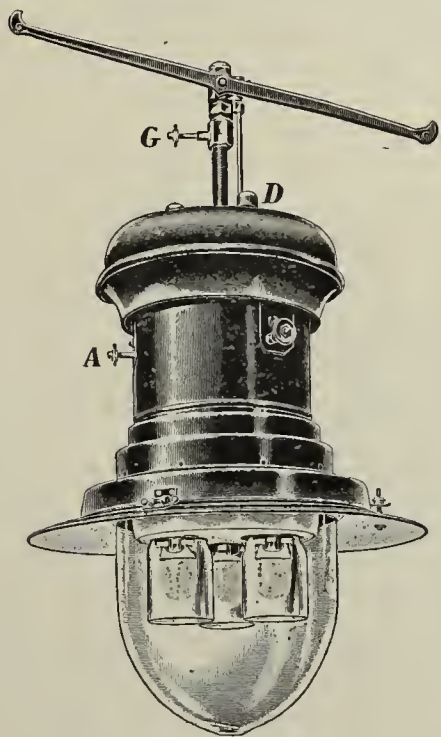
Death of Mr. Alfred Maby.—The death occurred recently of Mr. Alfred Maby, who had for forty-four years been in the service of the Bristol Gas Company. At the funeral, which took place last Tuesday at the Shirehampton Cemetery, the coffin was borne by six of the Company's meter inspectors; and, besides the relatives of the deceased, there were present Mr. John Phillips, the Secretary, and Mr. D. Irving, the Engineer.

FORTY-TWO CANDLES PER CUBIC FOOT.

By the "Nico" High-Power Low-Pressure Lamp.

STILL we progress; and gather fresh reward, through perseverance, from the unexplored reserves of the gas industry. The end of progress or reward is not yet. When it was our pleasure to announce to the gas industry the large jump that had been made in lighting efficiency through high-pressure gas and a specially constructed lamp, there were the sceptics, who could not believe until they themselves had seen. They are sceptics no longer. It is written large in the history of accomplished and tried things in the gas industry, and in the successes of this period, that what was stated was true. The same whisperings of scepticism that were then heard may be heard again on learning that a lamp is now on the market that has the capacity for giving to the user, with a mixed coal and carburetted water gas of about 15 candles illuminating power, at ordinary district pressures, an efficiency of (the independent testings of a photometrical authority show) 42 candles per cubic foot of gas consumed per hour. The points as to the candle power of the gas and as to "ordinary" district pressure are mentioned particularly, as it is necessary to emphasize the facts that the tests were not made in an area in which high illuminating power or high district pressures rule.

The new lamp has been put upon the market by the New Inverted Incandescent Gas-Lamp Company, Limited, whose efforts at maintaining the reputation that they deservedly have in the inverted gas-lamp world—having been pioneers in this particular direction—are as successful as the inverted lamp is brilliant and efficient. The present achievement comes very opportunely before the gas industry. People want more light. Light seems to



A. Air Regulator. D. Dust Ejector. The action of pressing the knob down forces a needle plunger through the gas-way, freeing same from obstruction.
G. Gas Regulator, controlling all the burners at the same time.

The Nico High-Power Low-Pressure Lamp for Outside Lighting.

create an insatiable appetite. Everywhere, where lamps of higher power can be applied, people are asking for units of illumination that had no place in the past. In the streets, for shop lighting, in railway stations, in halls, in the market place, in the emporium, a larger unit of light is now sought; and a high-power unit of light that can be applied to the present fittings, without any cost save that incurred in the purchase of the lamp itself, that shows a running economy at low pressure, and that lights the place without disturbing the peace, will secure abundant favour. That is what the "Nico" high-power low-pressure lamp claims to do, and, what is more, does it. It is an advance.

The lamp is made in three sizes—500, 750, and 1000 candle power; the burners each giving a light of 250 candles. From this, it will be observed, that the lamps are fitted respectively with two, three, and four burners each. Being a fact that the trials made by an independent testing expert show an efficiency of 42 candles per cubic foot of gas at 18-10ths pressure (which is the pressure at which the highest efficiency has been attained), it follows that the consumption of each burner is 6 cubic feet of gas per hour, so that a 500-candle power lamp can be run on 12 cubic feet per hour at low pressure, a 750-candle power one on 18 cubic feet, and a 1000-candle power one on 24 cubic feet. In other words, the 500-candle power lamp will run for exactly three hours on a pennyworth of low-pressure gas, sold at 2s. 4d. per 1000 cubic feet. That is economical lighting.

Besides the economy of this high-power low-pressure lamp, there are several points about it that appeal strongly to the practical and technical investigator of its merits. In high-power lamps of this kind, naturally a large amount of heat is generated;

and such lamps should be strongly constructed, in order that the depreciation allowance may be spread over a long period, and repairs be kept at a minimum. In buying a high-power gas-lamp, the best are the cheapest in the end. These lamps have metal in them, and plenty of it. They are of extra heavy make throughout, even to such details as the bunsen tubes, the nozzles, nuts, and so forth. Yet the lamps are not clumsy-looking. On the contrary, for such high-power lamps, and for lamps of such good weight, they are extremely neat looking.

The principles of the lamp (which has been patented, and, broadly, is on the self-intensifying principle) are not for description at the present stage. There are, however, two or three features that may be referred to as being of importance in connection with the maintenance of a lamp in a state of high efficiency. Combined with the two features of low-pressure and high-power, we regard the development of the ease of maintaining the efficiency of high-power gas-lamps as of vast importance, in view of the large growth of their use. In this lamp one gas-regulator, externally operated, controls all the burners; and to this regulator a lock-nut is fitted; so that, when once adjustment has been made, the lock-nut can be brought into use, and prevent the adjustment being disturbed. The burners are each fitted with an air-regulator, also operated from outside the lamp, so that precise regulation can be effected at any time. In connection with this adjustment an important point arises. In these burners, there is no needle regulator—the burners being made with fixed nipples. The question naturally occurs to one: How is the orifice, or gas way, of the nipple cleared in the event of any obstruction? It is rendered an easy operation by a very ingenious device, which will attract the attention of our readers, just as it did ours, on account of its simplicity and effectiveness. If readers look at the illustration, a small dome or cap will be noticed at the head of the lamp. There is one of these over the top of each burner. This cap is spring controlled; and it is connected with a cleaning-needle. By simply pressing down the cap, the needle passes through the gas-way of the nipple, and clears it of any obstruction. This can be accomplished at any time, whether or not the lamp is in use (and if in use, without extinguishing the flames); and by this beautifully simple and handy means, the efficiency of the lamp can be fully maintained. On its "return stroke" after passing through the burner, the needle is carried quite away from the nipple orifice, in order not to impede in any way the velocity of the gas.

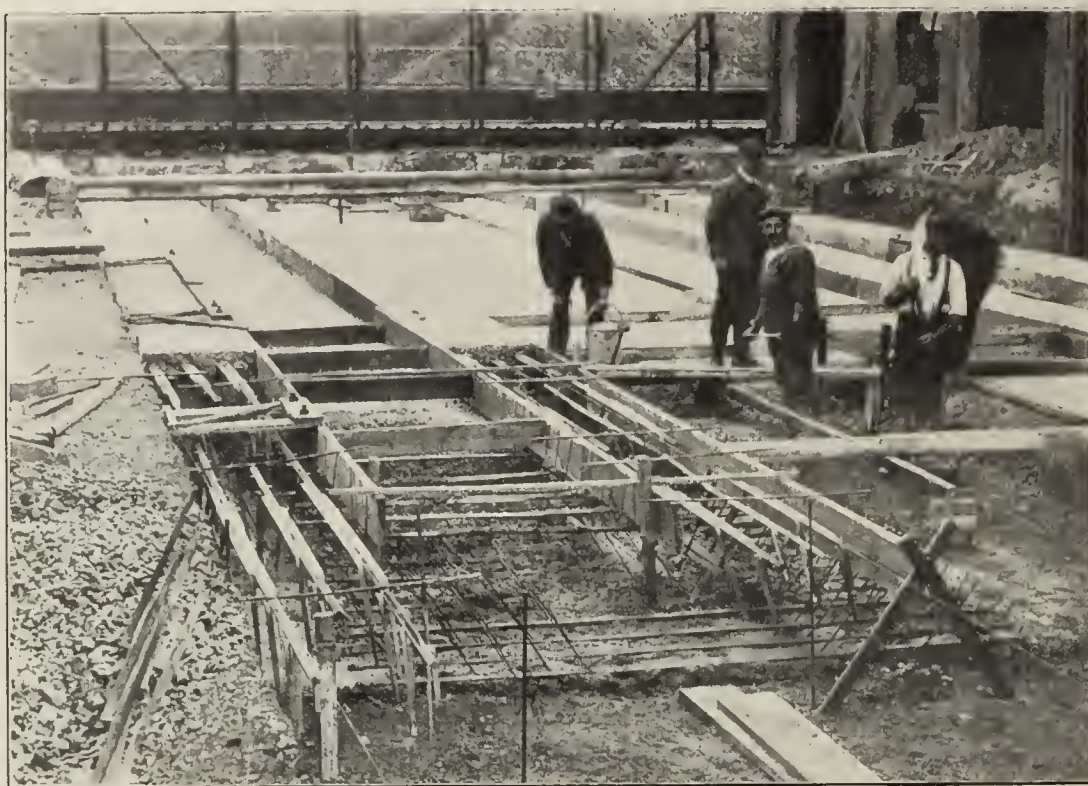
A point that bears upon structural upkeep is the interchangeability of the parts of the three sizes of lamp. In length they are all three the same; and it is only the four-burner lamp that is rather large circumferentially in the body part—the steel casings of the other two lamps being precisely the same. With this one exception, all parts of the three lamps are precisely similar—the burners are the same, the glassware the same, the reflectors the same, the mantles the same. The importance of this interchangeability and conformity will be recognized in connection with lamp maintenance schemes and stock requirements. We have mentioned the mantles. These are larger in diameter and greater in length than the standard inverted mantle—having, we should calculate, about twice the superficies of the latter. They are also stronger built than ordinary mantles; and so far as durability goes, they should have a life equal to other good mantles used on low-pressure burners.

We have had an opportunity of seeing a set of the new lamps in use; and though nine burners were in operation (in the three lamps) in an enclosed space, they were absolutely noiseless. This will be a commendation for interior work where a high-power, steady, silent light is required. But the greater of the two main impressions was the intensity in the matter of incandescence (without any glaring effect) of the mantles. The best effect it was found was obtained about a quarter of an hour after the lamp had been in use, when it had become well heated up, although from the start the duty was high. Every mantle was thoroughly inspected; and everyone was found just as incandescent by the supporting ring as at the base. There were no dark spots. Inside the mantles, there must be a bunsen flame of extraordinary merit. It is a soft flame; and each mantle is full of it. To attain such results with such low pressures, points to the production of an ideal flame; and thus, through the achievement, a further stride has been effected in efficiency, and in the securing of a high-power and economical unit of light, at a low cost for installation. This lamp is going to claim considerable attention, and gain and retain fresh ground for the gas industry.

The sensation produced on the retina by a source of light of short duration has for the last three-quarters of a century been taken as proportional to the product of the intensity of the source into its duration. The early experiments of Talbot and Swan, and the later ones of Bloch and Charpentier, provided ample justification for the law so far as it related to sources of considerable intensity. In the "Journal de Physique" for July, MM. A. Blondel and J. Rey point out that for weak sources, the intensities of which are not much greater than the lowest perceptible, the statement cannot be true, or there would be no lower limit to perception. On this ground, says "Nature," they argue that the sensation should be proportional to the product of the excess of the intensity of the source over the minimum just perceptible into the duration of the source; and this conclusion they have verified by means of the measurements made by seventeen observers by two independent methods of observation.

WOODALL-DUCKHAM CONTINUOUS SYSTEM OF CARBONIZING.

A Large Installation at Bournemouth.



The Continuous Ferro-Concrete Foundations.

IN view of the continued rapid growth of the consumption of gas in their district, the Directors of the Bournemouth Gas and Water Company have already been obliged to consider the necessity of increasing the carbonizing plant at their new gas-works at Poole.

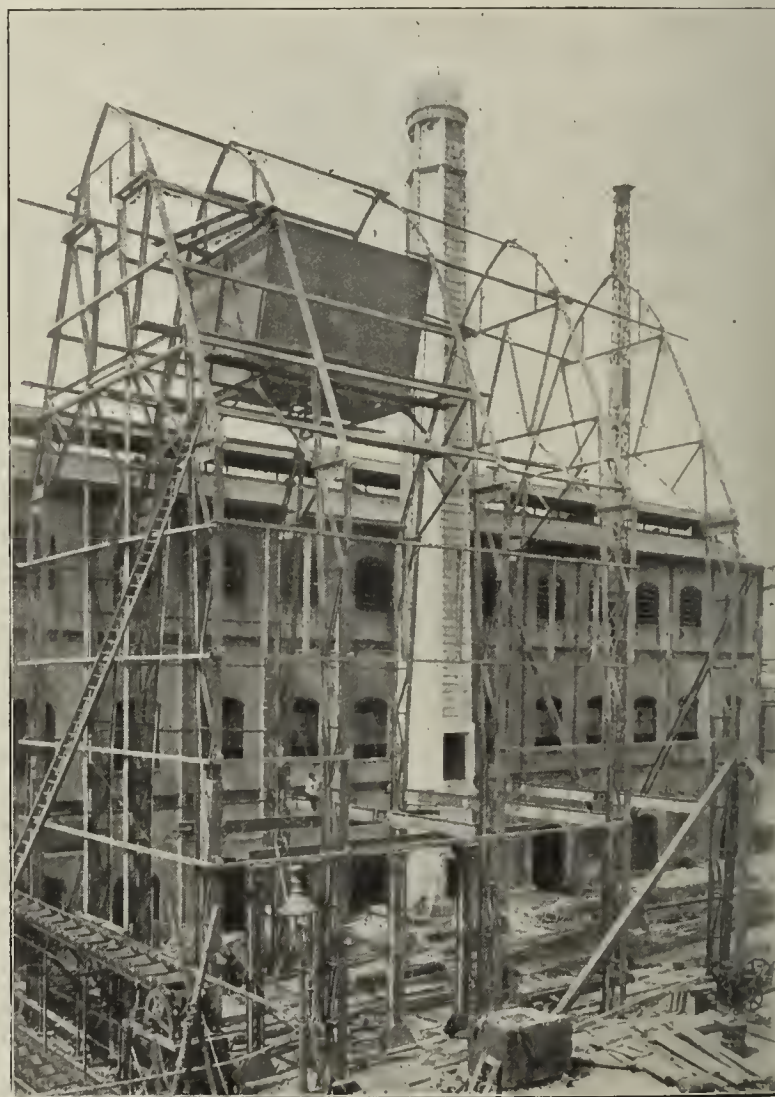
Anxious in this instance, as in others, that the plant should be most efficient and up-to-date, they decided, after going carefully into the details of the various methods of carbonizing now before the gas industry, to put down a large installation of continuously operated vertical retorts, as originally developed by their own officers, and now controlled by Messrs. Duckham and Cloudsley, of 189, Palace Chambers, Bridge Street, Westminster, S.W.

The installation, which is under construction, consists of 24 retorts, in six settings of four retorts each, and embodies the latest improvements in feeding and extracting devices, as well as in heating the retorts, and is designed to carbonize 120 tons of coal per day, or a make of $1\frac{1}{2}$ million cubic feet.

The ground at Poole is of a very treacherous nature consisting chiefly of made-ground alternating with beds of mud, so that the question of foundations to carry the very heavy loads involved in vertical retort-settings is a rather difficult one. The foundations for this house take the form of a continuous ferro-concrete raft over the entire area occupied, reinforced by Kahn bars supplied by the Trussed Concrete Steel Company. All the work in connection with these foundations was carried out by the Gas Company's own men.

The advantage of vertical retorts in situations where space is limited can be appreciated from the fact that the house, which has a capacity of 1,500,000 cubic feet per day, stands on an area of 110 ft. by 31 ft. 6 in., or 3465 square feet.

The accompanying illustrations will give a good idea of the foundation work and the appearance of the house at the present moment. The whole of the structural ironwork shown has been erected in the space of three weeks by the Sub-Contractors, Messrs. Newton, Chambers, and Co.



The Framing for the New Vertical Retort-House.

Gas Engineering Classes at Smethwick.—We learn from the Principal of the Smethwick Municipal Technical School (Mr. R. W. Hutchinson, M.Sc., &c.) that classes in "Gas Engineering" and "Gas Supply" are to be conducted at the school during the coming session, commencing on the 19th of September. The class in "Gas Engineering" will be held on Tuesday evenings at seven o'clock, and that on "Gas Supply" on Thursday evenings at the same hour. Both classes will be under the direction of Mr. W. H. Johns (First-Class Honours and Medallist), of the Saltley Gas-Works, Birmingham. There has also been organized in the school a systematic course, extending over a period of two or three years, in "Gas Engineering" and allied subjects, on

the completion of which the diploma of the school in "Gas Engineering" will be granted. We have much pleasure in directing attention to this matter.

Large Gas-Engines.—Six new gas-engines are being erected in the new power-house of the Indiana Steel Company at Gary (Ind.) which are said to be the largest ever constructed. The generators to which they are coupled have a rating of 3200 kilowatts each. The engines are of the twin tandem double-acting Allis-Chalmers type, with cylinders 44 inch by 60 inch. They are to operate on blast-furnace gas, and drive alternators delivering three-phase current at 6600 volts and a frequency of 25 to the power network of the Gary mills.

THE RIGHT TO STRIKE.

[COMMUNICATED.]

THE object of all who have any commodity to sell for cash—it does not matter whether it is food, clothing, land, buildings, mental or muscular labour—is to get the best price for it; and the majority are satisfied to obtain this by *bona fide* peaceful persuasion, such as advertising, soliciting custom, and in various ways offering the commodity to possible buyers. But we are all familiar with various methods of forcing the market with the view of increasing the price beyond the figure obtainable in a natural way, which take the form of trusts, combines, corners, and strikes. In each case the object is the same—to obtain full control of the product in question, to withhold the same from the purchaser, and thus force him to agree to artificial terms—i.e., to pay more than he would do in the ordinary way. The actual exciting causes may be different. There may be simply a desire to amass wealth, a wish to escape from onerous or objectionable conditions, to secure the means for a higher standard of living, or to enforce or bring about certain political or social conditions.

The public at large, and the Governments that represent them, are not in favour of any violent or coercive methods of artificially forcing prices. No Parliament has ever advocated trusts, combines, or strikes as a legitimate or desirable method of conducting business negotiations, because in all cases such methods bring privation, not to say danger, upon the public at large, and this not only on those inside, but on those outside the circle of dispute. Sometimes the argument is advanced that a strike is the same thing as a trust, combine, or corner in labour, and is quite as justifiable as a combine in wheat or sugar. If trusts in merchandise are tolerated, why not trusts in labour? This is simply begging the question. Some combines cause so little inconvenience that they are worked without attracting the attention of the public, who may be hoodwinked and kept in ignorance of what is going on. But labour combines, if of any important extent, are not of this class. They involve public inconveniences and losses, privation, rioting, destruction of property, and loss of life.

The arguments in favour of the right to strike come from the seller's side of the counter; and a very common one is the plea that a strike hits no one harder than the strikers themselves, and that the hardships involved are to some extent a guarantee against frivolous or unreasonable action. A man will not run the risk of starvation without good reason. But is this assertion supported by facts? Is it not possible to instance obstinate and long-continued labour disputes that were found, on careful investigation, to be based on ignorance, intolerance, or other flimsy foundations? And in any case the public rights are not affected by the reasonableness or otherwise of the exciting cause. It is no relief to the trader who cannot get the valuable cargo of perishable goods for which he has paid cash, or to his customers who are going hungry for want of them, to know that the promoters of the trouble are also on the verge of ruin and starvation. Nor can it be shown that the strike is always the deliberate choice of those who, after full consideration, find that no other means of obtaining the desired result are available, or that such results are reasonable and practicable. Then it is said that certain commodities—coals, for instance—are commonly sold by contract subject to strike clauses, and therefore labour may legitimately be sold under similar conditions. But in the coal contract the strike clause is recognized by both parties not as a matter of choice but of necessity. If labour contracts can be effected under similar conditions and accepted both by employers and employed, well and good; but it is contrary to the usual conditions of service as distinctly specified, or implied by the custom in the trade. A labourer employed by the week or a clerk engaged by the month considers himself entitled to a week or a month's notice. If one party is entitled to repudiate the usual notice at will, why not the other? And what would be thought of an employer who discharged the whole of his staff at a moment's notice, to make room for others at a lower rate of wage?

A chief feature in the railway dispute that is so prominently before our minds, and for that matter in all other labour disputes, is the upholding, by those who claim to represent the unanimous feeling of the workers, of the right to strike. The fact that such action constitutes a wilful and deliberate breach of agreement is ignored, though evidently not out of mind, because a special provision is invariably insisted upon, as one of the terms of so-called settlement, to the effect that the strikers should not be held responsible, or suffer for the consequences of their action. They also claim the right to resort to what, with grim irony, they call "peaceful persuasion," as a means of preventing others from taking up the work at the point at which it was left. A feature of their "persuasive" methods is that they invariably call for the services of the police or the military, and are attended with loss of life, damage to property, and a curtailment of personal liberty far in excess of that inflicted by any employer. But who has heard of a labour contract in which a strike clause was a recognized item by both parties? The strike from first to last is an unconstitutional and illegal proceeding. The inception of it is a wilful breach of agreement, and the relief from the consequences is a form of compounding a felony. A great deal is being written and said to-day about the means that should be adopted to safeguard such occurrences; but the obvious method of making it as serious an offence to break an agreement-to-serve obligation as

any other, would go a long way. What is the use of agreements, written, verbal, or implied by custom, if one party thereto can repudiate them whenever he may wish to do so, and can claim relief from the consequences of such repudiation?

There are certain public services or utilities in respect to which the loss and inconvenience occasioned by a strike are spread over the whole of the public; and therefore the matter becomes something more than a dispute between two parties. So we must consider, not the effect on one or both of the parties immediately concerned, but the public interest. There is some show, on the part of those who engineer a strike, of a desire to avoid injuring the outside public. But, as a matter of fact, the public inconvenience is regarded as one of the strongest weapons. There never was a strike yet without the real or implied object of forcing the public, by reason of considerations respecting property, comfort, and safety, to take up the cudgels as against the other side. The leaders have been quick to see the weak point of electricity supply—that the whole can be stopped and rendered inert in a matter of minutes. Gas, with a 24 hours' storage, can struggle along for a few days. The only industries that can be carried on with reasonable safety and security under strike conditions are those which produce imperishable heavy goods that can readily be stored in sufficient quantity to outlast the probable duration of a trade dispute. But the makers of perishable or bulky goods cannot provide in this way against the industrial rainy day. The security of business in this class is incompatible with strike clauses; and it should be clearly understood that neither party concerned should be at liberty to repudiate agreements or resort to violent and unlawful methods of furthering their own interests.

NEW GAS-WORKS FOR A MEXICAN CITY.

A High-Pressure Distribution System.

The last number of "Progressive Age" to hand contains an illustrated description of the new gas-works which have lately been completed for the supply of Guadalajara, the second largest city in the Republic of Mexico, and a very beautiful one, having a population of about 120,000. The article was written by Mr. W. A. Aldrich, of Grand Rapids, Michigan, who designed the works.

DESCRIPTION OF THE WORKS.

After Mr. Aldrich had visited the city, it was decided that the system to be installed should be a high-pressure one. A site was selected on the right-of-way of the National Railway of Mexico, about a mile from the centre of the city, comprising 9000 square metres, or rather more than 10,000 square yards. The retort-house is located at the southern end of the property; the coal-storage yard (concrete) being east from it. The coal-weighing machine is at the entrance at the eastern end of the building; and after the coal is weighed, it is elevated to the charging-floor by a direct-acting steam hydraulic Ridgway elevator of sufficient capacity to deal with 4000 lbs. The elevator has an 8-feet lift with an 8 feet by 8 feet platform and automatic safety catches. In consequence of the moderate climate (never much below 60° Fahr.) and light prevailing winds from the south, the building was designed with an open front facing the north. This saved expense, and made it at all times comparatively cool and pleasant for the stokers. The brilliant sunlight never enters the building, because of the engine-room, which is located 20 feet north of it, and thus becomes a protection. The charging-floor is of diamond creased cast-iron plates, $\frac{5}{8}$ inch thick, and extends the whole length of the building. There is a retort-house governor of 500,000 cubic feet daily capacity on the offtake from the hydraulic main. The roof consists of five steel trusses, and is supported by ten 8-inch steel H-columns, five on each side of the building, the height of the retort-house. The basement floor is concreted; and the work of cleaning the fires is done under the most comfortable conditions. At present the coke is wheeled out; but as soon as the business warrants it, coke-conveyors will be installed. The boiler-room is to the west of the retort-house, and built in similar style. There are two 50 H.P. horizontal return tubular boilers, connected to one smoke-stack. Access to the boiler-room from the stage-floor of the retort-house is by a steel stairway.

The primary air condenser is outside the engine-room, and 20 feet from the front of the boiler-room. It is 54 inches in diameter and 20 ft. 6 in. high, with a hood and 24-inch diameter stack. Every piece of moving machinery is duplicated; every apparatus, from the retort-house governor to the double high-pressure regulator is bye-passed; and every valve is fixed above ground. The advantage of this is obvious.

The engine-room is 29 ft. by 23 ft. 6 in., of adobe and brick construction. The roof is of red brick (made locally), set on edge, on top of which were placed glazed tiles, making it impenetrable against heavy rains during the rainy season. After the primary condenser come two Roots No. 3 rotary exhausters, each with a vertical engine on the same bed-plate, with an automatic governor and steam-regulating valve having a capacity of 17,000 cubic feet, or a displacement of 1.5 cubic feet, per revolution, with suitable bye-pass connections to permit a portion of the gas being pumped over when the make decreases or is irregular. Following the exhausters is fitted a Pelouze and Audouin tar-extractor.

On the opposite side of the engine-room are two Laidlaw-Dunn-

Gordon single straight-line gas-compressors, each having a displacement of 196 cubic feet per minute. Recording gauges, showing high and low pressure on the inlet and outlet of the compression-tank, are in this room, together with a gauge-board with pressure-gauges for each apparatus.

From the outlet of the tar-extractor to the station meter, in a direct line, are the water-tube condenser, ammonia washer, and scrubber, fitted with crosses provided for future installations. Next follows a set of two 10 feet diameter by 10 feet high steel cylindrical purifying boxes, fitted up with Chollar's gas reversal system.

The station meter is 6 feet by 6 feet, and is located in a room 16 feet square, constructed also of adobe and red brick with cut stone balustrade, with which the engine-room also is ornamented. The holder is in a steel tank, and is of 200,000 cubic feet capacity. It was manufactured by the Stacey Manufacturing Company, of Cincinnati (O.), who were the contractors for the complete plant, and who, Mr. Aldrich says, "spared no effort to turn out a first-class job, in which they were eminently successful."

The connections round the plant are all 10-inch to the outlet of the holder, where they are reduced to 4-inch to the compressors. The compression-tank, located on the east side rear of the condenser and scrubber, is 36 feet long and 8 inches diameter; and to the outlet of it is connected the double high-pressure regulator. In addition to the primary air condenser, the multitubular condenser, washer, scrubber, and purifiers are in the open.

The permanent water supply was obtained from a well sunk 75 feet west of the engine-room. It is 3 metres (nearly 10 feet) in diameter; and water was found at a depth of 5½ metres (18 feet); but Mr. Aldrich continued the sinking until they were in nearly 6 feet of water. The gasholder tank was filled in 42 consecutive hours; and the water in the well was not lowered in the slightest degree. The works are provided with water for all time without any cost whatever.

The subsoil under the gasholder is vegetable earth and sand. Before laying the foundation, all the earth (of which there was a depth of about 15 inches) was removed. When the sand was reached, the outer ring was excavated to a depth of 4 ft. 6 in. by 4 feet. After thoroughly tamping, concrete was laid to a depth of 2 ft. 6 in. Then old railway iron was laid at equal distances from the diameter to the circumference—thus reinforcing the foundation. The inner ring was 2 feet deep. In carrying out this work, 424 barrels of portland cement were laid, in the proportion of 1:3:5.

The first ground for the works was broken on Oct. 6, 1910; and gas was turned into the mains, of which 32½ miles were then laid, on the 12th of May last. But had it not been for the delays in the arrival of freight owing to the railway traffic being held-up by the revolutionists, a start could have been made six weeks earlier. At the outset there were 405 services laid on, and 195 consumers; and the first day's output of gas was 21,000 cubic feet.

PRIMITIVE HEATING SUPERSEDED BY GAS-FIRES.

Before describing his high-pressure distributing system, Mr. Aldrich gives the following sketch of the conditions under which domestic operations were carried on in Guadalajara before the introduction of gas: "The common fuel used for four hundred years has been charcoal. There are no fire-grates in the houses of either rich or poor; and there are no fire-engine stations. If there were, they would be of very little use, as the houses are made of adobe brick, the ceilings of brick, the floors of tiles. There is absolutely no lumber used in the construction of a store or residence except the doors and window sashes. If a gallon of gasoline were spilt over the contents of a room and set fire to, it would burn itself out without damage to the walls or ceilings. It may be said that the city is fireproof. The 'mozo' (servant) problem does not exist, as servants are plentiful; the only trouble being that Americans find it very difficult to teach them how to cook 'American.' In some of the richest families—and there are a great number—American ranges are in use; but the ovens are utilized for drying the wood used in the stove. The servants do not understand that it may be used for cooking. The common appliance used for cooking is the 'braseró,' the top of which stands as high as an ordinary gas-range. In the better class of houses, these braseros extend the whole length of the kitchen, and contain as many as ten or twelve openings. Charcoal is laid on a small grate (similar to the top grate of a hot-plate), placed at the bottom of the braseró on top of one or two pieces of pitch pine. The fire is then fanned until the charcoal ignites, when it will burn for hours providing it is kept replenished. The charcoal is brought in on burros' backs and sold for 2 c. and 2½ c. per pound, Mexican money. In the better class of houses, hot-water coils of ¾-inch pipe form the grate at the bottom of the braseró, and it takes several hours to heat sufficient water for a bath. Can it be wondered at that, although gas was an absolutely unknown quantity, the people welcomed the advent of anything that would relieve them from using charcoal, and in such primitive appliances? The fact is sufficiently demonstrated when the writer states that more than \$20,000 worth of appliances were sold by the time he left, two-thirds of which were sold from catalogues alone."

THE HIGH-PRESSURE DISTRIBUTION SYSTEM.

In planning the distribution system, Mr. Aldrich endeavoured to carry out the one approved by the Pacific Coast Gas Association—viz., a system without a "dead-end." The original intention was to form it into loops, supplied from one main feeder. In the

paved district there are about 20 kilometres (12 miles) of asphalt-paved streets. Inquiries as to repairs to asphalt after the pipe was laid, and for laterals for services, demonstrated that it would be too great a luxury; so it was decided that the main should be laid on the outside of the sidewalks on each side of the street. This would obviate cutting the asphalt either for mains or services, except at the intersection of streets. It would also reduce the danger of electrolysis in running services under tracks. When an intersection of street was reached, a pipe pusher was used wherever possible; and in changing the plan to conform to the new conditions, many thousands of dollars were saved.

The system employed was as follows: Commencing from the outlet of the double high-pressure regulator at the plant, 3-inch steel line pipe with recessed threads and couplings was used. The pipe was thoroughly hammered to remove scale. This is one of the most important factors; and if done in a careless or perfunctory manner, it means untold trouble after the plant is in operation—particles of dirt and scale getting into the seat of the regulators, causing the seals to blow and the consequent loss of gas, to say nothing of the nuisance to the consumer. After the hammering process, sacking is cut into strips, made into the form of a lamp glass-cleaner, which is pushed through the pipe. The couplings are then reversed, and the pipe painted with a preservative used with great success by Mr. Aldrich for many years. When it is dry, which takes about two hours, the pipe is strung out on the opposite side of the street, where it is to be used. Just previous to laying, the "swab" is again brought into use, and the male end of the thread "doped." The line extends north for about 2000 feet; thence west eight blocks, thence north 14 blocks, thence east 16 blocks, thence south 14 blocks, thence 8 blocks west to the point of divergence from the main feeder.

Preparatory to laying the main, the owners or occupiers were canvassed for permission to put in a service free of charge; and a large number of permits were received. The length of pipe necessary for services averaged 8 feet. Mr. Aldrich explains that the object of putting in these services as he went along was to obviate the necessity of breaking the sidewalk when in the future gas was required. As many withheld their orders until they saw what gas was like, it will be seen that a large saving was made in repairs, as 60 per cent. of the services laid are now in use.

The paving outside the downtown district is mostly cobblestone and macadam. From the main loop other loops were formed of 2-inch pipe, laid on one side of the street farthest from the car tracks, which, it may be stated, run on one side of the street only. As the streets are too narrow to permit of double tracks, the cars go out by one street and return by another to the terminus. This 2-inch loop is connected to the 3-inch one at each corner of the rectangle, and valves placed so that extensions may be made at any time without shutting off the supply. Owing to the irregularity of some of the downtown blocks outside the 3-inch loop, several runs of 1-inch and 1½-inch pipe were made, but always tied in to a feeder.

There is one drip in the system, about 1200 feet from the plant; though it is not necessary. Blow-offs are placed at certain points to deal with any condensation that carelessness at the plant may occasion. The system is divided into districts, so that all or any part of it can be shut off in case of necessity. Galvanized pipe and fittings (beaded) are used for services, with individual Reynolds mercury regulators. The present pressure at the outlet of the double high pressure at the plant is 4 lbs., which was the pressure shown on a Bristol recording gauge at the remotest distance. Tests made at different pressures throughout the system were uniform, regardless of distance.

There is not one "dead-end" in the system, and high-pressure distribution is having a test in Guadalajara as nowhere else, for the people are ignorant of the use of gas, and they would not know what to do if a regulator valve-seat became fixed and the gas began to "whistle." However, the plant has now been in operation for nearly three months without one complaint. It will necessitate a long persistent educational campaign, which is now being carried on by means of a monthly magazine, the second number of which has been issued.

Many objections were made to the modern gas-range by the Mexicans, who stated that their cooks could not be made to manipulate the ovens. This difficulty was overcome by fitting up the braseros with pipe; taking the bottom grate out of the braseró where the pipe was brought up, and an ordinary ring-burner, used generally at the top burners, substituted.

Mr. Aldrich says the manner of handling consumers is a very delicate operation, owing to the extreme sensitiveness of the average Mexican. They are an extremely courteous people—even the very poorer classes. The "peon" will raise his sombrero to a passing acquaintance. Women and men alike never meet or part without a formal handshake. He was severely handicapped by his inability to speak the Spanish language, especially in giving instructions to salesmen. But two young men who could speak some English were engaged; and they had evening school for a time in salesmanship. For the better class, nothing is too good (the Company made many sales of more than \$500 Mexican); but they are very economical in their home life, and will need no lessons in the art of "kicking" at a high gas bill. At the time of writing the article, they had nearly 300 consumers. Upwards of 200 Humphrey gas arcs have been installed, which Mr. Aldrich says are a delight to the people; and the increase in business is only according to the capacity of the staff to execute the orders, which, when he left the city, were a month in arrears.

ARTIFICIAL SILK MANTLES.

The following is an abstract translation of a paper by Dr. Nass, Professor of Charlottenburg, on artificial silk mantles.

It soon became apparent on the introduction of incandescent gas lighting in the eighties that a disagreeable accompaniment of the system was the frequent breaking of the glass chimneys and the sensitiveness of the mantles to shock. The glass industry succeeded, after attempts in various directions, in making chimneys, such as the gold brand Jena variety, which may be sprinkled with cold water while the burner is alight without flying or cracking. Efforts to bring the mantle up to a similar state of perfection were less fortunate. If the mantle were made stronger, it was of greater mass, and so required more heat and more gas to bring it to incandescence. Consequently, it was less economical of gas. The aim, however, in modern gas lighting is to impart as nearly as may be the whole of the heating energy in the gas to the mantle, the radiating power of which far exceeds that of the carbon particles which cause the luminosity of the old-fashioned gas-flames. The carths of which the mantles are formed are, however, particularly fragile. The imposition of a tax of 1½d. each on

mantles in Germany has impelled technical men to further efforts to reduce the fragility of mantles, and so, by increasing the durability, to nullify the effect of the mantle-tax. The author proceeds to refer to what he describes as the latest important advance in this direction in the manufacture of mantles.

The basis of the mantle is a yarn of vegetable fibres, such as cotton, or, preferably, ramie. But the fibres of such vegetable substances are comparatively short, and are joined together by spinning. The spun materials are then impregnated with the fluid or solution of the salts of the earths. After burning off with a very hot blast flame, the mantle as known to the public is produced. The thread of the ramie mantle being, however, as already explained, produced by twisting together several short fibres, it naturally loses stability in the burning off. If a material having longer fibres were used, it is extremely probable that the stability of the mantle would be increased. There is, however, no such material of vegetable origin; but long fibres can be produced artificially by squirting liquids which harden quickly in the air from fine glass tubes. In this manner, artificial silk is produced. The artificial silk most suitable for mantle manufacture is made by dissolving cellulose in ammoniacal copper oxide and squirting the liquid obtained into dilute acid. The very fine fila-

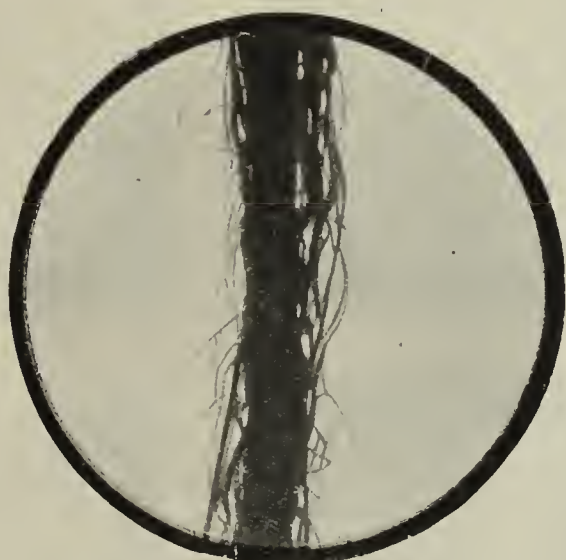


Fig. 1.—Ramie after One Hour's Burning.

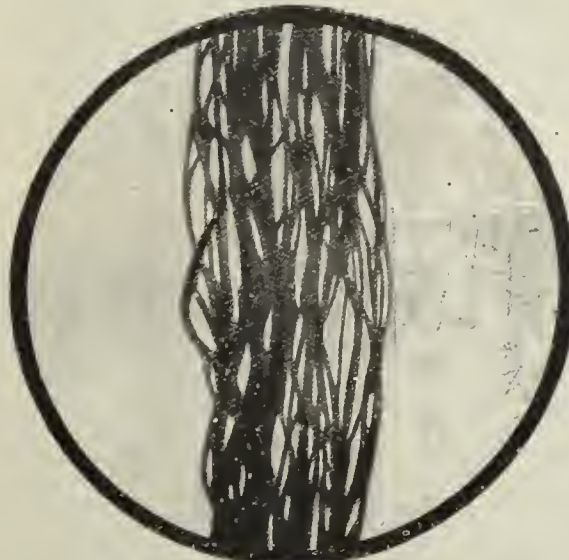


Fig. 2.—Artificial Silk after One Hour's Burning.



Fig. 3.—Ramie after 1000 Hours' Burning.

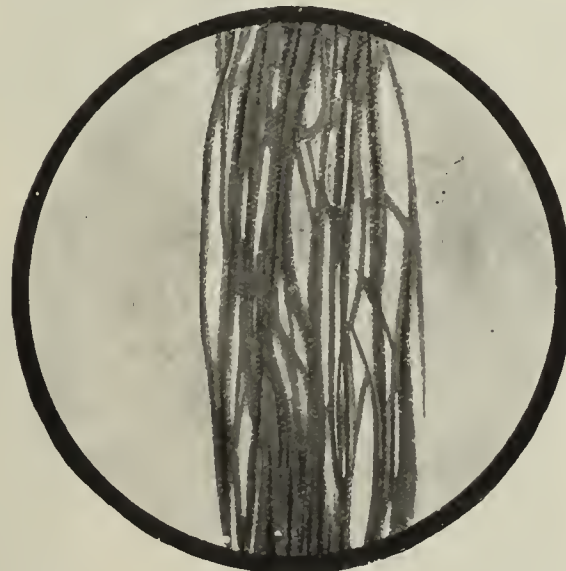


Fig. 4.—Artificial Silk after 1000 Hours' Burning.

ments of any required length so produced are woven together, and form a yarn which consists of endless wirelike filaments instead of short fragments.

Efforts to make mantles of artificial silk go back to the year 1903, when Knöfler began his experiments of mixing the artificial silk solution with the salts of the earths, and squirting filaments of the mixture. The result, however, was not satisfactory. At the present time the artificial silk is formed into hose, which is impregnated with the salts of the earths. Even in the impregnation there is a great difference noticeable between the vegetable fibres and the artificial silk. The vegetable fibres are composed of cells which become filled with the fluid, but the wirelike artificial filaments behave in the fluid like gelatine in cold water, and produce a body which is uniform throughout its mass. Even with hard drying, the soaked artificial silk filaments do not entirely lose their swollen condition. Simple drying is not sufficient; and the impregnated hose is subjected to a subsequent treatment which is a secret or a protected process of the manufacturing firms. This peculiarity of the artificial filament makes the manufacture a trifle more difficult, but leads to a better product.

The difference between the fibres after burning off is readily seen from suitable enlargements of them. The ramie fibre gives the impression of a rough frayed hempen rope, and untwines itself more and more as it is used in the flame, until it finally

falls to pieces. The artificial silk fibre, on the other hand, resembles a wire rope, and does not untwist, even on prolonged use, because it consists as it were of long continuous filaments (see figs. 1 to 4). The numerous attempts at producing mantles of artificial silk have resulted in a strong mantle being obtained, but hitherto with much to be desired in respect of illuminating power. Moreover, the strength falls off when the mantles are impregnated with collodion to fit them for transport. Further, the high price has been against the general introduction of these mantles. The author reports, however, that the Berlin-Anhalt Company have now succeeded in overcoming these defects, and have produced an artificial silk mantle (the "Bamag") which withstands collodionizing without ultimate reduction of its strength, and is not inferior to a good ramie mantle in illuminating power.

A good ramie mantle, when tested in Drehschmidt's shock-giving machine, which subjects the mantle under test to both vertical and horizontal shocks, withstands before burning 500 to 1000 shocks, and after ten hours' burning only about 100 shocks. The "Bamag" artificial silk mantles, after burning for 500 hours, withstand, on the average, the author reports, 600 shocks. Before burning, they were unaffected by 6000 shocks. The burnt-off mantles are so tough that they can be hung on a support and loaded with weights, as shown in the accompanying figure (fig. 6). Initially the mantles will carry on the average a weight of about

20 grammes (nearly 310 grains), and after 500 hours' burning, a weight of 15 grammes (about 230 grains). Evidently a very long period of burning would have to elapse before the mantle would be incapable of carrying its own weight of about 1 gramme, and would thus become useless. "Bamag" artificial silk mantles



Fig. 5.



Fig. 7.



Fig. 6.



Fig. 8.



Fig. 9.



Fig. 10.



Fig. 11.



Fig. 12.

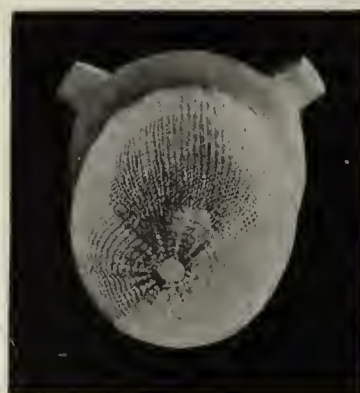


Fig. 13.



Fig. 14.



Fig. 15.



Fig. 16.



Fig. 17.



Fig. 18.



Fig. 19.



Fig. 20.

for high-pressure inverted gas-lamps have been used night after night for seven weeks, and remained practically uninjured; whereas ramie mantles of the best make lasted, on the same lamps, for only about six days. On Drehschmidt's shock-giving machine, these high-pressure inverted mantles of artificial silk withstood, after one hour's burning, 200 shocks, though they had not been specially hardened at the point of attachment—a procedure which is indispensable with ramie mantles.

The annexed illustrations indicate the stability and resistance of "Bamag" artificial silk mantles. Fig. 5 shows one which has been burnt for 100 hours, and then given 2000 shocks on Drehschmidt's machine. Fig. 6 shows one which, after burning for 24 hours, has been held by a clamp and loaded with a weight of 25 grammes (385 grains). Fig. 7 shows the same mantle after that test, its lower edge having been broken through by the



Fig. 21.



Fig. 22.



Fig. 23.

clamp; but elsewhere it is free from cracks or damage. Fig. 8 shows one of the mantles, which, after 50 hours' burning, has been given 12,000 shocks. It began with 10,000 shocks to tear longitudinally; nevertheless it was so durable that when clamped, it carried a weight of 15 grammes (232 grains) without rupturing. Figs. 9 and 10 represent the "Bamag" artificial silk inverted mantles for ordinary lighting and for railway carriages respectively after 24 hours' burning. Figs. 11 and 12 represent the same mantles with the crown pressed in, and figs. 13 and 14 after it has been pressed out again. Figs. 15, 16, and 17 show some high-pressure mantles which have been used for seven weeks in succession on public lamps. It is worth noticing that the mounting of two of these

mantles has been destroyed by the flame, though the mantles themselves are uninjured. Figs. 18, 19, and 20 are other views of the same mantles, showing how their tips have become filled with iron oxide gradually disengaged from the mounting. A defect which had arisen in the mantle in course of use is also observable. Figs. 21 and 22 are two "Bamag" artificial silk mantles incinerated and hardened at pressures of 67 and 236 inches of water respectively; while fig. 23 shows a ramie mantle after the shock of the explosion, due to the flame lighting-back. It is no longer fit for use.

In the author's opinion, the new "Bamag" artificial silk mantle constitutes an advance in gas lighting which cannot be overrated.

Manchester and Salford Smoke Abatement Exhibition.—We learn from the Hon. Secretary (Councillor James Kendall, J.P.) of the Special Advisory Committee formed in connection with this exhibition, which is to be held in Manchester in November, that the progress made has up to the present been extremely satisfactory, and that the organizers have secured exhibits of such variety and excellence as to lead them to believe that the exhibition will be visited by a number of the mill and factory owners of the North, as well as by a large section of the general public. Mr. Kendall states that, through the Gas Department, the Manchester Corporation are taking the keenest interest in the organization of the undertaking; and that their support is practical is made evident by the following resolution which was adopted at the meeting of the Gas Committee held on the 13th ult.: "That the Advisory Committee of the Smoke Abatement Exhibition be informed that the Gas Committee will supply the gas used during the exhibition at 1s. 6d. per 1000 cubic feet, and also fix all gas-fires and other gas apparatus sold for cash at the exhibition free of cost to purchasers, provided they are consumers in the Corporation district of supply; and they will also give the exhibition their sympathetic support, as they are anxious to do all they can to lessen the smoke nuisance in the city."

MEETING OF DUTCH GAS MANAGERS.

The Thirty-Ninth General Meeting of Members of the Association of Gas Managers of Holland took place on July 4 and 5, at Leeuwarden, according to the programme already given in the "JOURNAL" [Vol. CXIV., p. 749]. The following summarized report of the proceedings at the meeting is taken from "Het Gas," the official organ of the Dutch Association.

The meeting proved one of the most successful on record; the number of those participating was 139. The members assembled on the evening of July 3 in the building of the "De Harmonie" Society, and were welcomed by the Burgomaster of Leeuwarden, Heer A. E. Zimmerman. Thanks for the reception and welcome were returned on behalf of the gas managers by Heer Bauduin, the President of the Association, and Manager of the Maestricht Corporation Gas-Works.

Business proceedings opened on the morning of the 4th ult., with the nomination of Mr. H. H. Salomons, of Brussels, to the honorary membership of the Association. The President referred to the losses the Association had sustained during the past year by the deaths of three members—including one honorary member, Heer W. de Liefde, of Zeist—and to the jubilees of other members. The number of members of the Association of all classes amounts to 462. The new members during the year included Madame van der Spoel, of Zeist, the first lady member of the Association. Reference was next made by the President to courses of instruction for gas students given by Heer F. van Itersen, at The Hague, and by Heer G. A. Brender à Brandis, at Delft. The thanks of the meeting were accorded to Heer G. F. van Limborch van der Meersch, of Amsterdam, for the compilation of collective indexes to the journal "Het Gas" for the years 1880-1910. A history of lighting in Amsterdam, by Heer G. P. Zahn, jun., would, the President said, also be welcomed by gas engineers, since it dealt with the latest inventions in manufacture, distribution, and use of gas. It referred to the opening of a third coal mine at South Limburg, which made it possible that within a few years Dutch gas-works would obtain a supply of native gas coal. Chamber settings were under construction at Tilburg, The Hague, and Rotterdam, and settings of vertical retorts at Amsterdam and Arnheim, at the latter of which places they would come into use on the 15th prox. (September). It was possible that before long Maestricht would obtain a supply of coke-oven gas from a local works. It had been proved that the gas produced by the ovens during the first ten hours of distillation had a high enough calorific power. The President referred to the accident to the Hamburg gasholder in December, 1909, and said it was satisfactory that the report showed that the accident was not caused by any fault on the part of gas engineers. In regard to distribution of gas, a number of communities were to be supplied from the Leyden Gas-Works by means of high-pressure mains. In other places, too, similar systems of supply were contemplated. The President also referred to the competition between gas and electricity, and the efforts made by the Association and by its members to promote the use of gas by allowing rebates to large consumers, and otherwise.

The meeting proceeded to elect, with loud applause, Mr. J. de Brouwer, the Manager of the Bruges Gas-Works, an honorary member of the Association, as reported in last week's "JOURNAL," p. 410. The election of officers for the year 1912 took place. Heer O. S. Knottnerus, of Rotterdam, was elected President; Heer J. Bauduin, of Maestricht, Vice-President; and Heer N. W. van Doesburgh, of Leyden, Secretary. Arnheim was chosen as the venue for next year's general meeting. The Treasurer's report showed a slightly lower balance in hand at the end of the year than at the beginning, owing to a greater expenditure on the journal, "Het Gas," and on the previous year's general meeting at Brussels.

The reports of the Association's Committees, on: (1) Coal, (2) photometry, (3) the establishment of standard methods of examining gas oils, (4) the archives and library of the Association, were taken. Summaries of the contents of these reports, so far as they are of general interest, are given below. The report of the Benevolent Fund of the Association, from which disbursements had been made in respect of two cases in the course of the year, showed an increase in its capital. Various sums were voted for furthering the work of the Technical Committees of the Association, for meeting the expenses of the general meeting, for the staff of the Journal "Het Gas," for publishing the annual statistics of Dutch gas-works, and for participation in a forthcoming gas exhibition at Amsterdam. This exhibition is to be held in September or October, 1912, and the credit was voted to enable the Council of the Dutch Association to make arrangements for inviting the Members of Councils of Foreign Gas Associations, distinguished leaders of the gas industry, and the editors of the chief foreign technical journals, to a visit to the exhibition. It was provisionally arranged that on the first day there should be an evening reception, followed by a visit to the Exhibition; and on the second day, visits to various places of interest in the city, and to the Southern (Amsterdam) Gas-Works, followed by a boat trip on the Amstel, and a dinner.

The technical communications were next taken; the first being a paper by Heer N. W. van Doesburgh, of Leyden, on "The Influence of the Use of Electricity on the Consumption of Gas at Leyden." Heer J. Rutten, of The Hague, then gave a description

of an igniting and extinguishing apparatus for gas-lamps depending on the phenomenon of diffusion. This apparatus had been taken up by the Berlin Anhalt Engineering Company ("Bamag") but had not yet been put on the market. The speaker had also devised a gas-leak detector depending on the same phenomenon, by the aid of which very small traces of gas could be detected. It has been found in practice, however, that it did not work when there was no flow of air into the room, and the escaping gas was distributed uniformly in the air in the room. The same author also gave a description of a safety appliance for consumers' gas-meters which he had devised, and a description of which will be published shortly. Heer van der Mersch, of Amsterdam, gave a description of a safety apparatus devised by Signor F. Agudio, an Italian Artillery Officer, which depends for its action on the heat developed by small quantities of gas in platinum sponge. The heating of the platinum sponge which ensued, he said, when gas was present produced contact in an electric circuit whereby a bell was rung and the main cock closed, so that further escape of gas would be prevented. Small proportions of gas in the air—viz., 0.9 to 3.8 per cent.—were sufficient to produce the necessary development of heat and set the apparatus in action.

Herr von Hanffstengel, the Chief Engineer of the firm of Adolf Bleichert and Co., of Leipzig, gave a lecture, accompanied by numerous lantern views, on "Modern Apparatus for Quenching and Conveying Coke." He described the plant at the Stuttgart Gas-Works, where the red-hot coke is received in perforated buckets and plunged into a water-tank, lifted out of the water, and taken by a suspension line to the coke-store. The arrangements for conveying and quenching coke from the large chamber settings at the Tegel works in Berlin, and those for the vertical retort-settings at Agram, were also described. The coke-quenching towers in use at the Connewitz Gas-Works at Leipzig, and at the Simmering works at Vienna, were also referred to, as well as the apparatus which is being installed at the new Leopoldau works at Vienna. The lecturer concluded with an account of an electrically driven travelling line for unloading and conveying coals at the Assen Gas-Works.

Heer J. Diephuis, of Amsterdam, next described a fan driven by means of a small gas-engine, and reported the results obtained with it in one of the offices of the Amsterdam Gas-Works. The fan was known as the Brockway-Phillips patent. Heer T. J. Smit answered an inquiry respecting the working of the Hovine system of gas-retort setting. He said that three of these settings, each with nine retorts, had been erected at Gorinchem in 1907, and on the average the consumption of coke as fuel amounted to 16 per cent. by weight of the coal carbonized. The settings had a self-contained generator with a step-grate. They were easy to regulate with precision, and, with six-hour charges, produced about 75,000 to 80,000 cubic feet of gas per day. Heer R. Zijlstra, of Amersfoort, reported that he had used an old coke-breaker for pulverizing caked material from the purifiers, and had obtained good results therewith. The material was discharged direct from the purifiers into the breaker, pulverized, and then spread out. It was thus rendered fit for use again more quickly, and there was a saving of wages in its handling. Heer Geerling, of Amsterdam, next referred to the admission of steam to purifiers for the prevention of the hardening of the material. Herr Lux, of Ludwigshafen, described experiments made at Breslau on purifying material with which 1.5 per cent. of crude salt, in which magnesium chloride occurs as an impurity, had been mixed.

Heer van Limborch van der Meersch read a paper on Paul and Hartmann's method for the determination of hydrogen in gas. They absorb the hydrogen in colloidal palladium and picric acid. The method has been in use for a time at the Western Gas-Works, Amsterdam. Results showed that the method was exact but slow. It could be applied in special cases for the precise estimation of hydrogen in gaseous mixtures; but it was too tedious for daily gas analyses. The question of the use of lead wool or ribbon lead in place of run lead for socket joints was next considered. The lead wool and ribbon lead have been found to be equally good, and have the advantage over run lead for making a joint that no fire is required; but for ordinary main joints in the ground, run lead is cheaper. Where, however, repairs are being made, and there is risk from the use of fire, lead wool or ribbon lead is preferable.

The attention of those attending the meeting was directed to different high-power gas-lamps which had been installed in the streets of Leeuwarden. There were examples of the low-pressure "Degca" high-power lamps of the German Welsbach Company. These lamps gave a light of about 1000 candles, and contained three inverted burners, consuming together about 21.2 cubic feet of gas per hour. One of the three burners could be used alone for the later hours of the night. There was also an installation of Pintsch high-pressure gas-lamps, and an installation of Graetzin lamps. A greater novelty was a high-pressure gas-lamp on Liedke's system, which was explained by Herr Loewenstein, of Vienna. This lamp is connected to the ordinary low-pressure gas-service, and the heat of the burning gas is used to work an injector by means of which the gas is raised to a pressure of 40 to 50 inches. A certain amount of mercury is volatilized and condensed in the process; but the loss of mercury in the course of the year was stated to be extremely small. The lamp requires no high-pressure service or special motor.

There were also exhibited three different types of automatic gas lighting and extinguishing devices. A communication by M. Gaulis, of Paris, describing an automatic lighting and extinguish-

ing apparatus on the Kilchmann and Gaulis system, was followed with much interest. It is a clockwork apparatus which has already been extensively adopted abroad. The clockwork is placed below the lantern, and is therefore not exposed to the heat of the lamp. Tests made with the apparatus in Amersfoort and Leyden have up to the present given good results. The objection to clockwork igniting appliances was that the lamps were lighted and extinguished at a time fixed beforehand, and there was difficulty in anticipating the time of ignition or in delaying the time of extinction. Automatic apparatus depending on a wave of pressure in the main, on the other hand, allowed the ignition and extinction to be altered with ease. At Flushing, lamps over 6 miles from the gas-works were lighted and extinguished by a wave of pressure without any difficulty arising. The Bauduin apparatus was in use at four villages in the neighbourhood of Leyden.

The questions included in the programme for discussion at the meeting having been dealt with, the technical proceedings were brought to a conclusion. In the afternoon of July 4 the members visited the local gas-works. A telegram was received from M. de Brouwer, expressing his hearty thanks for the distinction which the Association had bestowed on him in electing him an Honorary Member. A concert was afterwards held in the Princes Garden, which was beautifully illuminated. Wednesday, July 5, was devoted to a whole day excursion to Sneek, and a boat trip on the Sneek Lake. Thanks were expressed by those who attended to the Gas Committee of Leeuwarden for their hospitality and the arrangements which had been made for the meeting. In the evening, the official banquet of the Association was held.

REPORTS OF COMMITTEES.

Coal Committee.

The Coal Committee have received reports from a number of gas-works indicating that the majority have adopted the system of making their contracts for coal in the last quarter of the year for the twelve months commencing on April 1 following. The Committee review the position of the coal market as shown by the prices current quoted in the "Colliery Guardian" for each quarter of the past five years, and find therefrom that the lowest prices within this period were those obtaining in the last quarter of last year. The conclusion therefore is that gas undertakings which made their contracts in that quarter did well.

The Committee have investigated Bridgeness gas coal from Linlithgow, because it has not previously been bought by Dutch gas-works. A test made on a large scale of a sample of this coal, consisting of one-third "doubles" and two-thirds "peas," gave 11,088 cubic feet of gas per ton, after deduction of air in the gas. The illuminating power of the gas was 14.7 candles, and its gross calorific power was 629 B.Th.U. per cubic foot. Two tests of the sulphur in the gas gave 14.7 and 12.5 grains per 100 cubic feet. From these and other results which are quoted, it is concluded that Bridgeness coal is a good gas coal. Reports received by the Committee from 125 gas-works in Holland show that they bought in the year 1910 the following quantities of gas coal:—

Westphalian	748,982	metric tons
Durham	208,508	" "
Yorkshire and Derbyshire	118,666	" "
Scotch	358	" "
		1,076,514 metric tons

The total shows an increase of 4.48 per cent. over the corresponding purchases for 1909. The amount of Westphalian coal bought has increased by 13.19 per cent., and that of English and Scotch decreased by 11.43 per cent. The report gives tables showing the quantities from different pits. Of the Durham coals purchased, the largest quantity came from Mickley, and of other English coals the largest quantity was of Pope's Diamond.

Questions were sent by the Committee in March to 45 of the chief gas-works with reference to their store of coke at the beginning of April. The answers showed that the coke in store amounted to about 6 per cent. of the total quantity produced by Dutch gas-works in 1910, after deducting that consumed in the retort-houses. The quantity in store was, however, very unequally distributed—seven works had none, while two had large quantities. Having regard to the mildness of the two preceding winters, the stock of coke was not great. In consequence of the fall in the price of gas coke, the consumption has greatly increased, and many works which previously used oven coke are now using gas coke. It was ascertained that considerable quantities of coke were sold by 37 gas-works in other towns in which there were gas-works. The quantities thus sold were larger than in the previous year. The Committee point out that a small quantity of coke brought into a district for sale at a low price can cause great trouble and much injury to the management of the local gas-works, and think that an arrangement should be come to between the managements of works in different towns to avoid this evil.

The price obtained for coal tar in 1910 was higher than in 1909. The production of coal tar in 120 Dutch gas-works amounted in 1910 to 48,889 metric tons, and the production of water-gas tar in nine works to 4002 metric tons. The price obtained for water-gas tar was satisfactory. In regard to liquor, 111 gas-works produced the equivalent of 70,682,804 gallons of liquor of 1° Baumé (1.0068 specific gravity). Of this liquor, 65 per cent. was worked up in 39 works to sulphate of ammonia, of which the total quantity made was 5295 metric tons. The average price obtained for sulphate in 1910 was 7.5 per cent. higher than in 1909.

It is mentioned that questions from the Government Department of Agriculture, Industry, and Commerce, as to the position of the gas industry in Holland, were received and answered by the Committee during the year. The report is signed by Heer N. W. van Doesburgh as Chairman of the Committee.

Photometry Committee.

This Committee have been engaged during the year in making tests of the "London" argand burner No. 1. They have also investigated a specimen of the Simmance and Abady apparatus for determining the specific gravity of gas. This apparatus depends in principle on the variation in the time of outflow of different gases from a fixed opening. Compared with Schilling's apparatus and the Lux gas-balance, it gave very trustworthy results; and in regard to its construction, it is well adapted for technical use.

An investigation has been made at the Western Gas-Works, Amsterdam, of Professor H. Strache's calorimeter [described in the "JOURNAL," Vol. CXI., p. 387]. This instrument explodes a measured volume of gas—viz., 30 centimetres, mixed with air. The explosion takes place in a glass vessel surrounded by an air-jacket, the air in which is warmed and expands. Its expansion is read off on an empirical scale. The manipulation is simple and rapid, and no water supply is needed, which is an important consideration in some cases; also, it requires only a quite small quantity of gas for the determination. Comparisons have been made of determinations of the calorific value of mixed gas in this calorimeter and in the Junkers instrument. The following table gives the results of one set of such comparisons, in B.Th. U. per cubic foot, with the exact percentage deviation of the Strache results from the Junkers results:—

Strache.		Junkers.		Deviation.
570	..	571	..	-0.20 per cent.
569	..	571	..	-0.30 " "
563	..	565	..	-0.32 " "
592	..	586	..	+0.99 " "
589	..	586	..	+0.50 " "
591	..	585	..	+1.04 " "
574	..	576	..	-0.23 " "
569	..	567	..	+0.32 " "

These results show that the deviations are not important, and that the Strache calorimeter can be very useful where a supply of water is not available. It is readily portable, but is very fragile, and the measuring vessel is easily broken; also the rubber connections with the mercury levelling vessel, as supplied, are unsatisfactory. A peculiarity of the apparatus is that the gas is measured by means of a comparison tube, as if in the conditions of 0° C. and 760 m.m. Conversion therefore is necessary to obtain the results at 15° C. and 760 m.m., as used at Amsterdam. A table is given in the report for facilitating this conversion. Notwithstanding the simplicity of manipulation, the fragility of the apparatus is against its use on works; but where the employment of a Junkers calorimeter is precluded, owing to absence of water, the Strache instrument should be very serviceable. The report is signed by Heer J. van Rossum du Chattel, the Chairman, and two other members of the Committee.

Testing of Gas Oils.

This Committee have held two meetings, and tests of gas oils have been made at The Hague, Amsterdam, and Rotterdam, with a modification of the oil testing apparatus devised by Dr. Hempel [see "JOURNAL," Vol. CXI., p. 391], of which the results are given in an appendix to the report.

The first tests at The Hague were made on one description of oil with a view to ascertaining whether the product of the make and calorific power of the gas was constant at particular temperatures and particular durations of gasification. It was found that the results were not constant; the deviations were probably due to the formation of soot, which occurs freely at the higher temperatures of about 750° C., and interferes with the correct reading of the temperature. The early tests were made with the Hempel's apparatus up to a temperature of 850° C. At Rotterdam, a lower temperature was used; and owing to the absence of the formation of soot, the results obtained were more satisfactory. At the higher temperatures, however, in this case also, formation of soot occurred. Further tests were then made at The Hague with the gasification tube packed with small stones or else iron shavings. Tests were also made with a vertical, instead of a horizontal, gas-making apparatus; but the results were not much better. Other tests were carried out at Amsterdam. A number of these were made on various descriptions of oil at different temperatures, but with the same rate of inflow of the oil. The rate of inflow chosen was a hundred drops per minute. The tests showed that the most favourable results—that is, the maximum product of the make and calorific value—were obtained at the temperatures shown in the following table:

Oils.	Specific Gravity.	Relative Valuation Figure (Make Multiplied by Calorific Power).	Best Temperature of Gasification.
Galician	0.870	100	725° C.
Pennsylvanian . .	0.855	96.7	700° "
Oklahoma	0.860	92.6	750° "
Texas	0.877	91.7	800° "

It will be seen from the table that the variations are not great. The next series of tests was with the object of seeing the effect of variations in the rate of inflow on the gas-making results. The different descriptions of oil, however, behaved differently at the temperatures employed and no definite conclusions could be drawn from the tests.

The Committee draw the following general conclusions from the results of the tests made with Hempel's apparatus:

- (1) Between the temperatures of 700° and 800° C., and with the test extending over about 45 minutes per 100 c.c. of oil gasified, the method is useful, and admits of the character of the oil used being ascertained.
- (2) The method is valuable for objective study, and as such can be commended.
- (3) The number of combinations between the time of gasification and the temperature is so great, and the influence of either of these on the product of calorific power and make of gas is such, that a very great number of observations must be made, and much time expended, in order to determine the gas-making qualities of an oil.
- (4) Owing to the great time required for the observations, the method is not suitable for commercial application.
- (5) It may be assumed that the number of combinations referred to in (3), and the time expended on the observations, and the variation of the result with different oils, would prevent any gas-making method of testing being suitable for use as a commercial method.

In conclusion, the Committee have still to trace whether, from the calorific value of, and the proportion of hydrogen in, the oils, data may not be obtainable for the rapid testing of different descriptions of gas oil. The report is signed by Heer M. C. Sissingh as Chairman of the Committee, and thanks are given to several gentlemen who have collaborated in making the investigations.

BENZOL RECOVERY FROM COKE-OVEN GASES.

A recent number of the "Iron and Coal Trades Review" contained an illustrated article by Mr. D. C. Bagley on "The Recovery of Benzol from Coke-Oven Gases." The author gave a plan and elevations showing the general arrangement of a benzol recovery and rectification plant with washery; a view of a similar plant, comprising 120 ovens, constructed by Messrs. Bolckow, Vaughan, and Co., Limited, at their Dean and Chapter Colliery; and another view, accompanied by a full description, of larger plant constructed according to the system of Herren Carl Still, of Recklinghausen, by whom, it is stated, about 90 per cent. of the benzol plants in connection with coke-ovens in Germany have been erected. This description, to which those of our readers who desire information on the subject are referred, is accompanied by some interesting historical and other remarks which are reproduced below.

For many years it has been known that ordinary coal gas contains proportionately large percentages of benzol, in which term may be included the homologues of the benzene series, which contribute largely to the illuminating value of the gas. The discovery of benzol in coal tar is attributed to Hofmann, about the year 1845; while its separation was entrusted to his pupil, Charles Mansfield, who eventually carried out the process on a large scale—the principle of the separation of the various liquid hydrocarbons being the usual system of dephlegmation, previously used for the rectification of spirits of wine. The aniline dye industry owes its inception to the successful production of benzol.

The rapidly advancing demand for benzol for the aniline trades stimulated the attempts of inventors to discover means for the extraction of the benzol contained in the gases evolved in the production of furnace coke in bye-product ovens. Seeing that in some cases the yield per ton of dry coal is more than 2½ gallons—excluding that contained in the tars derived from the like quantity of coal, generally not exceeding 5 per cent. of the volume contained in the coal gases from the unit referred to—and that the removal of this benzol may be effected without unduly affecting the heat value of the gases used for the heating of the ovens, it was natural that attempts should be made to recover this product. Various methods were suggested and tried. By cooling the coal gases to -70° C., benzol separates in the liquid form; but the obvious difficulties of using this method on a practical scale, and the high cost associated therewith, preclude its adoption. Another system—that of attaining the separation by compressing the gases—was found to be equally impossible.

As it was well known that the heavier oils obtained from the distillation of coal tar possessed the property of absorbing benzol from coal gases, and that by this medium a simple and practical means of recovering the benzol from coke-oven gases was available, the idea was made use of; and it formed the subject of a patent taken out in England in 1884 by Carvès, who successfully applied the process to his own ovens. Others, notably Brunck and Huessener, worked upon the same principle; the latter using as his absorbent a lighter oil, containing no naphthalene when cooled to 0° C., and distilling between 160° and 210° C. His process involved the use of plant for cooling the absorbing oil down to 0° C.; and, in practice, a yield equal to 93 per cent. of the benzol contained in the gases was attained.

To-day, the recovery of benzol from coke-oven gases is generally, perhaps exclusively, effected by means of liquid absorbents.

The degree to which the cooling of these absorbents shall be carried after separation of the benzol in the separating column remains a matter for argument. If the cooling is to be carried below atmospheric temperature, then special refrigerating appliances must be employed, necessitating an increased capital expenditure, and obviously a rather more complicated system of operation than if the oil is cooled down merely to near atmospheric temperature. As it is possible to extract the like quantity of hydrocarbons from the coal gases by means of absorbent oils not subjected to special refrigeration, this system would appear to possess advantages over one which requires refrigerating apparatus for cooling the oils prior to their use as absorbents in the gas scrubbers or other vessels.

The most important parts of the complete apparatus for the recovery of benzol are the scrubbers and the columns for separating the benzol from the absorbent. Obviously, the former must be so proportioned and arranged as to provide the maximum of contact between the absorbing oil and gas to ensure the best results, as it must be remembered that the affinity of the oil for the benzol is considerably less than that of water for ammonia. As concerns the separating column, this must be capable of continuously separating the benzol and the absorbent; and the separation must be complete if losses are to be avoided. The great difficulties attending the construction of this part of the plant to ensure these peremptory conditions will be better appreciated by the distiller.

Until very recently, British practice, and then only on a relatively small scale, was almost entirely confined to the production of crude benzol; the buyers usually specifying that 65 per cent. should distil over at 120° C. A little consideration will show that the market for this product is an extremely narrow one, and that the producer is more or less tied to purchasers possessing the apparatus necessary for its rectification, and the production of standard products having a much wider sphere of usefulness. As the railway charges for conveying inflammable products are exceptionally high in Great Britain, it will be further observed that the seller's operations may be limited to the vicinity of his own works, and, even so, the finished product is saddled with, perhaps, double charges for conveyance and handling.

Further consideration discloses the fact that the producer has facilities generally very much more favourable for the production of finished products on his own works, quite apart from the above. As by this means his net results are considerably enhanced, it appears curious that so little should have been attempted here, notwithstanding the twenty-five or more years' lead by Germany. The answer will probably be found in the desire of most bye-product coke-oven owners to limit their chemical activities. A trade specification for 90 per cent., or pure, benzol, or toluol, or even solvent naphtha, is not calculated to encourage the cautious colliery agent to extend his operations into unknown fields. But, with modern plant, the advancing of crude benzol to these products, and the fulfilment of the tightest specifications extant, occasion no special skill—the operations being attended with less difficulty than the production of sulphate of ammonia. No one, nowadays, would think of disposing of crude ammoniacal liquor. The production of sulphate is a simple matter, the markets are world-wide, and the profits from the manufacture are a prime factor in the cost of furnace coke.

Naturally, the market outlook for the various products is a matter for consideration. Fortunately, an assured future for the finished products may now be predicted. But, as regards "crude," the maker possesses hardly one tithe of the channels for disposing of his product compared with the manufacturer of pure washed naphthas, toluol, xylol, solvent, and heavy naphtha. Some time ago, attempts were made to introduce "crude" as a motor spirit. It can hardly be said to have proved a success. Containing many impurities, chemically inert, its vaporization at ordinary temperatures was attended with difficulties, the deposition of carbonaceous residues on the working parts of the motor was a constant trouble, and the higher efficiency expected by increased thermal value volume for volume with petrol was hardly ever attained in practice. Now, with a properly constructed and arranged rectifying plant, the production is possible of a motor spirit suitable for any temperature; and its constituents may be changed at will for abnormal circumstances.

As an economic factor in the production of furnace coke, the recovery and rectification of benzol plays an important part. Probably this phase of the situation appeals mostly to the owners of coke-ovens. Though no hard-and-fast net result per ton of coke made can be stated, owing to the differing content in the gases from various coals, from 1s. to 1s. 6d. per ton of coke made can be achieved, after providing for all outgoings of the usual character; so the subject is worthy of attention from the financial side. But to ensure these results, it may be reiterated that the plant of whatever system must be of a proved and practical description, capable of easy control with the minimum of labour. These are, and have been, the essential requirements for plants in connection with coke-ovens; and they will remain in force.

Meeting of the British Association.—The annual meeting of the British Association for the Advancement of Science opens to-morrow at Portsmouth, under the presidency of Sir William Ramsay, F.R.S. Professor J. H. Biles is the President of the Engineering Section, in which papers will be submitted (among other subjects) on oil-engines and suction-gas plant.

MONAZITE SAND FROM INDIA.

Richer in Thoria than Brazilian and Carolina Sand.

In previous issues of the "JOURNAL," reference has been made to the work of the authorities of the Imperial Institute in connection with the testing of samples of monazite sand forwarded to them. The last quarterly "Bulletin" of the Institute contains the following information in regard to a sample sent some time ago by the Geologist for the Northern Division, Travancore, India, who stated that it represented naturally concentrated sand, of which a considerable deposit had been found near Quillon.

The sand contained over 46 per cent. of monazite; ilmenite and zircon being the other principal constituents, with some rutile and traces of spinel, garnet, quartz, and hornblende. A chemical analysis gave the following results:

	Per Cent.
Thorium dioxide (ThO ₂)	4'00
Cerium, yttrium, and lanthanum oxides (Ce ₂ O ₃ , Y ₂ O ₃ , and La ₂ O ₃)	28'34

The monazite in this sand can be readily separated in a fairly clean state by means of an electro-magnet. A specimen of pure monazite separated from the sample was found to contain 8'5 per cent. of thoria; so that, as the crude sand contained 4 per cent. of thoria, the amount of monazite present must be about 46'2 per cent. In reporting these results, it was pointed out that the value of the sand would be much enhanced by eliminating the valueless minerals—such as ilmenite, zircon, &c.—by electro-magnetic separation, as described in a previous "Bulletin."

A second sample of monazite sand from Travancore was received in May last year. It contained about 50 per cent. of monazite; the other constituents being the same as those in the first sample.

Subsequently the Institute received a sample of a concentrate obtained from the crude sand, which had the following approximate mineral composition:—

	Per Cent.
Monazite	90'5
Ilmenite (including a little garnet)	6'5
Zircon (including a little rutile)	3'0

The thoria present amounted to 8'87 per cent., expressed on the concentrate as received; and a specimen of practically pure monazite, separated electro-magnetically from the concentrate, contained 10'08 per cent. of thoria. This was a specially prepared concentrate; and it is understood that the concentrate prepared on the large scale from the Travancore sand, and marketed in London, usually contains from 5 to 6 per cent. of thoria.

This commercial material is probably represented by a fourth sample, which reached the Institute in May of the present year. It consisted chiefly of monazite, with a considerable amount of ilmenite and some zircon. Small quantities of magnetite, garnet, rutile, sillimanite, and quartz were also present. The following is approximately the composition of this concentrate, as ascertained by electro-magnetic separation:—

	Per Cent.
Fraction 1.—Chiefly ilmenite	26
" 2.—Practically pure monazite	62
" 3.—Chiefly zircon	11

The first sample of Travancore monazite sand was submitted for valuation to chemical manufacturers in London. They stated that it would be worth about £5 per unit per cent. of thoria present (June, 1910).

It will be seen from the foregoing information that this Travancore deposit consists of material of considerable commercial value, even in its natural state; and that by concentration its value as a source of thoria can be enhanced far beyond that of the Brazilian material, which, as marketed, contains, as a rule, less than 4 per cent. of thoria. The monazite in the Travancore sand is also of interest from the fact that it is richer in thoria than the monazite in the Brazilian and Carolina sands. In this respect it resembles the variety of monazite which occurs in Ceylon.

GAS ENGINEERS AND COKE-OVEN GAS SUPPLY.

In the notice of the "Transactions" of the Belgian Gas Association which recently appeared in the "JOURNAL," it was mentioned that one of the papers was on "The Utilization of Coke-Oven Gas for the Lighting of Towns;" the author being M. Charles Regout, the Managing-Director of the Liège Gas Company, in collaboration with his two Engineers, MM. Bertholet and Houtvast. The portion of the communication contributed by the last-named gentlemen consisted of descriptions, illustrated by plates, of the Otto and Koppers coke-ovens, and an account of the installations of coke-oven gas supply in Germany. Most readers are familiar with the construction of the two ovens mentioned; and the other branch of the subject was fully dealt with in an article on "Coke-Oven Gas for Town Supply" which appeared in the "JOURNAL" for the 28th of March last (p. 921). These portions of the paper, therefore, do not call for more than passing reference. Some general remarks by M. Regout are,

however, of special interest, from the fact that included in them is an estimate for a large installation of coke-ovens.

M. Regout pointed out that coke-oven gas is a bye-product which, up to within the last few years, was considered as a negligible quantity; indeed, it was almost looked upon with contempt. The reason was that the metallurgic coke industry could exist without the sale of the gas resulting from the manufacturing operations connected with it, because the price of the coke was always higher than that of the slack employed in its production. Consequently, the sale of the principal product paid for the raw material. This, unfortunately, could not be said of the gas industry. Another point, not less important, was that slack was much cheaper than gas coal; while oven coke sold at a higher price than that produced in the manufacture of gas, and found a market all the year round—thereby saving the cost of storage and avoiding waste. The yield of coke and sulphate of ammonia was higher than that obtained in ordinary gas-works; but, on the other hand, the quantity of tar was much smaller, and its quality inferior to that produced in the distillation of coal, owing to its high content of pitch. If the bulk of gas produced in coke-ovens was about the same as that of gas-works, its quality was much lower. Out of 10,240 cubic feet produced per ton of raw material, it was not possible, by fractional distillation, to obtain more than about 4100 cubic feet of gas of a calorific power of more than 555 B.Th.U. per cubic foot.

In order to enable his colleagues to make a comparison with their own working, M. Regout gave the following figures of the yield of gas and residual products per ton of slack when treated in coke-ovens:

Gas—116 cubic metres, at 3·5 c.	Francs.
29 " " " 1·0 c.	4·06
Coke—750 kilos. of metallurgic coke, at 28·42 frs. per ton	0·29
40 kilos. waste, at 13 frs.	16·86
Tar—25 kilos., at 25 frs.	0·52
Sulphate—11½ kilos., at 280 frs.	0·62
	3·22
Total	25·57
Cost of coal	16·65
Difference	8·92

In submitting these figures, M. Regout said he considered them to be quite normal. The price of 3·5 c. per cubic metre (9½d. per 1000 cubic feet) for gas of 555 B.Th.U., completely purified, and equal in all respects to town gas, could be easily obtained when it was a question of entering into a contract with a town. The price of 1 c. per cubic metre (2½d. per 1000 cubic feet) for gas of 400 to 445 B.Th.U. per cubic foot was about what it was worth, whether for home consumption or for sale to neighbours for manufacturing purposes. Assuming that his audience were willing to accept these figures, there would remain, after having disposed of the residual products, 8 frs. 92 c. per ton of raw material to cover the cost of manufacture, maintenance charges, and general expenses, and provide for interest and sinking fund and trade profit.

M. Regout then submitted a rough estimate of the cost of installing coke-oven plant capable of supplying 353 million cubic feet of gas per annum, or rather more than 1¼ million cubic feet per day—the gas to have a calorific value of 555 B.Th.U. per cubic foot. In order to be in a position to meet the maximum daily demand, an installation would be required of sixty ovens, distilling 430 tons of slack per 24 hours. This he estimated would entail the following expenditure:

Installation of sixty ovens	Francs.
Charging and drawing machinery, &c.	500,000
	150,000
	650,000
Condensing plant	400,000
Sulphate-house	200,000
Pumping plant	65,000
	1,315,000
Dry purification	130,000
Meters and compressors	90,000
Fences	200,000
Coal-store, &c.	225,000
Coal elevator and classifier, &c.	44,000
Gasholder (425,000 cubic feet).	150,000
Boilers.	230,000
Buildings and electric lines	70,000
Two steam cranes	27,000
Locomotive and six trucks	50,000
Offices, laboratory, &c.	50,000
Repairing shops and stores	75,000
Paving for coal-store	30,000
Water, tar, steam, and gas pipes.	50,000
Excavations, foundations, locomotive shed, closets, &c.	75,000
Ground	300,000
Enclosure and expenses unprovided for	50,000
	(£126,440) 3,161,000

M. Regout said he would refrain from dealing with so delicate a question as the net price of the gas, but he would direct attention to a few interesting points. In installations of coke-ovens, the steam required for the electric light station, the sulphate of ammonia plant, &c., was raised by gas, of about 400 B.Th.U. per cubic foot. The quantity of this gas for an annual carbonization of 86,000 tons would be 690,000 cubic metres for the electric light station and 1,632,000 cubic metres for the sulphate plant—making together 2,322,000 cubic metres, or about 82 million cubic feet. The number of workmen required, exclusive of foremen, would be 66; but it would only be 84, all told, for an annual distillation of

157,000 tons. The quantity of raw material carbonized yearly would depend upon the way in which the works were carried on. It would, of course, be possible, as in the case of gas-works, to vary the number of ovens in use; but only in cases where, as in the Koppers system, the ovens and heat recuperators are independent of each other. On the other hand, all the ovens could be kept going, and the excess gas either utilized on the works or disposed of to metallurgists or manufacturers in the neighbourhood. When, however, the ordinary routine of gas-works was followed, it would be necessary to take into account the distillation of gas coal instead of slack. With Westphalian coal, there could be obtained per ton about 11,000 cubic feet of gas of the calorific value of 555 B.Th.U. per cubic foot, all of which could be employed for lighting, inasmuch as the heating of the ovens could be done with gas produced in a special generator. The coke obtained with the coal named was hard, and suitable for metallurgical purposes; and the yield of sulphate of ammonia could reach 13½ kilos. (30 lbs.) per ton.

In conclusion, M. Regout offered the following observations: That the metallurgic coke-oven, which is, in point of fact, a large chamber oven, can be advantageously installed in gas-works, provided the system adopted is one in which the ovens are independent of each other; that the system of the direct recovery of bye-products can also be advantageously employed; and that the method of working an installation of coke-ovens must be determined according to circumstances, as must also the question of sending the resulting gas to a great distance. With regard to the last matter, he said the cost of conveying the gas must be less than the difference between its net cost in works established near the centre of consumption and in others situated far from the town to be supplied. The respective net prices would depend upon the cost of the conveyance of coal and coke, and whether it was sent by rail or by water; also upon the possibility of selling the excess gas for utilization in neighbouring industries. Each gas manager would have to decide for himself, in view of the conditions presented to him. His own conviction was that if the gas to be supplied to towns should some day have to be produced in coke-ovens, it depended on gas engineers to take up the work.

PROTECTOR FOR INCANDESCENT MANTLES.

A patent has been taken out for France by Herr Scheidegger for a protective sheath or socket for gas-mantles, by the use of which they can be more easily handled, and at the same time, it is claimed, rendered more durable.

The device differs from other known protectors of a similar kind in the fact that, in addition to the support used to fix the mantle, and formed of incombustible though fragile material (magnesia), there is a resisting and incombustible material which passes slightly beyond the level of the junction of the mantle with its support; and the part of the socket which encroaches on the light-emitting surface of the mantle does not reduce its illuminating power. As the result of the use of this protector, a mantle can be utilized, without inconvenience, after the support has been broken; and thereby its life is considerably lengthened. The mantle is fixed on a support made, for example, of magnesia, and furnished with grooves. The protector, which is formed of incombustible durable material (say metal), and provided with grooves corresponding to those in the support, is slid over these two parts. By bending the clips on the edges of the protector, the support is fixed to the socket, and all relative displacement is rendered impossible. The protector can be adjusted to either upright or inverted burners.

Illuminating Gas from Sewage.—According to a paragraph in "La Technique Moderne" (reproduced in "Engineering"), the Municipality of Brunn, Austria, have decided to filter the town sewage, and to distil the solid residue for obtaining illuminating gas. Analyses made at different periods from 1906 to 1909 show that at Brunn 1 cubic metre (220 gallons) of sewage yields on an average 1666·4 grammes (3·7 lbs.) of solid residue. The yield in gas of the latter amounts to 23·8 cubic metres (840 cubic feet) per 100 kg. (220 lbs.) of solid residue. The gas has a calorific value at least equal to that of coal gas, and "gives a better light than the latter."

The Railway Inquiry Commission.—In the House of Commons last Tuesday, the Prime Minister announced the names of the members of the Royal Commission of Inquiry into the working of the Railway Conciliation Scheme. They are: Right Hon. Sir David Harrel, K.C.B., K.C.V.O. (Chairman); Sir Thomas Ratcliffe Ellis, Mr. Arthur Henderson, M.P., Mr. Charles Gabriel Beale, and Mr. John Burnett. The Secretary of the Commission is Mr. J. J. Wills, of the Labour Department of the Board of Trade. The name of Sir Thomas Ratcliffe Ellis is known to most readers of the "JOURNAL" from his connection with the Mining Association of Great Britain and the Federated Coal Owners' Association. He is a Durham coal owner, and received his knighthood on the occasion of the Coronation. Mr. Beale is a member of the firm of Messrs. Beale and Co., of London and Birmingham, Solicitors to the Midland Railway Company, and Chairman of the South Staffordshire Water-Works Company. He has been three times Lord Mayor of Birmingham.

REGISTER OF PATENTS.

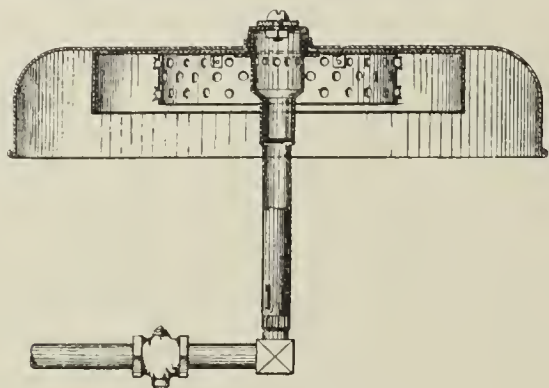
Gas-Burners for Heating Apparatus.

WITHERS, J. S.; a communication from E. G. VAN ZANDT, of St. Louis, Missouri, U.S.A.

No. 17,881; July 27, 1910.

The object of this invention is to provide a heating device of light and simple construction, in which "the gas, after having been burned in the initial burner and retained for a time in close proximity to the initial burner, is finally subjected to a second burning."

For this purpose, the arrangement consists of a device having an initial burner, a plate or shallow dish-shaped cylinder over the initial burner having a downwardly projecting outer flange, an intermediate perforated ring or flange fixed to, and projecting from, the plate between and concentric with the burner and the outer flange, and a shallow hood over and around the plate and flanges; the outer burner being formed by the depending perforated ring or flange, and the second or final combustion taking place between this depending perforated ring and the outer flange.



Van Zandt's Heating Burner.

In combination with the device shown, there is a bunsen type tube having an enlarged top-piece with lateral openings forming a rose "initial burner," with a cap on the top-piece and having a flange just above the lateral openings for supporting the flanged plate. A downwardly projecting perforated retaining ring or flange is fixed on the lower face of the plate between and concentric with the top-piece and the flange of the plate, and a hood resting on the plate has a closed top with, at its edge, a curved annular flange extending lower than and beyond the lower edges of the flanges.

Gas-Stoves.

WALLIS, W. H., of Southampton.

No. 19,908; Aug. 26, 1910.

This invention relates to burners for gas-stoves and the like, provided with a chamber wherein the gas and air mix before passing to the burner; and it has for its object to provide an automatic pilot flame (or, as an alternative, a reduced supply of gas) whereby the main supply of gas to the burner can be shut off and the gas extinguished or reduced in supply, and a pilot jet of virgin gas, or a reduced supply, maintained for relighting the burner.

Heretofore a like object has been attained, the patentee points out, by reducing the supply of gas to the burner—i.e., turning down the gas, by a weighted lever device acting on the ordinary gas-tap and coming into action to open the tap when a vessel or the like placed on the burner threw its weight on the lever and thereby opened the tap, and turning down the gas to a reduced supply when the weight of the vessel was removed.

The patentee's proposal is to provide a tubular rod having a pierced adjustable valve end adapted to close with the flow of gas. It is placed in the mixing-chamber and nozzle of the burner, so as to act as a by-pass and valve for governing the supply and subsequent ignition of the gas from the burner. The device is adjustable to the required position, and operated by the action of a weighted lever by means of an elongated end and arm, or the like, which engages with the end of the hollow by-pass tube, whereby the valve at the other end of the hollow tube is opened and closed; thus automatically governing the supply of gas—the action being dependent on the pressure or release of same caused by placing on, or removing from, the gas-burner, a cooking utensil.

A modification of the device consists in the use of a solid rod in place of the hollow by-pass, in which case a slotted adjustable valve is employed, which enables the burner to retain a reduced supply of gas. This device is actuated as described in the case of the pierced by-pass valve.

Gas-Purifiers.

BERLIN-ANHALTISCHE MASCHINENBAU-ACTIEN-GESELLSCHAFT, of
Köln-Bayenthal, Germany.

No. 18,016; July 28, 1910. Date claimed under International Convention, April 20, 1910.

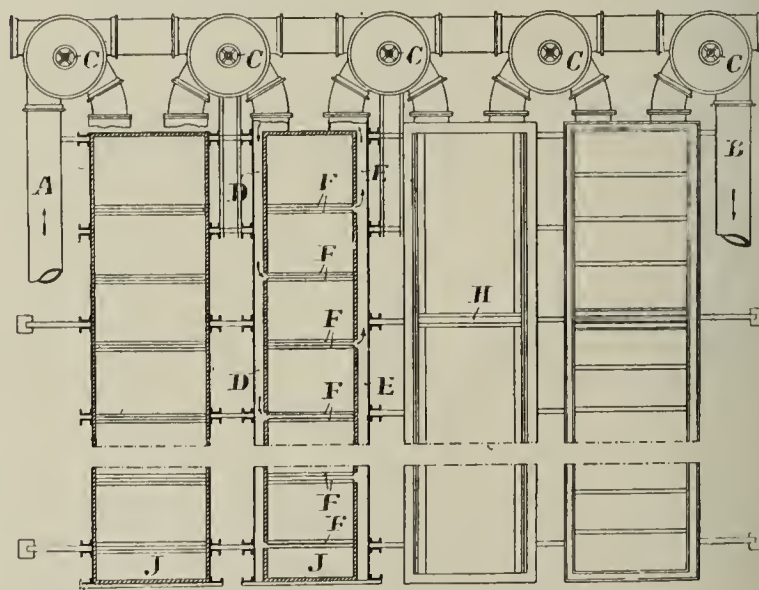
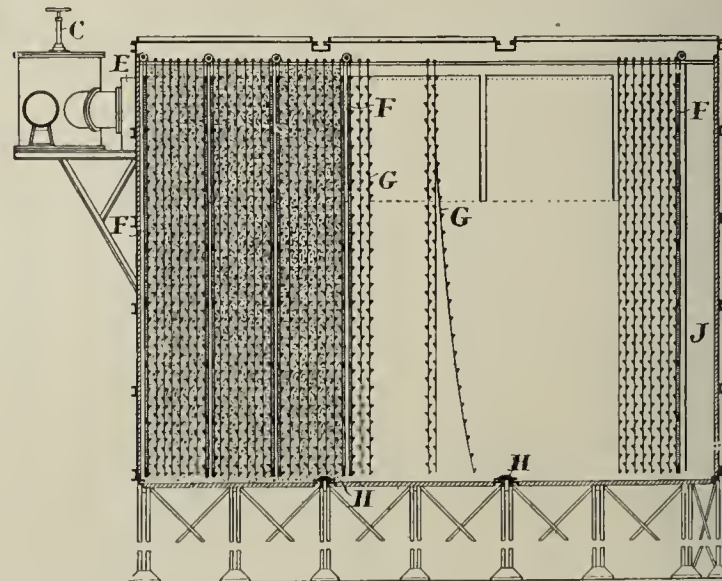
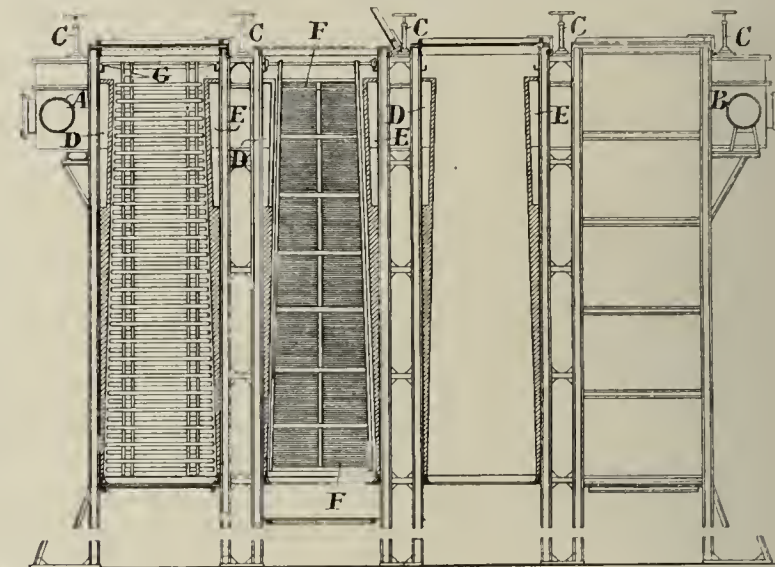
This invention relates to "elements for use in gas-purifiers," and has for its object "to build purifiers of such shape as to enable the purifying substance to be stacked very high, without, however, being injuriously compressed, and to construct purifiers in a simple and durable manner, easy to empty and to charge in spite of the great height."

These objects are attained by providing the purifier with supports for the purifying substance suspended on carriers so as to be adjust-

able in practically a horizontal direction. These supporting means are preferably secured to suspended pendulum-like bodies mounted on beams supported in an adjustable manner.

A construction of a purifier according to this invention is illustrated in longitudinal section, cross section, and horizontal section partly in plan.

In the construction shown, the walls of the purifier chambers or boxes are partly covered on the inside with concrete. A is the main gas-supply pipe; and B the main outlet pipe. The pipes are provided with branches, some of which form inlets to the purifier boxes and the others outlets from same. Reversing valves C are used for forcing the gas admitted to flow through either of the branches, which lead to the distributing chambers D E arranged adjacent to the walls of each purifier-chamber. The purifying-chambers are divided by perforated



A "Bamag" Vertical Purifier.

partitions F into subdivisions, while the walls of the chambers are provided with slots for the admission or escape of the gas. The perforated partitions rest, by means of supporting rollers, on rails provided on the upper end of the purifier-chambers, and can be moved in the chambers (while still remaining parallel to each other) by shifting the rollers on the rails. Apart from the two end walls, the perforated walls are arranged in pairs in each purifier-chamber in such manner that a space is left between them in which the gas can accumulate. These narrow spaces are arranged in such manner that they are exactly opposite the slots in the chambers. The spaces between the partitions, formed by the opposite faces to those which form the spaces, are filled by a series of pendulum-like supports or carriers G, also suspended to the rails and carrying ledge-like supporting means for the purifying substance. The supports are secured to beams which rest with their ends on the rails.

The spaces in which the supports hang are filled with the purifying substance, which is supported by the ledges throughout the whole chamber; so that the part of the substance contained in the bottom portion of the chambers is practically relieved from the pressure of that above it. The purifiers are closed at the bottom by covers secured to supports H. At the upper end, the purifying-chambers can be closed by covers. A chamber which is left free in the purifying-chambers is marked I.

The working of the purifier is as follows: The gas admitted through the pipe A passes, when the distributing valves C are in a suitable position, through one branch to the chambers D at the side of one of the purifying-chambers, and from this chamber, through the slots in the lateral walls of the box, into the spaces between the pairs of partitions F. From these spaces, the gas passes through the perforations of the partitions into the purifying substance, and escapes from it through the perforations of the adjoining partitions. In this way, it passes to the chambers which are in front of the outlet slots of the purifying-chamber, so that it can escape through the chamber E into the branch and finally into the main outlet pipe B.

When a purifying-chamber is to be emptied, the bottom plates are first opened, and then the partition F adjoining the empty chamber I is pushed into the chamber, whereupon the various series of supports G, with the supporting ledges, are caused to follow by shifting the beams. During this operation, all the purifying substance contained in the chambers gradually becomes free, so that it can fall and be easily removed. By laterally swinging the lower ends of the supports G, any material still adhering to the ledges is caused to fall off. When the purifier is to be refilled, the beams and the intermediate partitions are again brought into the proper position, and the bottom covers closed. The purifying substance is then charged in from the top, and becomes distributed in the intermediate spaces between the ledges, supported by the latter.

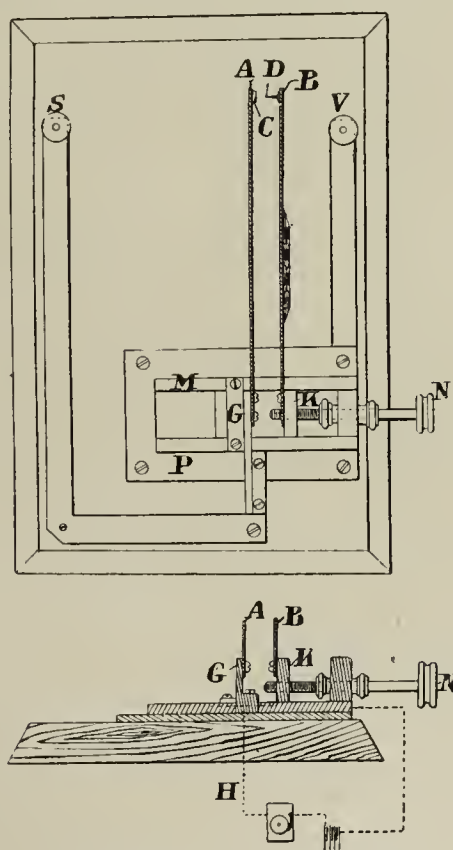
The provision of an empty chamber I in the purifier (if suitably dimensioned to receive a partition and the supports contained between two slots) also renders it possible, after each discharge, to begin the purifying process again without returning the partitions and the supports to their previous position. To this end, the partition adjacent to the empty chamber is advanced during the emptying operation to the end of the chamber, whereas the next partition is brought to the position which previously was the position of the partition adjacent to the chamber. In this way, all the supports between these two partitions are packed in the chamber, so that each partition is brought to the initial position of its adjacent partition. If this is done, the parts of the purifier are again in operative position, although they are not returned to their initial position. The compartment at the opposite end to the chamber I is now empty, but is filled up at the next emptying, when the chamber again becomes empty.

Indicating the Presence or Escape of Gases.

DI LEGGE, A., of Ancona, Italy.

No. 22,303; Sept. 26, 1910.

This invention relates to means for indicating the presence of gases, consisting of two parallelly arranged compound plates each formed of metals having different coefficients of expansion. The plates are so arranged that when they are heated by a rise in temperature of the ambient air, they remain parallel, but when gases are present one of them expands to a greater degree than the other one, and establishes contact therewith. This result is obtained by reason of the catalytic



Di Legge's Gas-Escape Indicator.

action of the gases on platinum arranged in proximity to one of the plates, which are arranged in an electric circuit in such a manner that, when they contact, the circuit closes and rings a bell, or in some other way gives an indication of the presence of the gas.

In the method illustrated of carrying the invention into practice, the metal part, heated by the catalytic action, is a compound plate con-

sisting of two separate plates soldered together, parallel with each other and presenting unequal coefficients of expansion, so that it becomes curved in consequence of the heating—the portion of the plate which expands the most forming the outer convex part of the curved compound plate. An indicating device embodying the invention indicates the presence of $1\frac{1}{2}$ parts of combustible gas in 1000.

The plates A B are identical, consisting of two layers of (preferably) zinc and malleable or cast iron. The zinc (the more expansible metal) is on the same side of the two compound plates—the right-hand side in the arrangement illustrated—so that upon any sudden increase of temperature influencing the apparatus as a whole, and producing curvature, the plates A B retain their parallelism. At the end of the plate B, a platinum point D is fixed opposite a platinum block C on the plate A.

The two plates are electrically insulated one from the other, each being connected by terminals S V with one pole of a source of electricity. The plate A is secured to a fixed metal angle iron G, while the plate B is mounted on a bar K, the interval between which and the iron G can be adjusted by the screw N. By this means, the interval between the point D and the block C (and, consequently, the sensitiveness of the apparatus) can be adjusted at will.

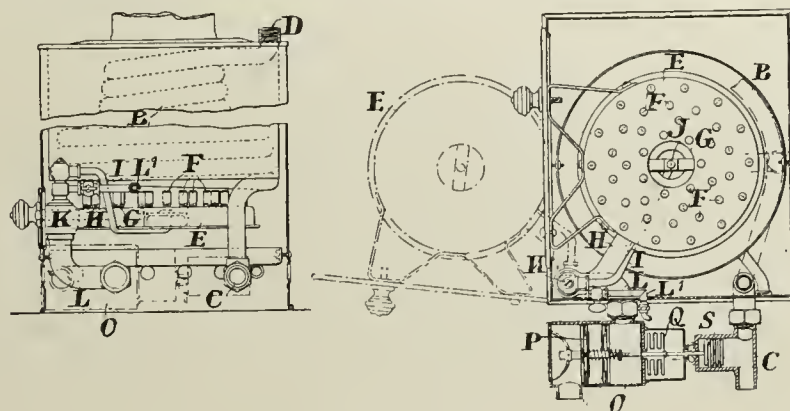
On the outer side of the plate B, by means of threads of silver or some other metal not readily liable to oxidation, pieces of platinum sponge are united one with the other and fixed to the plate B. If the pieces of platinum sponge come into contact with even a very small quantity of gas exerting a catalytic action upon them, the plate B is heated; and as the plate A is hardly warmed and does not therefore become bent, the plate B alone becomes curved towards the left hand, bringing the block C and point D into contact, closing the circuit, and giving a signal by some form of alarm mechanism inserted on the circuit.

Geysers.

EWART, J. W., of Mill Hill, N.W.

No. 28,703; Dec. 9, 1910.

This water-heater or geyser comprises a casing enclosing a coil to be heated by a gas-burner, and through which the water to be heated flows, controlled by a tap, and itself regulating the consumption of gas in such a manner that it is reduced to a minimum when no water is flowing through the apparatus. The invention is particularly applicable to apparatus in which the gas-burner is hinged inside the casing, so that it can be swung within it, or be withdrawn outside as required.



Ewart's Gas-Geyser.

The casing (as shown) is of rectangular shape in cross section. B is the coil through which the water to be heated flows—entering by the pipe C and leaving at D. E is the gas-chamber provided with burners F, and with the central aperture G. H is the burner-tube which supplies gas to the receptacle E. I is the bye-pass tube which supplies gas to the central bye-pass burner J. The outer ends of the burner and bye-pass tubes are hinged at K to the extremities of the gas-supply pipes L L', which are within the casing at one corner.

With this construction, when the flow of water through the geyser is cut off in the usual manner, by means of the discharge tap, the full pressure of the water supply is exerted upon the face of the piston S, which thus forces the valve spindle in the direction of the arrow, so as to cause the valve P to make contact with the valve-seat; the spring shown permitting the valve to yield relatively to the spindle should the pressure of water render this necessary.

When the supply tap of the geyser is turned on so as to cause the water to flow through the geyser, the pressure of the water upon the piston diminishes, so that the piston is moved in a direction opposite to that indicated by the arrow, under the action of the elastic diaphragm Q (which may be assisted by a spring if required), whereby the valve P is removed from its valve-seat and gas can flow through the casing O to the burner-pipe H.

Ignition Device for Gas-Burners.

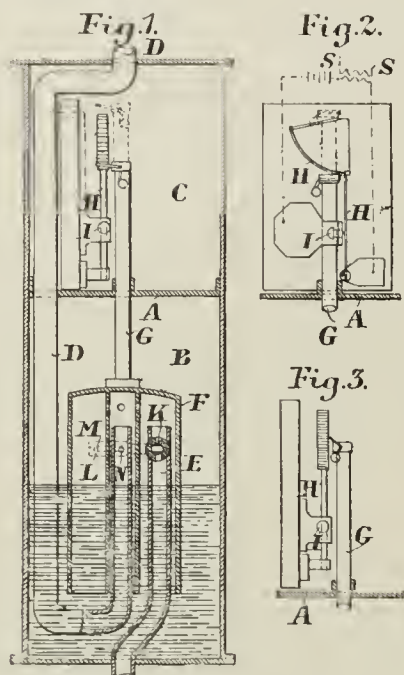
WASSERZIER, H., of Karlshorst, Germany.

No. 6182; March 11, 1911.

This invention relates to electric igniting apparatus for gas-burners in which the gas-flow is effected by the high pressure of the gas.

Devices are already known, the patentee remarks, in which the motion of a bell causes, by means of two contact springs, the making and breaking of an electric primary current circuit; and the spark thereby produced in the secondary current circuit serves to ignite the gas. In order by this means to obtain a multiple sparking, the contact springs are provided with a roughened or indented projection; so that the primary current circuit is repeatedly made and broken. Moreover, the speed of motion of the bell influences the operation of this contact. If the bell rises too quickly, the igniting sparks are too small to ignite the gas, or they do not flash over at all. According to the present invention, however, the igniting action is rendered independent of the

speed motion of the bell; and, under all circumstances, a very strong and effective oscillation of the contact springs lasting over several seconds is said to be obtained—thereby producing a powerful sparking—by applying a sector-shaped projection to the contact spring which is pressed aside by a projection actuated by the bell, and after it has slipped off, a powerful to-and-fro swinging of the contact spring is caused. The projection is, moreover, formed as an angle lever, which, after slipping off from the projection on the sinking of the bell, slides along the side of the projection in a sloping position, and finally comes to rest underneath in proximity to the front side of the projection, in order to be ready for further use.



Wasserzier's Gas-Burner Igniter.

The gas-tank shown is separated by the partition A into two parts B C, and has the tube D for the gas supply, while E serves for the gas exit. Over the lower end of the outlet tube is placed a bell F, which possesses outlets for the escape of the gas and dips below into water to keep it gas-tight. Upon the bell there is placed a guide-rod G, which is provided with a bearing at the top for influencing the contact. A rocking shaft is so placed that when the guide-rod rises it finds itself within the reach of the front side of a sector-shaped projection upon the contact spring H; but on the descent it slips along the side of the projection so as not to endanger the working parts. A weight fulfils the purpose of again restoring the lever G within the reach of the projection.

The spring is supported in a bearing connected with a plate attached (through a conductor) with the primary coil circuit. The spring co-operates with a fixed screw contact I; and to this is attached a plate, which, in turn, is connected with the primary coil through the conductor battery and wire shown. The secondary current circuit S which is interpolated in the secondary coil carries the ignition device for the lamps.

The action is as follows: When the mechanism is not under influence, the position is shown in figs. 1 and 2. The angle lever is to the front in reach of the projection on the spring H. As soon as the guide-rod G is raised (in consequence of the gas pressure), the angle lever presses against the projection, slipping alongside of it and pushing it aside together with the contact spring. When the lever has reached the dotted position, figs. 1 and 2, the springs both spring vigorously backward. This oscillating spring action lasts for several seconds, so that the primary current circuit which passes from the battery through the apparatus causes in the secondary coil strong sparks which last for several seconds. On the sinking of the bell, the angle lever turns on its pivot, and slips sideways on the projection. (See fig. 3.) When it reaches the lower position, the angle lever, in consequence of its weighting, again takes the position shown in figs. 1 and 2, and can again slip along the front side of the projection on the contact spring as soon as the bell rises.

For the surer operation of the entire mechanism, there is further provided an apparatus which automatically opens an exit cock when the bell rises, and shuts it again when it sinks. This is attained by placing a gas-cock in the outlet pipe, the handles of which are connected by rod mechanism with the bell. In the tube E is placed a cock, the handle K of which is connected with the rod mechanism L. In a slot M provided in the rod, there engages a pin N attached to the bell F. In the lowered position illustrated, the cock is shown closed, and the gas cannot pass to the supply pipe E. When the increased gas pressure passes through the tube D, then, by reason of the rising bell, the rod mechanism L is carried with it and the cock K opened. When the pressure diminishes, the bell again sinks and turns the handle into the closed position again.

Bridport Gas Company, Limited.—The accounts presented at the recent meeting of this Company showed that the revenue in the year ended the 30th of June amounted to £6137, and the expenditure to £4925; leaving £1212 to go to the profit and loss account. The amount available for distribution was £1703; and dividends of 7 per cent. on the ordinary and 5 per cent. on the preference shares were declared; carrying forward a balance of £686. Under the supervision of Mr. W. H. Reed, the Engineer and Manager, 2700 tons of coal were carbonized; and the sales of gas amounted to 26,560,000 cubic feet. Of coke 1305 tons, and of sulphate of ammonia 24 tons 19½ cwt., were produced.

CORRESPONDENCE.

[We are not responsible for opinions expressed by Correspondents.]

The Abolition of Sunday Labour in Gas-Works.

SIR,—At the opening of the Livesey Memorial Hall at the works of the South Suburban Gas Company, as reported in the "JOURNAL" for Aug. 22, p. 496, Mr. Charles Hunt, the Chairman, is reported to have said that Sir George Livesey and Mr. Morton were pioneers in the abolition of Sunday labour in gas-works; that it was in 1871 that Sunday labour was abolished at the Old Kent Road and Nine Elms works; and that at the latter place, he (the Chairman) was associated with Mr. Morton in the movement. This may be so; but let honour be paid where honour is due.

I do not know why my late father's (Alfred King, M.Inst.C.E.) memory is so persistently ignored, as he was the pioneer of the abolition of Sunday labour, long before Sir George Livesey was old enough to be interested in such matters. Sunday labour was abolished in Liverpool about the year 1843; and for years my father urged other companies to follow his example. But he preached to deaf ears.

Messrs. Hunt and Morton may be among the early abolitionists; but probably almost before they were born, the system had been adopted in Liverpool.

Beach Lawn, Waterloo, Liverpool, Aug. 26, 1911.

WILLIAM KING.

Corrosion of Service-Pipes.

SIR,—I shall answer the questions Mr. Hole asks in his letter in your last issue, although he refuses to answer mine.

1. Is it correct to refer to a subsoil containing moisture as a moist subsoil?—Certainly; and the presence of moisture can be easily proved.

2. Is it correct to refer to a subsoil containing salt water as a brackish subsoil?—Certainly; and the presence of salt water can be easily proved as indicated by the presence of chlorides.

3. Is it correct to refer to an ashy subsoil as acidiferous?—Certainly not, because such subsoils are alkaline and not acid; and to use the term acidiferous for an alkaline body is misleading and erroneous.

The term porous applied to such subsoils would be a much more suitable one. If Mr. Hole were simply to say I admit that ashy subsoils give an alkaline reaction, but I prefer (in spite of that) to call them "acidiferous," his position would be clear, if not quite sound; but as it is, his point of view is obscure.

Greenock, Aug. 25, 1911.

JAMES M'LEOD.

[No further letters on this subject will be inserted.—ED. J.G.L.]

The Inauguration of the Livesey Memorial Hall at Lower Sydenham—A Correction and an Explanation.

SIR,—The "JOURNAL OF GAS LIGHTING" is rightly regarded as a valuable record of events which take place in connection with the gas industry. Therefore, in the interests of accuracy, I should like to be permitted to point out that, as a Director of the South Suburban Gas Company, I was present at the inauguration of the Livesey Memorial Hall at Lower Sydenham on the 18th inst., which is reported in your last issue, and that the speech attributed by you to Mr. E. S. Morris is a much-abbreviated version of the remarks which I was privileged to address to my fellow co-partners on that occasion. Also Mr. Henry Vivian is late, not present, M.P. for Birkenhead.

May I add that, while I fully recognize the necessity for condensation, I regret the complete exclusion of my references to working-men Directors. I regard their creation as essential to any satisfactory scheme of co-partnership.

Ringwood, Beckenham, Aug. 23, 1911.

JOHN BORASTON.

[We, of course, regret the error to which our correspondent calls attention, which was caused through a misunderstanding on the part of the reporter representing the "JOURNAL" on the occasion referred to. Mr. Boraston is well known to members of our regular staff, who can attest to the earnestness with which he has, for several years past, used his voice in the advocacy of the claims and value of co-partnership. Our excuse for the misrepresentation must be the holiday season, which compelled the temporary pressing into service of a shorthand writer personally unacquainted with the members of the Board of the South Suburban Gas Company. We also take the opportunity here of correcting some of the figures mentioned at the same meeting by Mr. F. J. Jones. The total amount of bonus paid from the commencement of the co-partnership scheme in 1894 to 1911 inclusive was £40,453; while the deposits with the Company were £5014 on withdrawal account, and £2074 on trust account, or a total of £7088.—ED. J.G.L.]

Brighton and Hove Gas Company.—At the half-yearly general meeting of this Company last Friday, the Chairman (Mr. A. Matthews Paddon), in moving the adoption of the report and accounts, noticed last week, said there had been an increase of nearly 40 million cubic feet in the output of gas, in spite of the competition the Company had had to face from electricity. The cost of coals, coke, and oil for the six months under review was £38,346; and, though they had made so much more gas, the item was £142 less than a year ago. This showed that a high state of efficiency was maintained at the works. The profit of £34,000 was a record one, though the price of gas had been reduced 1d. per 1000 cubic feet; there having been a large decrease in expenditure. They were carrying forward to the next account a sum nearly sufficient to pay the dividend for the half year; and they were taking every precaution to maintain a large stock of coal. The report was adopted.

MISCELLANEOUS NEWS.

PROFIT SHARING AND STRIKES.

A letter on this subject by Mr. John W. Hope, the General Managing-Director of John Knight, Limited, appeared in "The Times" last Thursday. As the Company is a profit-sharing one, the story he tells of the efforts of the trade unionists to influence the employees will be of special interest to readers who have the system in operation.

For a good many years I have been a strong supporter of the idea that profit-sharing with employees would have the effect of rendering strikes and lock-outs a thing of the past; and, judging by the pleasant relationships which have existed between the employees of my Company and its Directors for many years, I was thoroughly satisfied that my anticipations were more than realized until a couple of weeks ago, when most of our employees appeared to be affected by the feeling of unrest in the labour world which has manifested itself in so lamentable a manner in many quarters. . . . Matters assumed a rather serious complexion, as some fourteen or fifteen of our carmen returned to the works early one forenoon with the loads of goods they were to distribute as usual in town, and gave as an excuse that they were held-up by the mob and forced to return. As owing to the then existing transport workers' strike we could neither get raw materials in nor manufactured goods out of the works, we decided to close-down; and immediately our employees were taken under the wing of one or other of the many Trade Unions existing in London, the leaders of which so far succeeded in engendering discontent that they have been successful in preventing our people from returning to work excepting as trade unionists, receiving what can only be termed exorbitant wages for greatly diminished services, and with the proviso that my firm should acknowledge the Trade Unions.

As we have always been supporters of free labour, it will be evident to every one that, as none of our competitors have so far been attacked, my firm has been selected by Socialistic leaders and others for one object—viz., the breaking-up of our profit-sharing scheme; for, as is well known, if profit-sharing were generally adopted in the country, the vocations of these Union and Socialist leaders would be gone. As other profit-sharing schemes have been defeated by their methods, I think it is as well that your readers should know something of the tyranny that is being practised at the present time. So-called "peaceful picketing" has been employed to such an extent that many of our employees who have loyally stood by the Company have gradually been forced by means of threats, and in some cases violence, to stay away from their employment; and the whole machinery of a business dealing with some 750 tons of manufactured goods per week is thus brought to a standstill.

Suggested Co-Partnership in Railways.

A representative of the "Daily Graphic" had an interview last Thursday with Mr. Edward Owen Greening, the Managing-Director of the Agricultural and Horticultural Association, and one of the earliest supporters of the profit-sharing system, who expressed his views on the applicability of the system to railways. Having referred to the effect of its adoption by the South Metropolitan Gas Company 21 years ago, he said: "The benefits to the three parties concerned have been these: The public have got their gas for 8d. or 9d. per 1000 cubic feet less; the shareholders have increased their dividends 2 to 2½ per cent.; and the workers have got £505,675, or 8½ per cent., on their wages, and have qualified themselves to have three Directors on the Board. The late Sir George Livesey took out the figures of the economies and improvements resulting from the harmonious relations between himself and the workers, and was able to show that the whole of the increased profit was due to the working of co-partnership. My suggestion, then, is to solve the railway problem on similar lines—namely, that the companies should take the profits they are making to-day, and the dividend they are paying on various classes of stock, as the starting-point to say to their employees: 'In future as we increase dividends you shall have profit-sharing bonuses on your wages.' But a proportion of the profits should also be used to reduce rates and fares. There, of course, we are faced by the difficulty that rates and fares are highly complex—not a simple matter like rd. off the price per 1000 feet. The way out lies through the Railway Commissioners, who are at present empowered to reduce rates and fares. . . . What I am going for is the harmonizing of the interests of railways, the public, and the employees, so as to remove existing friction. At present we are hindering the railway companies from increasing their profits, and they are fighting against our getting reductions. Once settle the basis for a distribution of profits, and the friction would be removed, to the benefit of all three parties." Mr. Greening went on to advocate the adoption by railway companies of the South Metropolitan Gas Company's plan of issuing stock at market value to consumers, which would, he said, give them a key to the difficulty in regard to new capital.

In an article which appeared in "The Times" last Saturday, it is pointed out that the question of profit-sharing schemes in connection with railway companies has received consideration on more than one occasion during recent years. Indeed, as long since as 1897, the "Railway News" published a definite scheme, which led to a discussion of the question; and the subject was again discussed in the same paper two years ago. The scheme then proposed, to the formulation of which the late Sir George Livesey contributed, was that the rates of pay then in force on railways should be considered the standard rates, and that they should remain unchanged until the annual amount of profit earned by any railway company exceeded 4 per cent. upon the total amount of its capital, when the profit-sharing scheme should come into operation.

The following remarks of the Financial Correspondent of the "Birmingham Daily Post" appeared in that paper last Tuesday: "At a time when labour unrest has threatened to paralyze industry and dislocate the whole social fabric, it is interesting to note that the South

Metropolitan Gas Company has never had any trouble with its employees since the co-partnership scheme was adopted, and that relations were never better than they are now. The present price of the Company's ordinary stock is 117½; and on the basis of last year's dividend—viz., 5 7-15 per cent.—the yield is £4 13s., which is a good return for a leading gas company's stock, especially a stock not liable to be affected by strikes."

NATIONAL INSURANCE BILL CRITICIZED.

A letter, signed by some members of the Opposition, criticizing the National Insurance Bill, was circulated from the House of Commons last Tuesday; and appeared in the "The Times" on Thursday. In the course of it, the writers offer the following observations.

On Friday, the 4th of August, Mr. Lloyd George made a long statement in the nature of a second reading speech on the position of the Insurance Bill as amended in Committee. The whole tone of that statement was one of extreme optimism and self-congratulation. We were informed by the Chancellor of the Exchequer that his scheme had won almost universal assent; that its main outlines, its machinery, its financial provisions had been accepted by the House of Commons; that most of the difficulties in its path had been surmounted; and that every alternative suggestion brought forward had received such ready consideration that the scheme now represents the very best conceivable result to which the combined wisdom of Parliament and the nation could attain.

Mr. Lloyd George's statement was made—most irregularly—on an occasion when the rules of procedure in the House of Commons excluded the possibility of any discussion and effective criticism. Yet it certainly stands in need of such criticism and examination, and all the more because it was so evidently intended to provide the authorized text for the campaign of "popularizing" the measure in the country which is now being organized by the Liberal Chief Whip.

Mr. Lloyd George asserted, with justifiable satisfaction, that the main outlines of his scheme, as a universal, compulsory, and contributory measure, have been accepted. That may be true; but does it carry us very far? In a measure of this importance everything depends on the manner in which the general principles which furnish its outlines are translated into action.

If the scheme is to be compulsory and universal, it must be fair to all classes included. Yet until the remaining clauses have been amended, it is impossible to agree that it is fair to young persons, to women, to agricultural labourers, to soldiers and sailors, to members of the smaller solvent friendly societies, to the deposit contributors, or to clerks, servants, seamen, and others already partly insured against loss of wages through sickness. Many of these—as, for instance, the employees of the railway companies, or of such a company as the South Metropolitan Gas Company—are already in receipt of better benefits than those provided by the scheme.

If the scheme is contributory, then the contributions must be based upon some equitable principle and secure proportionate benefits. It cannot be said that Mr. Lloyd George has at any stage furnished the House with any clear indication of the principle on which the contributions were to be apportioned. Meanwhile, discussion in Committee has been based upon the assumption that the workman is to pay 4d. and the employer 3d.; the State supplying an additional two-ninths of any benefit actually given. But now Mr. Lloyd George has introduced a new and disturbing uncertainty by pointedly insisting that the distribution of the 7d. between employer and workman "has yet to be settled when we come to the schedule." What is he really going to do? He owes it to all who are interested in the measure to make the point clear at once.

In this instance, as in that of the problems referred to above, it is entirely misleading to treat the difficulties as having been disposed of. Mr. Lloyd George has indicated methods of meeting some of them, has postponed others, and met by a direct refusal some proposals for the solution of the remainder. Even in its main features, the final scheme has yet to be made clear before it can really be accepted or condemned.

The same applies to the machinery of the measure, which Mr. Lloyd George also claims to have won general acceptance. That half of the machinery which is embodied in the "approved societies" has no doubt been agreed to in quite general terms. Mr. Lloyd George has put down or promised amendments which will enable dividing societies and industrial insurance companies to create special sections to carry out the State scheme, and, by relaxing the provision with regard to security, will make it easier for them and for trade unions to become "approved societies." He has offered to reduce the membership limit from 10,000 to 5000, and has intimated that he might consider Mr. Bathurst's suggestion of pooling the smaller societies in county groups.

To this extent Mr. Lloyd George has met certain obvious objections. It is, however, necessary to remember that these proposed amendments have not yet been discussed in the House, and that they are as yet by no means embodied in the scheme as it stands. In any case, they are very far from meeting all the objections. The membership limit of 5000 will still exclude more than 6000 of the smaller friendly societies. Mr. Lloyd George has criticized the smaller societies on the ground that "they cannot get the best advice—they cannot afford it—to begin with. Not merely that, but you have an epidemic in a district, and there are cases which make such a drain upon the funds of the society that it becomes bankrupt and has nothing to fall back upon." This criticism may be true in many instances; but it does not apply to hundreds of small societies, many with a standing of several generations, whose solvency is beyond dispute, who pride themselves on their management, and have the very strongest objection to being amalgamated with societies differently managed, or including, on the average, worse lives.

As regards the position of the deposit contributors themselves, Mr. Lloyd George has not made any attempt to deal with the objections to that part of the scheme. His appeal to the House not to do anything to encourage "the most thriftless class of the country, and that class which has the least right to the sympathy and financial support of the

State," may or may not have been justified; but it furnished no argument whatever in answer to the objection that men who are compelled to insure by the State should be given some real measure of insurance, even if on a lower scale than that given by the societies. The only suggestion of any kind for meeting this difficulty that he even mentioned was the suggestion put forward from the Labour benches, of making a levy upon the surpluses of the various friendly societies to assist the Post Office contributors—a suggestion which seems to us utterly indefensible.

Mr. Lloyd George's answer to all criticisms on this part of his scheme was, in effect, summed up in the following sentence: "Poor people will be better off than they were before; that is the first thing to get into their minds. At any rate, under the scheme they will get 9d. for every 4d. they put by." As a cue to the speakers who are setting forth to popularize the measure, this statement may be very useful. As a statement of fact, it is wholly misleading.

Let us examine the actual facts. As regards the 9d. the contributor is supposed to get, it is necessary to remember that the State subsidy of two-ninths is not equal to 2d., at any rate until after 1927. Its actual value rises from 3d. in the first year to 1½d. in later years. The cost of management is bound to be high—at least ½d. higher than under voluntarily-managed friendly societies. . . . As regards the 4d. which the contributor is supposed to pay, is that, in fact, all he is called upon to pay, considering that the scheme is a universal one? Will not, in the first instance, a large part—probably half, or nearly half, of the State subsidy—be paid through the taxes by the very classes who are compelled to join the scheme? Again, whether the employer's 3d. is passed on to the consumer, as Mr. Lloyd George once suggested, or shifted back on to the workmen in the shape of reduced wages or postponed increase of wages, will not the burden in either case fall largely upon the contributors themselves?

It is clear from the foregoing that the Bill is very far from being in the complete and generally acceptable form that Mr. Lloyd George has, no doubt, sincerely desired, and has, it would seem, persuaded himself it has already attained, or from being the finished result of the best combined efforts of Ministerialists and Opposition working together. This, no doubt, will be the impression conveyed by speakers whom the Liberal Chief Whip is proposing to send over the country. But, as a matter of fact, the Opposition have not been permitted to deal on broad lines with the reconstruction of the measure, and they have not had the opportunity of doing more than repair some of its defects.

CONCILIATION IN LABOUR DISPUTES.

The text of the Bill introduced by Mr. Crookes, with the support of representatives of the Unionist, Radical, and Labour Parties, for the establishment of Conciliation Boards to deal with labour disputes, was issued last Saturday.

The Bill, which consists of 46 clauses, would enact that wherever any dispute exists between an employer and any of his employees, and the parties thereto are unable to adjust it, either of the parties to the dispute may make application to the Board of Trade for the appointment of a Board of Conciliation and Investigation, to whom the dispute may be referred; and the Board of Trade, whose decision is to be final, shall, within fifteen days, establish such Board. Every Board shall consist of three members appointed by the Board of Trade, one recommended by the employer, another by the employees (the parties to the disputes), and the third (who is to be Chairman of the Board) by the members so chosen.

After setting forth the procedure for the appointment of the Board, the Bill states that no person shall act as a member who has any direct pecuniary interest in the issue of a dispute referred to the Board. It is provided by clause 7 that the application for the appointment of a Board shall be accompanied by a statutory declaration setting forth that, "failing an adjustment of the dispute or a reference thereof by the Board of Trade to a Board, to the best knowledge and belief of the declarant, a lock-out or strike, as the case may be, may be declared, and that the necessary authority to declare such lock-out or strike has been obtained." The party making application for the appointment of a Board must forward a copy to the other party, who shall prepare and furnish a statement in reply.

No dispute is to be the subject of reference in any case in which the employees affected are fewer than ten. The duty of the Board will be to endeavour to bring about a settlement of the dispute, and to this end "the Board shall, in such manner as it thinks fit, expeditiously and carefully inquire into the dispute and all matters affecting the merits thereof and the right settlement thereof; and in the course of such inquiry the Board may make all such suggestions and do all such things as it deems right and proper for inducing the parties to come to a fair and amicable settlement of the dispute, and may adjourn the proceedings for any period the Board thinks reasonable to allow the parties to agree upon terms of settlement." The Boards are further instructed to deal in their recommendations with each item of the dispute, and "shall state in plain terms, and avoiding as far as possible all technicalities, what in the Board's opinion ought or ought not to be done by the respective parties concerned." The Board will have power to summon and enforce the attendance of witnesses and take evidence on oath.

The Board is to be invested with powers of inspection at any time of "any building, mine, mine workings, ship, vessel, factory, workshop, place, or premises of any kind wherein, or in respect of which, any industry is carried on or any work is being or has been done or commenced, or any matter or thing is taking place, or has taken place, which has been made the subject of a reference to the Board, and inspect and view any work, material, machinery, appliance, or article therein, and interrogate any persons in or upon any such building, mine, mine workings, ship, vessel, factory, workshop, place, or premises, as aforesaid, in respect of, or in relation to, any matter or thing;" and any person who hinders or obstructs the Board or any such person shall be guilty of an offence and be liable to a penalty not exceeding £20. Any party to a reference may be represented before the Board by three or less than three

persons designated for the purpose, or by counsel or solicitor, where allowed. The proceedings are to be conducted in public, unless otherwise directed by the Board.

The members of a Board, while engaged in the adjustment of a dispute, and its officers or persons under its order in making investigations, are to be remunerated for their services (out of moneys to be provided by Parliament) according to a scale and under regulations to be made by the Board of Trade. The acceptance of a gratuity or perquisite by any member of a Board from any interested person will be considered an offence, rendering such member liable to a fine not exceeding £200.

Employers and employees are to give at least thirty days' notice of an intended change affecting conditions of employment with respect to wages; and where a dispute is referred to a Board, the relations of the parties are to remain unchanged pending the report. Any employer declaring or causing a lock-out contrary to the provisions of the Bill will be liable to a fine of not less than £20 nor more than £200 for each day or part of a day that such lock-out exists; and any employee who goes on strike in the same circumstances will be liable to a fine of not less than £2 nor more than £10 for each day or part of a day. Any person who incites, encourages, or aids in any manner, any employer to declare or continue a lock-out, or any employee to go or continue on strike, contrary to the provisions of the Bill, will be liable to a fine of not less than £10 nor more than £200. Either party to a dispute may agree in writing, at any time before or after the Board has made its report and recommendation, to be bound by the recommendation of the Board; and such recommendation is to be legally enforceable.

WANDSWORTH AND PUTNEY GAS COMPANY.

The Half-Yearly General Meeting of the Company was held last Tuesday, at the offices, Fairfield Street, Wandsworth—Mr. H. E. JONES in the chair.

The SECRETARY (Mr. Chas. W. Braine) read the notice convening the meeting. The Directors' report and accounts were taken as read.

A PROFITABLE HALF-YEAR'S WORKING.

The CHAIRMAN, in moving the adoption of the report and accounts, said that, having submitted the resolution, he might almost leave the matter there, because he should only have to inflict on the proprietors one of his congratulatory speeches. As would be seen the dividends were increased by 2s. 6d. per cent. on the "A" and "B" stocks, and 1s. 9d. per cent. on the "C" stock, consequent on the reduction in the price of gas by 1d. last year. They recommended these dividends with the greatest confidence, because the profit earned not only gave a small balance of ½d. per 1000 cubic feet sold, but because he always insisted on adequate charges being made for the upkeep of the undertaking. Not only was there no starvation of the works, but they were considerably better every half year, instead of worse. There were some among the proprietors who could read the accounts with the same ease that he could himself; and therefore he need not dilate upon them. They were convincing to anybody who understood gas accounts that all was well with this very prosperous Company.

GOOD TECHNICAL WORKING—FURTHER REDUCTION PREDICTED.

The make of gas per ton of coal carbonized was better than ever before; the consumption of coke for fuel was very good; the quantities of coke, tar, and sulphate of ammonia made for sale were also excellent—all showing that the technical officers had been doing their duty. The unaccounted-for gas, too, was moderate; being rather less than 5 per cent. So favourable, indeed, were the accounts that the Directors were almost sorry that they did not reduce the price of gas last time by 2d. instead of 1d. He did not think he would be risking his reputation as a prophet if he said that probably before the year was out the consumers and the proprietors would hear of another reduction of 1d., unless there were disturbances of markets of every sort that would cut them off from what at the present looked like a very sure prospect.

LARGE INCREASE IN BUSINESS.

The business in gas had grown by as much as 8·3 per cent., which was larger than they had had before; and he attributed this with the utmost conviction to the action of the Board in reducing the price of gas by 1d. when everybody else said they should not do so, because, as the proprietors no doubt realized, the price of 1s. 9d. at which they were selling gas was a phenomenal one for London and the suburbs. The reduction in the price of gas by 1d. gave £2500 to the consumers; and the addition to the proprietors' dividends only represented one-tenth part of this—in other words, the 2s. 6d. and 1s. 9d. increase in dividend on the various classes of stock only amounted to £250. The consumers had increased in number by 250; and stoves by 150. A large number of consumers had also bought their stoves—in round figures, 160. Coal had cost them more; and rates and taxes also stood at a higher figure. Fortunately, by vigilance and good sales of residuals, they had got through that.

FIRST YEAR OF PROFIT-SHARING.

Another matter which was of interest was that they had completed their first year of profit-sharing with their workmen; and the Deputy-Chairman, who looked after the funds and the Committee who dealt with this business, would give the proprietors particulars about it. As a matter of fact, humble and small as the undertaking was, and recently as they had started the profit-sharing system, the men had already something like £1700 accumulated, representing their interest in the concern. This amount was held by a comparatively large proportion of their men—257. For such a recent start, and for a small Company like theirs, he thought this was very satisfactory; and he looked forward, with great keenness, to the day when the amount accumulated would be £17,000, instead of £1700. Nothing could be better or more encouraging than the way the men worked with this object in view; nothing could be more delightful or helpful than the cheerful co-operation and loyalty they gave to the officers and the Board.

The DEPUTY-CHAIRMAN (Mr. T. A. Ives Howell), in seconding the motion, remarked that the Chairman had mentioned that he (Mr.

Howell) acted as Chairman of the Profit-Sharing Committee, and that he might tell the proprietors a few things regarding the scheme. But the Chairman had really given the salient points. Some 257 of the men had joined in the scheme; and they had distributed a sum of about £1600, or rather more, among them. The main point he thought that one noticed, and it was a point to which he drew the attention of the men when speaking to them recently, was that the Engineer had reported (as did the Engineer of every Company where profit-sharing was in force) that the workmen showed greater interest and care in their work. Now he was glad to see that the men of the Wandsworth Company had not been behind those of other companies in showing this care and interest. He hoped, when he met the men next year, that he would have another hundred men to welcome into the profit-sharing scheme. In fact, as he pointed out to them, every workman of the Company had the privilege of belonging to it, if they were able to show themselves to be efficient workmen. Indeed, he (Mr. Howell) would only be satisfied and happy when every man in the Company had proved himself eligible to join. He hoped, if he lived long enough, he would see this condition of things come to pass.

Mr. HARDWICK inquired how many men they had on the works.

The CHAIRMAN replied that in the summer they had about 430 regular men actually at work, and the casuals in winter numbered about 70. About half the men were employed on the works, and the other half in the district.

Mr. HENNELL inquired how long a man had to be in their employ before he was eligible to join the scheme.

The CHAIRMAN answered that they did not pick and choose very much. They were glad to afford the men an opportunity to join as the Engineer was satisfied that they were eligible.

The motion was unanimously carried.

Proposed by the CHAIRMAN, and seconded by the DEPUTY-CHAIRMAN, dividends were declared at the following rates per annum: On the "A" consolidated stock, £8 7s. 6d. per cent.; on the "B" consolidated stock, £6 17s. 6d. per cent.; and on the "C" ordinary stock, £5 17s. 3d. per cent.

FRESH CAPITAL AUTHORIZATION.

The CHAIRMAN said the Board now required the authority of the proprietors to raise more capital; but it did not follow that the Board would raise and spend it, although they received authority to do so. It was the particular function of their Board to get along without capital. The capital at the present time was only equal to 6s. 8d. per 1000 cubic feet of gas sold. In some of the other companies in which he was interested, the capital stood at about 8s. 6d. to 8s. 8d.; so that the capital of this Company was conspicuously lower. The secret of this was that they never spent capital when they could help it. He then moved a resolution giving the Directors power to raise, as required, new ordinary "C" stock to the amount of £120,000, in accordance with the provisions of the Company's Act of 1900. He added that they had unexhausted capital powers to the amount of £181,000; but they only asked for authorization to the extent of £120,000.

The DEPUTY-CHAIRMAN seconded the motion; and it was at once agreed to.

A further resolution was then passed, empowering the issue of debenture stock in the proportion of one-third of the new stock raised and fully paid-up.

Mr. HENNELL proposed a vote of thanks to the Board.

Mr. ERNEST L. BURTON, in seconding, remarked that the Company occupied a very distinguished position; and this was largely due, as everybody knew, to the energy and great ability of the Chairman and the colleagues he had supporting him. It also redounded on everybody concerned to-day in their works, as well as on the members of the Board, that the Company occupied such a magnificent position, selling gas as they did at 1s. 9d., and even lower than this for manufacturing purposes. This was unique for London.

The CHAIRMAN, having responded for himself and his colleagues, observed that they owed a great deal to their worthy Secretary (Mr. Braine) and to their Engineer (Mr. H. O. Carr), who was very energetic and very receptive. He took in all new things that promised well, and quickly reproduced them. There was also a large staff of men—foremen, leading hands, and rank and file—who combined, and for a long time past had combined, in the keenest and happiest spirit, to put the Company in the present position of prosperity. They owed them individually and collectively their thanks. They were now able to meet them individually through the profit-sharing scheme. It was a great pleasure to him—an old gas campaigner and manager of works—to occasionally meet the men face to face at their profit-sharing meetings. He wished meetings with them were more frequent than they were. In most large undertakings, it was not possible to come and shake hands with the men individually, except on occasions of this kind. He was perfectly certain that a good deal of the distressful and injurious labour unrest there was nowadays was due to the influence of outside persons, who had no interest except that of creating misunderstanding, in place of the relations that formerly existed between the *patron* (as they called the master in France) and the employee. He hoped the proprietors would join him in congratulating the men on the position of the profit-sharing scheme.

Mr. H. S. FREEMAN seconded, and Mr. BURTON supported, the motion; and it was cordially agreed to.

Mr. BRAINE, in his acknowledgment, said he should like to say, on behalf of his staff and himself, how much they appreciated the kind remarks that had been made and the vote. This was the first year they had embarked upon profit-sharing; and he desired to say how everyone appreciated what had been done for the whole of the workmen and staff in instituting the scheme. From what he saw of the men, he believed they were sincerely grateful.

Mr. CARR also thanked the Chairman, Board, and proprietors. With regard to his staff and the workmen, he said he was sure they had a good, honest set of men, who had the Company's interests at heart. As to the profit-sharing scheme, there were a great number still to join. But the men looked upon it as a matter of merit that they were allowed to join; and therefore they appreciated it very much.

The CHAIRMAN: The Deputy-Chairman informs me there are now about 100 more men waiting to come into the scheme.

MAIDSTONE GAS COMPANY.

Late Defalcations—Change in the Engineership.

The Annual General Meeting of the Company was held on the 17th inst.—Mr. GEORGE MARSHAM (the Chairman) presiding.

The accounts presented showed that the revenue in the twelve months ended the 30th of June was £58,011, and the expenditure £43,605; leaving £14,406 to go to the profit and loss account. The balance available for distribution was £13,709; and the Directors recommended the declaration of a dividend, less income-tax, at the rate of £7 5s. 6d. per cent. per annum, of which £3 12s. 9d. per cent. had been paid as an interim dividend on the 1st of March.

The CHAIRMAN, in moving the adoption of the report, referred to the satisfactory character of the accounts, and said they furnished evidence of the steady growth and stability of the undertaking. Alluding to the defalcations by the late Chief Clerk and Cashier, who had been sent to prison for twelve months for falsifying the accounts, he said the Directors did not want to shirk any responsibility; and he would only say that the report of the matter came upon him not only as a surprise but as a shock. If there was one thing of which he felt certain, it was that the Company were so safeguarded by their Act of Parliament and by their own arrangements that such a state of affairs as had happened was absolutely impossible. After careful consideration, the Directors, while continuing the services of the Statutory Auditors (which they were obliged to do by their Act, and also knowing that they would do the useful work which had been laid down for them), had also appointed Messrs. Wood, Drew, and Co. their Professional Auditors, and they would be responsible for the correctness of the accounts. Having briefly referred to the changes in the staff consequent upon the above-named matter and the retirement of Mr. Henry Smythe, the Engineer and Manager (Mr. F. A. Gulland having, as was recently recorded in the "JOURNAL," been appointed Accountant and Cashier, and Mr. Frank Livesey having succeeded Mr. Smythe), the Chairman went on to say that among contemplated improvements was a new Grafton crane, to facilitate unloading the coal from barges, and do the work both quickly and economically. During the past year, the sale of residuals had shown improvement. The tar dehydrating plant was installed, and commenced working a few months ago; and the increased return promised to justify the outlay. The receipts from ammoniacal liquor also showed a welcome improvement. The number of heating and cooking stoves was well maintained. There was an increase in the sale of gas compared with the previous year. The make per ton of coal had now reached the very satisfactory figure of 12,050 cubic feet; and the leakage was considerably lower—being only 4 per cent. of the make. The Directors had made a satisfactory contract for the purchase of coal; and, on the whole, the prospects for the coming year were decidedly hopeful.

The DEPUTY-CHAIRMAN (Dr. C. E. Hoar) seconded the motion; and it was carried unanimously.

The dividend recommended was then declared; and the retiring Directors and Auditors having been re-elected, a vote of thanks was accorded to the Chairman for presiding.

WEYMOUTH GAS COMPANY.

The report submitted at the half-yearly meeting of this Company last Thursday set forth that the statement of accounts for the half year ending June 30 was very satisfactory—showing, as it did, better returns both from gas and residual products. There was an increase of 3.73 per cent. in the gas sold; the quantity accounted for having been 60,373,900 cubic feet, which was 2,174,100 cubic feet in excess of the quantity sent out during the first half of the year 1910. The amount of profit, after meeting the fixed charge for interest on the debenture stock, admitted of the payment of the maximum dividend on the ordinary stock. The Directors therefore recommended that a dividend for the half year be declared at the rate of 5 per cent. per annum, less income-tax. Contracts for the supply of coal during the next twelve months had been entered into by the Directors at prices which were rather more favourable than those at which the purchases were made a year ago.

In moving its adoption, together with the accounts, the Chairman (Mr. J. G. Rowe, J.P.) referred to the satisfactory working during the half year, and to the continued expansion of business, as exemplified by the increase of 2,174,100 cubic feet in the quantity of gas sent out, which meant £326 added to the gas-rental. Meter and stove rental showed an advance of £49, while coke had produced £93 more; and, as a result of the erection and working of the new sulphate plant, combined with fairly good market prices, ammonia yielded £250 more. Tar, however, did not experience such a brisk demand; and this product brought in £84 less. Coal had a greater amount to its debit, partly owing to a slight advance in the price, and partly in consequence of the larger quantity used. He thought it would be interesting to the stockholders if he mentioned the fact that, though the lighting portion of the Company's business was a good asset, the quantity of gas used as a fuel for heating and cooking was also an important factor. The gas so used, being consumed largely in the daytime, tended to equalize the output over the 24 hours, instead of limiting it to a few hours, as was at one time the case. During the half year a large number of additional cookers were sent out, showing the popularity of gas in the kitchen. This popularity was brought about by the convenience, the cleanliness, and the economy attending the use of gas, as compared with the many disadvantages which the use of solid fuel entailed. The benefit of these additional cookers, together with other extensions now in progress, would be felt in succeeding half years. The stockholders were to be congratulated upon the sound and progressive character of the Company's business, which for years past had continually advanced. The prospects, too, were good.

The report and accounts were adopted; and votes of thanks were passed to the Chairman and Directors and the Engineer and Manager (Mr. D. F. Colson), the Secretary (Mr. E. Y. Wood), and the other officials.

SALISBURY GAS COMPANY.

The Annual General Meeting of this Company was recently held at the works—Mr. GEORGE FULLFORD (the Chairman) presiding.

The CHAIRMAN, in moving the adoption of the report and accounts, and the payment of the usual dividends, said the work of the Company during the past year had been satisfactory; and he could again congratulate the shareholders on the position of the business. Sales of gas had been fully maintained, and residual products had realized unusually good prices. Extensions to the Company's distributing system had been carried out where necessary, and the manufacturing plant renewed on the latest and most approved principles. Other new machinery was in course of erection. Contracts for the supply of coal over the ensuing twelve months had just been renewed on slightly more favourable terms than in 1910. The sale and hire of stoves for cooking or heating, and of outside lamps for illumination, was a growing business; but he might say that every department showed a steady increase. Some of their customers still preferred to clean incandescent burners, fit mantles, &c., for themselves; but he thought that in most cases they would do well to avail themselves of the services afforded by the Company's large staff of skilled maintenance inspectors, in the interests both of efficiency and economy. In concluding, he said the results of the year's working were in no sense spontaneous, but were brought about by continual industry and energy on the part of the staff. He would like to acknowledge the eminent services rendered by Mr. Humphrys as Manager, and by the whole of the employees. He considered that the Company were well served.

Mr. S. R. ATKINS seconded the motion, and it was carried unanimously.

The retiring Director and Auditor having been re-elected, a vote of thanks was accorded to the Chairman, Directors, and staff of the Company, for their services during the past year.

Mr. H. B. WELLS replied on behalf of the Board.

Mr. HUMPHRYS responded on behalf of the staff. After acknowledging the kindly references to their services, he remarked that he had been amused to observe, scattered throughout periodicals of the popular class—a title that indicated amusement rather than instruction—an occasional artfully worded and obviously inspired innuendo to the effect that the gas industry was practically played out, and that gas engineers had nothing to do but to peacefully await an early professional dissolution. The amusing part was the obvious attempt to deny the well-known fact that the gas industry was never more alive, there was never more initiative, more scientific and commercial skill applied to it, than at the present time. He ventured to think that the figures laid before the meeting that day, and the increase in the business that was the general experience throughout the country, supported this assertion. He could see no sign whatever of a slack time for gas engineers.

SUPPLY OF IMPURE WATER TO OSSETT.

At the Dewsbury County Court, His Honour Judge Gent recently gave judgment in a case in which the Dewsbury and Heckmondwike Water Board sued the Ossett Corporation for £50, being the balance of an account for water supplied. When the case was previously before his Honour, it was stated that defendants had been supplied with dirty water, and as a result their consumers had run a lot of water to waste. They therefore deducted £50 from the Board's account. Mr. H. Ellis, Clerk to the Board, submitted that, under the Water-Works Clauses Act, the proper course for the Corporation to have taken was to pay the account, and sue the Board for damages before two Justices. Mr. Nicholson, for the defendants, contended that, as the plaintiffs knew they were supplying water to be used by the people of Ossett, they were bound under the Sale of Foods Act to supply water fit for the purpose, which he maintained they had not done.

In giving judgment, his Honour said he thought the plaintiffs were supplying something which it was in the course of their business to supply within the meaning of section 14 of the Sale of Foods Act, and that the purchaser under the agreement must be taken to rely on the vendors' skill and judgment as to reasonably proper water being supplied. Under the agreement, the defendants had to take and pay for a minimum quantity of 2 million gallons of water a week. If it was not reasonably fit to be supplied by them to their own customers, what were they to do with it? Complaints had been made by consumers in Dewsbury, whose water was the same as that supplied to Ossett. Having regard particularly to the evidence as to the complaints from Dewsbury of the state of the water at the same time, he thought there was evidence of some deficiency in the quality of the water supplied to the defendants of which they might reasonably complain. But the evidence came far short of proving that the impurity of their water during the period specified was attributable solely to its condition as delivered to them by the plaintiffs, and not in great measure to neglect of their own mains. He thought the defendants had established a case for some small damages for breach of warranty, and he assessed them at £10, and gave judgment for the plaintiffs for £40, with costs.

ELECTRIC LIGHTING DILEMMA AT LLANGOLLEN.

The Llangollen Urban District Council held a meeting last Thursday to consider their position in regard to the Electric Light Company, in view of Counsel's opinion that the authority, by obtaining an Electric Lighting Provisional Order giving them the sole right of supply, and then transferring their powers to a Company, acted illegally. Mr. L. Lloyd John, Solicitor, who had been called in to advise the Council, as their Clerk is connected with the Company, said that up to 1905 there had been great uncertainty in electric light law. Mr. Justice Warrington, however, had decided that local authorities could not act as the Llangollen Council had done; and he (Mr. Lloyd John) was informed at the Board of Trade that many authorities found themselves in the same difficulty as the Council were. He advised that the Com-

pany should apply to the Board of Trade for a Provisional Order and the Council assist them. But the Company declined to do this; and so there were only three courses open to the Council: (1) They might acquire the undertaking and supply the town; (2) apply for an amending Order enabling them to transfer to the Company the Order they had obtained; or (3) they might permit things to go on as they were. The Council had an Order which they had not developed, and the powers to develop which they could not legally transfer. The Electric Light Company were providing light, but had no Order; the decision of Mr. Justice Warrington showing that they were not legally appointed agents of the Council. The Clerk (Mr. E. Foulkes-Jones) stated that the Council spent £200 to obtain the Order which the Electric Light Company, floated to develop it, repaid them. It was then thought that the Council could authorize their agents, the Company; but the decision was against this. A Committee will consider the matter.

FAULTY ELECTRIC INSTALLATION CAUSES FIRE.

Under the heading of "The Electrical Department," the "Ironmongers' Chronicle" for last Wednesday contained the following story.

A short time ago, a fire occurred in Montreal which aroused unusual interest. It presented certain features which suggested that it was the work of an incendiary, while at the same time there were others which seemed to negative this view. Investigation proved, however, that the fire was caused by a fault in the electric wiring which had been run into the building to supply a small motor.

Two fires broke out at the same time in different storeys of a house; the first to be noticed breaking out in the living-room on the first floor. An alarm was given, and on the firemen visiting the premises they discovered a second fire in the cellar. On the first floor the fire had broken out in a cupboard in which two coin-in-the-slot gas-meters were fixed, and the meters had been completely melted. In the cellar the situation was complicated, as, in addition to the fire, the water-mains had burst or been cut, and the fire was being slowly but surely got under by the rising flood. An investigation by the Fire Department brought nothing to light that could elucidate the mystery; and the Insurance Company concerned viewed the tenant with grave suspicion, and refused to pay the claim he made for damages.

After the Fire Commissioners had given up the matter, an electrical contractor, accompanied by a consulting engineer, examined the premises, and found that where the electric light mains had been passed over a beam, a joint or tapping had been made inside the conduit which protected the leads. This joint had been faultily made, and a surge or sudden rise in the voltage had taken place, and the joint had given way; connection being made between the live mains and the conduit, with the result that the latter fused and started the fire in the cellar. Contrary to rules or common sense, the installation had been earthed to the gas-service; and so the current travelled along the gas-pipe until the slot-meters in the cupboard were reached. These meters were of old pattern, with the parts soldered inside; and as the resistance of the meters was comparatively high, the soldering melted, and the gas escaped and was ignited by the sparking from the poor contacts. At the same time, at a point where the gas and water mains were making a poor contact in the cellar arcing took place, with the result that the water-pipe fused through, and assisted in extinguishing the fire. The attention of the Fire Commissioners was brought to the cause of the accident; and the tenant, who remained for some days under suspicion, had the satisfaction of receiving his insurance money.

COAL-TAR DISTILLATION AND PRODUCTS.

Question Paper at the Last City and Guilds Examination.

In previous issues of the "JOURNAL" [Vol. CXIV., pp. 316, 392], the questions set in "Gas Engineering" and "Gas Supply" at the last examinations of the City and Guilds of London Institute were given. "Coal-Tar Distillation" being a closely allied process, we reproduce the paper set in the Honours Grade in that subject. The number of marks obtainable is appended to each question.

1. Give a description, with sketches, of the plant you consider necessary for the distillation of 4000 tons of ordinary coal tar per year. It is to be presumed that only a primary distillation will be undertaken, and that the crude products will be sold as such. The necessary storage for raw material and products should be included [50.]
2. Describe and discuss the relative advantages and disadvantages of the various well-known methods of extracting tar acids from tar oils. [40.]
3. Describe the manufacture of pure toluene from crude naphtha or light oil. What impurities have to be eliminated, and what tests should the finished product be capable of passing? [40.]
4. How do the tar acids obtained from blast-furnace tar differ from those obtained from ordinary coal tar? [30.]
5. Describe the manufacture of any two of the following: Crystal carbolic acid, 90 per cent. anthracene, trinitrotoluene, nitrobenzene, *a*-naphthylamine, commercial pyridine. [40.]
6. How is the ammonia contained in the gas from Mond or other producers using bituminous coal recovered and converted into sulphate of ammonia? Compare the yield of ammonia obtained from producer gas with that from coal gas. What impurities would you expect to find in the sulphate from either source? [40.]
7. Describe the method of creosoting timber, giving sketches of the plant required, and a general specification for the creosote to be used. [40.]
8. State briefly what you know of any two of the following processes: (a) The direct recovery of sulphate of ammonia from coke-oven gases. (b) The Burkheiser process for manufacturing sulphate of ammonia. (c) The method of recovering benzol from coke-oven gases. (d) The bacteria method of purifying the effluent from ammonia works. (e) The Claus process of dealing with the waste gas from saturators. (f) The synthetic production of ammonia. [30.]

NOTES FROM SCOTLAND.

From Our Own Correspondent.

Saturday.

In the minutes of the Gas Committee of the Glasgow Town Council, recently before the Council, it was stated that, on the motion of Bailie Paxton, the Convener, it was agreed (1) that, in view of the continued development of the Gas Department, it be remitted to a Special Sub-Committee to consider and report on the advisability of appointing a Commercial Superintendent for all work connected with the distribution and sale of gas and gas appliances, including the workshops, show-rooms, and inspectors' and complaints' department, the Superintendent to be under the direct control of the General Manager of the Department; and (2) that, in order to increase the output of gas, and thereby materially help in the purification of the air, it be remitted to the same Special Sub-Committee to make inquiries and obtain information with the view of reporting on the advisability of the Corporation supplying gas-cookers, range-fittings, and grillers for domestic purposes free of charge. Speaking in the Council in support of this motion, Bailie Paxton said he thought it must be patent to everyone that there was room for improvement in the commercial department of their vast undertaking. The methods of forty years ago were not suitable to present-day requirements; and, in order to put matters right, he had been successful in getting the Gas Committee to agree to the appointment of a Sub-Committee to inquire and report as to the desirability of appointing a Commercial Manager under the General Manager. A Committee had also been appointed to consider the desirability of supplying free cookers to the citizens—a matter which he considered long overdue. There was no doubt that the time had arrived when very decisive steps must be taken to maintain the progress of the Department, if the facilities for development at their disposal were to be fully taken advantage of for the important work of air purification. Mr. P. G. Stewart moved that the Committee take back for reconsideration the proposal to appoint a Commercial Superintendent. He considered they were overloading the Committee with officials. By 24 votes to 23, the Council sent the proposal back.

On Monday evening, the Gas Committee of the Perth Town Council considered the subject of the introduction of stoking machinery into the gas-works. In a report by Mr. Clark, the Convener of the Committee, it was stated that the cost of the plant would not exceed £3900. The Convener also said that the claims which had been made for the new type of machine had been more than justified from time to time by the results obtained in other gas-works. Those results showed increased yields of gas, higher heating and illuminating power, more ammonia, better tar, and less naphtha. Further, the introduction of plant driven by electric power would relieve the steam-boilers, which during the past three years had been taxed to their utmost capacity. No part of the existing plant would be sacrificed in the event of electrical stokers being adopted, as all the existing plant could be incorporated in the scheme, with the exception of two hand machines, which cost £210 each when new; and these might be sold to other works. The economies to be effected by the introduction of the new plant would result in an annual saving of fully £11,000. The Committee unanimously agreed to recommend the Town Council to adopt the proposal of the Convener, and to introduce an installation of De Brouwer charging and discharging machinery, to be driven by electricity.

In a well-informed special article published in the "Glasgow Herald" on Tuesday, upon the subject of purchasing coal, the statement is made that: "The results of technical education are nowhere more noticeable than in the general change of method in the purchase of coal. For some years, a few firms have bought their coal on a scientific basis; and that the practice is rapidly extending is shown by the recent discussions before various Technical Societies. . . . To buy coal by the ton without regard to its heating value, is no more justifiable than would be the purchasing of gas by the cubic foot without regard to its lighting or heating qualities. Yet the selling price of coal, as a rule, has nothing to do with heating value, but is often determined by the size of the lumps and the absence of small coal. . . . A large firm were accustomed to buy coal of so-called different qualities to the extent of several hundred tons per week. They paid 10s. 10d. per ton for one quality in fairly large lumps, then 8s. 11d., 8s., 7s. 10d., 6s. 10d., and 5s. 10d. for various qualities of slack. The samples, taken over a considerable period, showed that for each million British thermal units the price paid was 4'2d. for the coal at 10s. 10d., 3'47d. for that at 8s., 3'6d. for that at 7s. 10d., and 2'38d. for that costing 5s. 10d. per ton. . . . The net result shown was that the cheapest coal per ton was also the best, considered from a calorific point of view. The differences in quality were merely fictitious."

CURRENT SALES OF GAS PRODUCTS.

[For Table of "Tar Products Prices," see p. 557.]

Sulphate of Ammonia.

LIVERPOOL, Aug. 26.

During the past week business in this article has again been restricted by the labour unrest; but in spite of this fact, prices have been maintained, and at the close the nearest values are £14 2s. 6d. per ton f.o.b. Hull, £14 3s. 9d. per ton f.o.b. Liverpool, and £14 6s. 3d. per ton f.o.b. Leith. For future delivery, the tone has become rather quieter, consumers not showing much disposition to operate for distant periods at the level of prices now required. Manufacturers are quoting £14 7s. 6d. to £14 10s. per ton f.o.b. at the best ports, but as yet no transactions have been reported at these figures.

Nitrate of Soda.

The market for this article continues without any change, and the quotations are repeated at 9s. 10½d. per cwt. for ordinary and 10s. for refined quality, on spot.

LONDON, Aug. 28.

Tar Products.

The markets for tar products have remained steady during the past week. Pitch continues firm, and prices have been well maintained. Benzol is very firm indeed, and the demand for prompt delivery has been very good. Solvent naphtha is quiet, but a fair amount of business has been done for forward delivery. In heavy naphtha, there is not a great demand for prompt delivery, but prices remain steady. Creosote is steady both for prompt and forward delivery; and there is likely to be an improvement in the market for this article. Carboic acid is very firm, particularly for prompt delivery, but prices remain unchanged. In naphthalene, there is a very good demand; and the inquiry for salts still continues for delivery during the winter months.

The average values during the week were: Tar, 21s. to 25s. *ex works*. Pitch, London, 40s. 6d. to 41s. 6d.; east coast, 40s. to 41s.; west coast, Manchester, 39s. 6d. to 40s. 6d., f.a.s.; Liverpool, 40s. 6d. to 41s. 6d., f.a.s.; Clyde, 40s. to 41s., f.a.s. Benzol, 90 per cent., casks included, London, 9½d. to 10½d.; North, 9½d. to 10d.; 50-90 per cent., casks included, London and North, 9½d. to 9½d. Toluol, casks included, London, 10d.; North, 9½d. to 9½d. Crude naphtha, in bulk, London, 4d. to 4½d., North, 3½d. to 3½d.; solvent naphtha, casks included, London, 11½d. to 11½d.; North, 10d. to 10½d.; heavy naphtha, casks included, London, 11½d. to 1s. 0½d.; North, 10d. to 11½d. Creosote, in bulk, London, 2½d. to 2½d.; North, 2½d. to 2½d. Heavy oils, in bulk, 2½d. Carboic acid, 60 per cent., casks included, east coast, 2s. to 2s. 3d.; west coast, 1s. 11d. to 2s. 2d. Naphthalene, £4 10s. to £8 10s.; salts, 42s. 6d. to 45s., bags included. Anthracene, "A" quality, 1½d. to 1½d. per unit, packages included and delivered.

Sulphate of Ammonia.

This article has been firm throughout the past week. The principal gas companies still quote £13 15s. usual terms. Outside London makes are £13 12s. 6d. In Hull, £14 2s. 6d. is asked; and in Liverpool, £14 2s. 6d. to £14 5s. In Leith, £14 7s. 6d. is quoted; and Middlesbrough, £14 2s. 6d.

COAL TRADE REPORTS.

Northern Coal Trade.

Since the close of the strike, there has been a strong demand for coal to make up the stocks which had been depleted. In the steam coal trade, best Northumbrians may be quoted at about 11s. 3d. per ton, with a good request, second-class steams are from 9s. 6d. to 10s., and steam smalls are 5s. to 6s. The collieries are again working well; and the output is speedily taken up. In the gas coal trade, the demand is now steadily increasing for home use; while there is a large export trade being done. Durham gas coals may be said to be about 9s. 9d. per ton f.o.b. for seconds; best Durhams are 10s. 10½d. to 11s.; and for "Wear specials," up to 11s. 6d. or 11s. 7½d. is now the current f.o.b. price. As to contracts, one or two small lots are reported as sold for shipment to some of the Mediterranean ports, at prices influenced by the freights, but similar to those quoted above as now current. The position, however, is made more difficult by the fact that over eighty vessels are in the Tyne waiting for cargoes—tonnage having accumulated during the period of the strike. Coke is firmer. Good gas coke is from 14s. to 14s. 9d. per ton f.o.b. in the Tyne.

Scotch Coal Trade.

Trade is active; the foreign demand being strong. Prices for ell and splint are advancing. For steam coal and small sorts, there is not so much inquiry. Prices may be now quoted as follows: Ell, 9s. 3d. to 10s. 6d. per ton f.o.b. Glasgow; splint, 9s. 6d. to 9s. 9d.; and steam, 9s. 3d. to 9s. 6d. The shipments for the week amounted to 329,230 tons—a decrease upon the previous week of 52,211 tons, and upon the corresponding week of 11,450 tons. For the year to date, the total shipments have been 10,210,579 tons—an increase upon the corresponding period of 121,374 tons.

Co-Partnership in the Harrow and Stanmore Gas Company.—In the report which the Directors of this Company will present at the half-yearly general meeting next Monday, they state that they propose to introduce co-partnership; admitting all the regular staff as shareholders by means of a bonus in addition to their usual salaries and wages. The progress of the Company continues. The balance on the profit and loss account is £11,229; and dividends at the rates of £10 10s., £7 7s., and £7 per cent. per annum (less income-tax) on the different classes of capital are recommended. The reserve fund is to be increased by £484; and there will be a carry-forward of £5135.

Suggested Amendment of the Conspiracy and Protection of Property Act.—The following remarks, under the heading of "Strikes and Electric Lighting," appeared in the "Builder" last Friday: "The strike of workmen at the Liverpool power station draws attention to the need of amending the Conspiracy and Protection of Property Act, 1875, to bring it into line with modern requirements. Section 4 of the Act contains special provisions relating to employees of a municipal authority or of any company or contractor upon which is imposed by Act of Parliament the duty of supplying any city, borough, town, or place with gas or water who wilfully or maliciously break contracts of service knowing or having reasonable cause to believe that the probable consequences of such breach will be to deprive the inhabitants wholly or to a great extent of their supply of gas or water. Electric light has in many towns and districts superseded gas; and the reasoning which made special provisions desirable in regard to employees engaged in supplying gas under statutory powers applies with equal force to those employed in supplying electric light under similar conditions. Yet we are not aware of any statute which extends the provisions of section 4 of the Conspiracy and Protection of Property Act to workmen engaged in the supply of this modern necessity of life—electric light. Possibly the section could be usefully extended to other statutory undertakings as well, where public interests are concerned."

Ticehurst and District Water and Gas Company.

The Directors of this Company have issued their report for the period from Oct. 23, 1909, to April 30, 1911. In the course of it they state as follows: "On Dec. 14, 1909, after several adjourned meetings, the Directors of the Company, Messrs. William Bentham Martin and Dr. William Robert White, nominees of the promoter, Mr. Edward Oxenford Preston, then of 4, Tokenhouse Yard, E.C., were requested to resign, and Messrs. C. S. Glover and W. H. Collier were elected by the shareholders in their stead. Mr. Alfred Evans, of York, has since joined the Board as representative of a large number of share and debenture holders, whose collective interests represent about £7000. The Directors have critically investigated the affairs of the Company, and done all in their power to carry on successfully the undertaking and to preserve the goodwill and assets. By judicious management and saving of expenses and other economies, instead of a loss, as shown by the ex-Directors' accounts, of about £600 per annum, a profit for the period under review has resulted of approximately £1000. Strenuous endeavours have been made to remedy matters, and the works have been thoroughly overhauled. A new gasholder has been erected at Wadhurst capable of containing 23,500 cubic feet of gas; a new gas-engine, an exhaustor, and a scrubber have been fixed; to ensure a pure quality of gas at Ticehurst, new purifiers have been provided at Wadhurst and Ticehurst, retorts replaced, and many other renewals and repairs effected. New mains have been laid, and everything done to ensure local satisfaction, a good supply of gas and water, and an increased revenue. Your Directors are pleased to report that they are enabled to pay a 3 per cent. half-year's interest on the debentures properly issued."

Glossop Gas Company.—The report of the Directors of this Company for the half year ended the 30th of June shows that the total receipts amounted to £7162, and the expenditure to £4945; leaving a balance of £2217. The amount carried over on the 31st of December last was £4954. The sum applicable for distribution is, therefore, £7171. The Directors recommend that, after payment of maximum dividends on all classes of shares, £200 be placed to the insurance fund and the balance carried forward.

Wolverhampton Gas Company.—The report of the Directors of the Wolverhampton Gas Company for the half year ended June 30 shows that the net profit is £11,116. This, added to the balance brought forward, enables them to recommend the payment of dividends at the rate of 3 per cent. upon the preference stock, 5½ per cent. upon the consolidated stock, and 3½ per cent. upon the new ordinary stock, less income-tax, and to carry the balance to the reserve fund. They further recommend that £330, interest for the half year, be placed to the credit of the reserve fund, and likewise £50, with interest, to the credit of the insurance fund; and that the balance of £10,672 be carried forward.

Wakefield Gas Company.

The ordinary half-yearly meeting of this Company was held on Monday of last week—Dr. Statter (the Chairman) presiding. In moving the adoption of the report and accounts, he said the Company had had a very satisfactory half year. There had been an increase of 4.20 per cent. in the quantity of gas sold, and of 3.15 per cent. in the quantity made, with a consequent reduction of 1.05 per cent. in leakage. During the half year, they had broken all previous records in the make and sale of gas, both in the total and per ton of coal carbonized. They had also done very well with their residual products; while the great reduction in the cost of purification, amounting to 392 per cent., showed that the new purifiers were a profitable investment. A hearty vote of thanks was accorded to the Chairman and Directors for their conduct of the business of the Company, in responding to which the Chairman moved a cordial vote of thanks to the Engineer (Mr. H. Townsend), the Secretary (Mr. R. B. Wilson), and their staffs, which was suitably acknowledged by them.

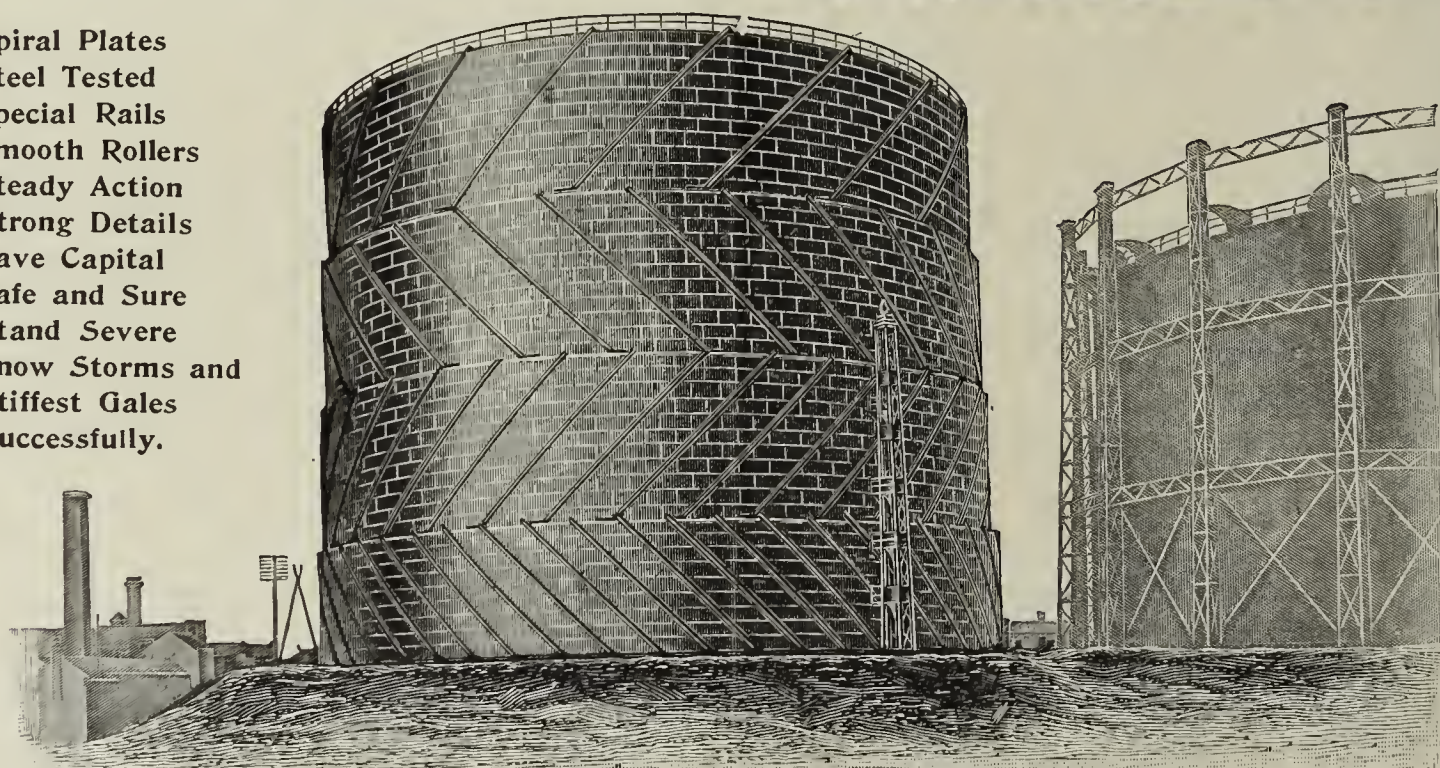
Leeds Lamplighters and their Holidays.—The lamplighters of Leeds have put forward an application for more holidays—ten days in a year, with pay, instead of six; and their claim is being pressed by the Labour members of the Corporation. The Lighting Committee, of which Mr. R. Firth is the Chairman, has had the matter under consideration, and it now stands in abeyance pending inquiries as to the conditions in other places. The average wages of the men are 27s. 6d. a week, which compares well with the pay in other towns. Mr. Firth says that if the claim for extended holidays is proceeded with, the Committee will have to consider the advisability of establishing the automatic lighting system in the city, the immediate effect of which would be to throw about 60 per cent. of the men out of work—a result which he, personally, would regret, though it would be the means of saving a good deal of money, not only in labour, but in the quantity of gas consumed.

Burst Water-Mains.—Between four and five o'clock last Tuesday morning, Parliament Street, Westminster, was flooded owing to the bursting of a large water-main opposite the Education Office. The cause of the flood was the rupture of the 30-inch trunk main which connects Battersea with Islington. About four o'clock a great volume of water began to spread rapidly over the street; and it was cut off with all promptitude. In several places the wood paving of the roadway was raised by the force of the escaping water, and the roadway in the neighbourhood of the damaged main was lifted 2 or more feet for a space of about 100 square yards. The excellence of the drainage, and the prompt manner in which the burst was dealt with by the police and the Board, prevented any serious damage being done. On the previous day, a main burst in Praed Street, Edgware Road. The roadway was flooded for a considerable distance; the wood paving being forced up for about 20 yards.

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Stiffest Gales
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From a Photograph showing the conversion of a Two-Lift Guide Framed Holder to a Four-Lift Spiral Holder of 3½ million cubic feet capacity, for the Newcastle and Gateshead Gas Company, to Plans and Specifications of W. D. GIBB, Esq., M.Inst.C.E., Engineer.

Additional Capital for the Hailsham Water Company.—At the recent half-yearly general meeting of the Hailsham Water Company, when an interim dividend of $2\frac{1}{2}$ per cent. was declared, the Directors were authorized to raise additional capital to the amount of £1000, by the issue of 4 per cent. debenture stock.

Sutton Gas Company.—The total revenue of this Company for the past half year amounted to £22,589; giving a balance of £6624. The dividend is $5\frac{1}{2}$ per cent., the maximum allowed under the sliding-scale. By the installation of new stoking machinery, a reduction in wages of £1200 has been effected. The Directors were voted 300 guineas for special services connected with the new installation.

Sale of Shares.—At a recent sale in Exeter, £150 of original stock of the Exeter Gas Company fetched £342; and nine new ordinary £10 shares (7 per cent.), £16 7s. 6d. each. Twelve ordinary £10 shares (10 per cent.) in the Torquay Gas Company realized £22 10s. apiece; while eight £5 ordinary shares (same dividend) in the Totnes and Bridgetown Gas Company were bought for £6 10s. each.

Wisbech Gas and Water Supply.—At the half-yearly general meeting of the Wisbech Lighting Company last Thursday, the Directors reported that a sum of £7801 was available for distribution; and they recommended that a sum of £937 10s., being a dividend of 3s. 9d. per certificate, free of income-tax, should be paid to the stockholders; that a further sum of £375 should be paid to them for undivided profits for past years; and that the balance remaining (£6488) should be carried forward. On the same day, the half-yearly meeting of the Water Company was held. A sum of £6577 was available for distribution; and the Directors recommended the payment of a dividend at the rate of 9 per cent. per annum, free of income-tax, on the original ordinary shares, and of 6 per cent., also free of income-tax, on the ordinary shares issued under the Order of 1884 and the Act of 1901. These dividends would amount to £2124; and the balance would be carried forward.

Fatal Gas Poisoning at Preston.—A gas-poisoning fatality occurred at Preston last Friday, by which one child was suffocated and another had to be removed to the Infirmary in such a condition that recovery was practically hopeless. The two children—Joseph Livesey (2) and Annie Livesey (8)—were left in bed shortly before six o'clock in the morning by their mother, who worked in a mill; a neighbour taking charge of them. Three hours later a smell of gas was perceived in the house, and on search being made it was found that the boy was dead and his sister unconscious. She subsequently died. The evidence given at the inquest showed that gas had been laid on to the house only a fortnight previously, and that on an examination after the tragedy a large hole was found in the gas-pipe behind a bracket in the bedroom. Alfred Lambert, a plumber, who put in the gas-fittings, said the pipe was perfect when he completed the job. Asked if he could explain how the hole came to be made in the pipe, he said it might have been caused by being struck with a piece of furniture that was being removed. A verdict of "Death from misadventure" was returned.

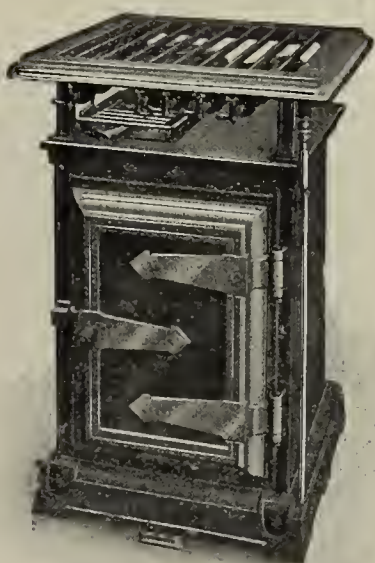
Camelford Water Supply.—At a recent meeting of the Camelford Rural District Council, the Clerk (Mr. J. Mitchell) stated that he had received sanction from the Local Government Board for the borrowing of £2356 for 30 years, and £200 for 60 years, to enable the Council to carry out a scheme for providing a water supply.

Gas-Stoves and Prepayment Meters at Huddersfield.—According to a report presented to the Gas Committee of the Huddersfield Corporation by Mr. Edward A. Harman, M.Inst.C.E., the Engineer and Manager, the number of gas consumers is 30,192, and there are now fixed in the borough 17,294 prepayment meters and 8522 cooking and heating stoves.

Taunton Gas Company.—Mr. Jonathan Barrett, the Chairman, presided at the annual meeting of this Company last Tuesday. The report showed that the quantity of gas sent out during the past twelve months was 111,428,400 cubic feet, and that the amount available for distribution was £7605. The Directors recommended dividends at the following rates: 5 per cent. on the preference stock; 9 per cent. on the consolidated "A" stock; $7\frac{1}{2}$ per cent. on the yellow shares; $7\frac{1}{2}$ per cent. on £12,900 of new ordinary stock for the year; and $7\frac{1}{2}$ per cent. on £3000 of this stock for a half year. These dividends would absorb £4292. The Chairman, in moving the adoption of the report, remarked that the Company was still on the upward grade; and he congratulated the shareholders upon the financial position in which they found themselves. Votes of thanks were passed to the Chairman, Directors, Manager (Mr. A. J. Edwards), and staff for their services; the Chairman remarking that they would have to go a long way to find Mr. Edwards' equal, as Manager or Secretary. Mr. Edwards, in reply, remarked that the Company had had a truly successful year.

Camborne Gas Company.—At the recent annual meeting of this Company, the Directors reported a balance of £1062 on the profit and loss account, and they recommended the declaration of a dividend of $5\frac{1}{2}$ per cent. per share. This was unanimously agreed to. A vote of thanks having been accorded to the Chairman (Mr. H. P. Vivian), the Consulting Engineer (Mr. S. J. Ingram), and the Secretary (Mr. W. J. Couch), Mr. Ingram made a few remarks on the progress of the Company. He said the business had grown; the gas actually sold and paid for having increased by more than 3 million cubic feet per annum for the past three years. Where they once had 5000 or 6000 cubic feet per day per retort, they now had 7000 or 8000 cubic feet. They paid great attention to the residuals; and their total receipts amounted to £1376, or more than sufficient to pay the dividend. Two years ago, for every ton of coal carbonized they had a return of 9s. 3d. for residuals; the following year it was 9s. 8½d.; last year 10s. 17d. The works had not been bled to show an artificially increased profit. They had tried to do their best by effective economy. Practically the whole of the distributing system had been overhauled, and the leakage brought down to a reasonable amount. At an extraordinary general meeting held after the annual meeting, it was resolved to increase the capital to £22,000, by the issue of 1000 shares of £5 each.

ALL THE YEAR ROUND.



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APPLICATIONS FOR LETTERS PATENT.

- 18,340.—SNOW, E. C., "Compound for making road surfaces." Aug. 14.
 18,341.—JENKINS, A. F., "Acetylene gas-generating systems." Aug. 14.
 18,344.—RUSSELL, E. L., "Valves." Aug. 14.
 18,364.—HUTTENLOCHER, F., "Preventing the escape of unburnt gas." Aug. 14.
 18,372.—ROBINSON, C. T., and PRESCOTT, S. J., "Valves." Aug. 14.
 18,385.—FITCHETT, H. W., "Detection of explosive, noxious, and other gases." Aug. 14.
 18,386.—CASES, A. L., "Liquefaction of gases." Aug. 14.
 18,393-4-5.—EDGEWORTH, K. E., "Carbonizing peat." Aug. 15.
 18,426.—M'EWEN, C. J., and GIBBONS, G. B. A., "Cooling and utilizing the heat of coke or other material discharged from retorts or ovens." Aug. 15.
 18,442.—DAVIS, H. N., and TWIGG, W. R., "Gas supply for gas-fires." Aug. 15.
 18,464.—HUMPHREY, H. A., RUSDELL, W. J., and NORTH, O. D., "Internal-combustion pumps and compressors." Aug. 15.
 18,468.—ADAIR, J., "Oil or gas engines." Aug. 16.
 18,478.—WORKMAN, R. E., and MURRAY, WORKMAN, AND CO., LTD., "Valves for compressors or pumps dealing with gaseous or fluid substances." Aug. 16.
 18,502.—ARNDT, M., "Testing air or other gases and liquids." Aug. 16.
 18,528.—NEW INVERTED INCANDESCENT GAS LAMP COMPANY, LTD., "Inverted incandescence gas-lamps." Aug. 16.
 18,533.—DAWSON, C. E., "Carburetting air." Aug. 16.
 18,562.—CHANDLER, S., and WALLER, B. B., "Rotary gas scrubbers and washers." Aug. 17.
 18,622.—BETTANY, J. T., MEADOWS, W. A., and HEATH, C., "Indicating at a distance when the light of one or more lamps is out." Aug. 18.
 18,638.—WILSON, H., "Gas fires and stoves." Aug. 18.
 18,647.—WILLIAM SUGG AND CO., LTD., and MATTOCK, W. G. H., "Incandescent gas-lamps." Aug. 18.
 18,699 to 18,702.—FLINT, L. J., "Internal combustion engines." Aug. 19.
 18,703.—PEARSON, J. S. & F. S., "Carburettors." Aug. 19.
 18,717.—CROFTON, W. B., "Internal combustion engines." Aug. 19.
 18,724.—LAMB, W. J., "Valves and valve seats." Aug. 19.
 18,726.—THOMPSON, R., "Taps or cocks." Aug. 19.

RESTORATION OF LAPSED PATENT.

An order was made on Aug. 11, 1911, restoring the letters patent granted to CARL REISS for "Improvements in and relating to regulating gas-nozzles," No. 23,554 of 1906, and bearing date Oct. 23.

APPLICATIONS FOR RESTORATION OF LAPSED PATENTS.

Notice is given that MOFFATS, LIMITED (in liquidation), have made application for the restoration of the patent granted to GEORGE CECIL DYMOND for "Improvements in incandescent gas-lamps," No. 14,553 of 1900, and bearing date Aug. 14.

Notice is given that MOFFATS, LIMITED (in liquidation), have made application for the restoration of the patent granted to WILLIAM PHILLIPS THOMPSON for "Improvements in incandescent gas-lamps," No. 23,222 of 1900, and bearing date Dec. 19.

Reductions in Price.—The Directors of the Blyth and Cowpen Gas Company have decided to reduce the price of gas 2d. per 1000 cubic feet; making it 2s. 6d. Within three years, the price has been lowered to the extent of 6d. As from the end of the current quarter, the price of gas in Waterford will be 3s. 4d. per 1000 cubic feet—a reduction of 2d.

Southport Corporation Employees' Wages.—According to a return prepared by the Town Clerk of Southport, there are 750 men employed under the Corporation, excluding clerical staffs, school teachers, police, and casual labourers. The able-bodied men receive a minimum standard wage of 24s. per week; but with length of service and good conduct, it can reach 26s. The men get five days' holiday in a year, and two days a week sick pay in temporary illness; and in case of accident full wages are paid. The workmen also benefit by a superannuation scheme, under which the allowance is equal to 3d. in the pound, or 1½ per cent. on the wages paid, multiplied by the length of service. There are at present 30 men in receipt of pension, having passed the limit of sixty-five years of age. The report has been prepared in consequence of an agitation on the part of the employees for more wages, less hours, and more holidays.

Auckland (N.Z.) Water Supply.—The "Engineer" for Dec. 30, 1910, contained an illustrated description of a dam which had been constructed on the Waitakerei River for obtaining a further water supply for the city of Auckland (N.Z.). This scheme became necessary owing to the rapid increase of the population of the city, which for some thirty years had been supplied from a source only three miles away. The Waitakerei Range is distant some 16 or 17 miles in a straight line; and it was decided to make the conduit as nearly straight as possible. There is, however, a range of hills between Auckland and the Waitakerei River, and it became necessary to drive a tunnel through these hills. It is 2320 feet long, and by it a gravity supply all the way to the city became possible. At the time the description was published, the details of the conduit in addition to the tunnel were not available. These have now been given in our contemporary, and are as follows: The tunnel measures 7 ft. by 7 ft., and beyond it there were, first of all, seven miles of 27-inch lock-bar steel pipes, and seven miles of 24-inch similar steel pipes. In addition, there were two miles of 20-inch cast-iron pipe used in connection with the work.

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Increased Capacity of the Worthing Gas-Works.—In the course of his remarks when moving the adoption of the report at the recent half-yearly meeting of the Worthing Gas Company, the Chairman (Mr. H. H. Gardner) said the Directors were on the eve of completing a new installation of purifiers of double the present capacity. They had nearly arrived at a point when they could say they were prepared to produce a maximum output of 1½ million cubic feet of gas per day, compared with the present 830,000 cubic feet. The one remaining link was the new holder, with the connecting mains. A dividend at the rate of 5½ per cent. per annum was declared.

Woking Water and Gas Company.—The report of the Directors of the Company for the half year ended June 30 states that the balance at the credit of the profit and loss account is £5322, out of which they recommend the payment of a dividend at the rate of 5 per cent. per annum for the half year, less income-tax, which will absorb £3961; leaving £1361 to be carried forward. In April the Directors decided to realize some of the investments, in order to pay off the loan from their bankers, with the result that there was a loss on realization of £955, which has been written-off against the premiums received on the perpetual debenture stock. The investments in hand at June 30 showed a further loss of £1008. These, it is stated, must be disposed of in due course; and any loss resulting from the sale of them will be charged to capital account. The Directors deem this the proper course to take—having regard to the fact that the investments in question were the result of a capital profit arising from the sale of a part of the undertaking to the Guildford Corporation.

Alderman Ridyard, the Chairman of the Stalybridge Corporation Gas Committee, stated at a recent meeting of the Town Council that, as the result of a gas exhibition held recently by Messrs. Fletcher, Russell, and Co., Limited, in one of the Corporation shops, the department had supplied about a hundred cookers, in addition to smaller gas appliances.

We have received a copy of the latest illustrated list of the "Forto" upright and inverted incandescent gas-mantles manufactured by Messrs. Isaac Eales and Co., of No. 8, Whittall Street, Birmingham. It is claimed for these mantles that by the use of the best ramie silk in their composition extra strength is obtained.

The Manchester Municipal Officers' Guild has now a membership of between 1400 and 1500. The objects of the Guild, which has no connection with the Municipal Employees' Association, are to promote a knowledge of the principles of local government, and to provide means of social intercourse and further the general interests of its members. Mr. Thomas Hudson, the Town Clerk of Manchester, is this year's President of the Guild.

The fusing of an electric wire was responsible for an outbreak of fire on the premises of Mr. C. G. Child, jeweller, of High Street, Birmingham, early last Wednesday morning. When the brigade arrived on the scene, they found Mr. Child asleep in a room on the top floor. Although the room was full of smoke, its occupant was entirely ignorant of his danger until he was aroused by one of the men. The fire was extinguished after half-an-hour's work.

TAR PRODUCTS PRICES.

Representative manufacturers give the following as fair current values for the week ending Aug. 26. Prices are net, and they include the usual packages and delivery f.o.b., f.a.s., or f.o.r., as customary.

Article.	Basis.	London.	North-East Coast.	East Coast, Yorks.	West Coast.		Glasgow.
					Liverpool.	Manchester.	
Tar, crude	per ton	—	20/- 25/-	21/- 25/-	—	21/- 24/-	—
Pitch	"	42/6	39/- 40/-	40/-	40/-	39/- 39/6	40/-
Benzol, 90%	per gallon	-11½	-9½ -10	-9	-9½	-9½	-10
Benzol, 50-90%	"	—	-10	-9½	—	-9	—
Toluol, 90%	"	—	-10	-10	-10	-10	-10
Crude naphtha, 30%	"	—	-4½	-4	-3½	-3½	—
Light oil, 50%	"	—	-3½	-3½ -4	-3½	-3½	—
Solvent naphtha, 90-160	"	—	-10 -10½	-10	-10	-10	-11
Heavy naphtha, 90-190	"	—	-11	-11½	-11½	-11½	-11
Creosote in bulk	"	-2½	-2½	-2	-2½	-2½ 2 3/16	-1 7/8
Heavy oils.	"	—	-2½ -2½	-2½	-2½	-2½	-2½
Carbolic acid, 60's.	"	2/4	2/1	2/3	—	—	2/3
Naphthalene, crude drained salts	per ton	—	43/9	41/3	47/6	47/6 50/-	—
" pressed.	"	—	60/-	63/-	60/-	60/- 72/6	—
" whizzed.	"	—	—	—	70/- 72/6	65/- 75/-	60/-
Anthracene	per unit	-2	-1½	-1½	-1½	-1½	—

GAS COMPANIES' STOCK AND SHARE LIST.

Referred to on p. 531.

Issue.	Share.	When ex-Dividend.	Dividend or Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.	Issue.	Share.	When ex-Dividend.	Dividend or Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.
£			p.c.				£ s. d.	£			p.c.				£ s. d.
1,551,868	Stk.	Apl. 12	5	Alliance & Dublin Ord.	81-84	-1	5 19 1	4,940,000	Stk.	May 12	9	Imperial Continental	180-183	..	4 18 4
374,000	Stk.	July 14	4	Do. 4 p.c. Deb.	93-95	..	4 4 3	1,235,000	Stk.	Aug. 16	3½	Do. 3½ p.c. Deb. Red.	90-92*	..	3 16 1
250,000	5	May 12	7	Bombay, Ltd.	64-6½	..	5 3 8	561,000	Stk.	Aug. 16	10	Liverpool United A.	210-212*	..	4 14 4
50,000	10	Feb. 24	15	Bourne-) 10 p.c..	29-30	..	5 0 0	718,100	"	"	7	Do. B.	160-162*	..	4 6 5
311,810	10	"	7	mouth Gas > B 7 p.c.	16½-17	..	4 2 4	306,083	"	June 30	4	Do. Deb. Stk.	102-104	..	3 16 11
75,000	10	"	6	and Water) Pref. 6 p.c.	14½-15	..	4 0 0	75,000	5	June 15	6	Malta & Mediterranean	4½-5	..	6 0 0
350,000	Stk.	Aug. 16	13	Brentford Consolidated	256-261*	..	4 19 7	560,000	100	Apl. 1	5	Met. of } 5 p.c. Deb.	100-102	..	4 18 0
330,000	"	"	10	Do. New	198-203*	..	4 18 6	250,000	100	"	4½	Melbourne } 4½ p.c. Deb.	100-102	..	4 8 3
50,000	"	"	5	Do. 5 p.c. Pref.	120-122*	..	4 2 0	541,920	20	May 31	3½	Monte Video, Ltd.	123-134	..	5 5 8
206,250	"	June 15	4	Do. 4 p.c. Deb.	97-99	..	4 0 10	1,775,892	Stk.	July 28	4½	Newcastle & Gateshead Con.	103-105	+1	4 3 4
220,000	Stk.	Mar. 10	11	Brighton & Hove Orig.	219-224	+3	4 18 3	529,705	Stk.	June 30	3½	Do. 3½ p.c. Deb.	87-89	..	3 18 8
246,320	"	"	8	Do. A Ord. Stk.	159-162	+2	4 18 9	55,940	10	Mar. 10	7	North Middlesex 7 p.c.	15-16	..	4 7 6
490,000	20	Apl. 12	11½	British	45-46	+½	5 3 3	300,000	Stk.	Apl. 27	8	Oriental, Ltd.	138-140	..	5 14 4
120,000	Stk.	June 30	4	Do. 4 p.c. Deb. Stk.	94-96	..	4 3 4	60,000	5	Apl. 12	8	Ottoman, Ltd.	63-74	..	5 10 4
109,000	"	Aug. 16	6	Bromley, A 5 p.c.	113-115*	..	5 4 4	31,900	53	Aug. 16	13	Portsea Island A	132-136*	..	5 1 0
165,700	"	"	4½	Do. B 3½ p.c.	85-87*	..	5 3 6	100,000	50	"	12	Do. C	117-122*	..	4 18 4
82,278	"	"	5½	Do. C 5 p.c.	103-105*	..	5 4 9	398,490	5	May 31	8	Primitiva Ord.	74-7½	..	5 6 8
55,000	"	June 30	3½	Do. 3½ p.c. Deb.	82-84	..	4 3 4	796,980	5	June 30	5	Do. 5 p.c. Pref.	54-5½	..	4 10 11
250,000	Stk.	"	4	Buenos Ayres 4 p.c. Deb.	95-97	..	4 2 6	488,900	100	June 1	4	Do. 4 p.c. Deb.	97-99	..	4 0 10
100,000	10	"	—	Cape Town & Dis., Ltd.	2-3	..	—	312,650	Stk.	June 30	4	River Plate 4 p.c. Deb.	95-97	..	4 2 6
100,000	10	"	—	Do. 4½ p.c. Pref.	4-5	..	—	250,000	10	Mar. 24	9	San Paulo, Ltd.	213-22½	..	4 0 0
100,000	Stk.	June 30	4½	Do. 4½ p.c. Deb. Stk.	80-83	..	5 8 5	115,000	10	"	6	Do. 6 p.c. Pref.	12-12½	..	4 16 0
157,150	Stk.	Aug. 16	5	Cbeater 5 p.c. Ord.	107-109*	..	4 11 9	125,000	50	July 1	5	Do. 5 p.c. Deb.	493-504	+2	4 19 0
1,513,280	Stk.	"	5/9/4	Commercial 4 p.c. Stk.	111½-113½*	..	4 16 1	135,000	Stk.	Mar. 24	10	Sbeffield A.	239-241	..	4 3 0
560,000	"	"	5½	Do. 3½ p.c. do.	105½-107½*	..	4 19 3	209,984	"	"	10	Do. B	238-240	+1	4 3 4
475,000	"	June 15	3	Do. 3 p.c. Deb. Stk.	76-78	..	3 16 11	523,500	"	"	10	Do. C	238-240	+1	4 3 4
800,000	Stk.	May 31	4	Continental Union, Ltd.	88-92	-½	4 7 0	70,000	10	June 15	7	South African	84-94	..	7 7 4
200,000	"	"	7	Do. 7 p.c. Pref.	135-137	..	5 2 2	6,429,895	Stk.	Aug. 16	5/9/4	South Met., 4 p.c. Ord.	116½-118½*	..	4 12 2
492,270	Stk.	"	5½	Derby Con. Stk.	122-124	..	4 8 9	1,895,445	"	July 14	3	Do. 3 p.c. Deb.	78½-80½	..	3 14 6
55,000	"	"	4	Do. Deb. Stk.	104-105	..	3 16 2	209,820	Stk.	Aug. 16	8½	South Shields Con. Stk.	150-152*	..	5 11 10
840,150	10	July 28	10	European, Ltd.	183-19½	..	5 2 7	605,000	Stk.	"	5½	S'th Suburb'n Ord. 5 p.c.	117½-119½*	..	4 14 9
16,160,600	Stk.	Aug. 16	4/14/8	Gas-) 4 p.c. Ord.	106-107*	+½	4 8 5	60,000	"	"	5	Do. 5 p.c. Pref.	115½-117½*	..	4 5 1
2,600,000	"	"	3½	light) 3½ p.c. max.	83-85*	..	4 2 4	117,058	"	July 14	5	Do. 5 p.c. Deb. Stk.	121-123	..	4 1 4
4,062,235	"	"	4	and) 4 p.c. Con. Pref.	101-103*	..	3 17 8	502,310	Stk.	May 12	5	Southampton Ord.	108-110	..	4 10 11
4,531,705	"	June 15	3	Coke) 3 p.c. Con. Deb.	78½-80½	..	3 14 6	120,000	Stk.	Aug. 16	7½	Tottenham) A 5 p.c.	144-147*	..	4 17 0
258,740	Stk.	Mar. 10	5	Hastings & St. L. 3½ p.c.	95-97	..	5 3 1	483,940	"	"	5½	and) B 3½ p.c.	114-116*	..	4 17 0
82,500	"	"	6½	Do. 5 p.c.	—	..	—	149,470	"	June 15	4	Edmonton) 4 p.c. Deb.	96-98	..	4 1 8
70,000	10	Apl. 27	11	Hongkong & China, Ltd.	17½-18	..	6 2 2	182,380	10	June 15	8	Tuscan, Ltd.	83-94	..	8 13 0
131,000	Stk.	Mar. 10	7½	Ilford A and C	147-150	..	4 18 4	149,900	10	July 1	5	Do. 5 p.c. Deb. Red.	96-98	..	5 2 0
65,780	"	"	6½	Do. B	119-122	..	4 16 3	236,476	Stk.	Aug. 16	5	Tynemouth, 5 p.c. max.	113-115*	..	4 6 11
65,500	"	June 30	4	Do. 4 p.c. Deb.	94-96	..	4 3 4	255,636	Stk.	Feb. 24	6½	Wands-) B 3½ p.c.	144-147	+1½	4 13 6
200,242	Stk.	Mar. 10	6	Lea Bridge Ord. 5 p.c.	120-122	..	4 18 4	85,766	"	June 30	3	worth) 3 p.c. Deb. Stk.	71-73	..	4 2 2

Prices marked * are "Ex. div." † Next dividend will be at this rate.

The annual abstract of accounts for the borough of Dukinfield, issued by the Borough Accountant, shows that the gas-works loans amount to £30,180; and the unredeemed annuities are estimated at £17,112. The profit for the past financial year was £4812; and the assets are put down at £49,374.

The "Surrey Mirror" last Friday contained an article pleading for funds to support the Reigate and Redhill Hospital. It is mentioned therein that the Manager of the Redhill Gas-Works (Mr. W. H. Bennett) had put the matter before the employees of the Company, and that nearly the whole of the staff had volunteered to contribute 1d. per week. This, it is stated, will represent a very appreciable addition to the income of the institution.

We learn that the firm of Messrs. Julius Norden, Limited, has been amalgamated with the General Incandescent Company, Limited, and that the combined businesses will in future be carried on at 45, Farringdon Street, E.C., under the title of "Nordens and General Incandescent Company, Limited," the Joint Managing Directors being Messrs. W. J. Moore and A. J. Davis, late Managers and Directors of the General Incandescent Company, Limited. New departments for the sale of lamps, burners, glass, and accessories are being opened at the address named as well as at 52, Great Eastern Street, E.C. A complete illustrated catalogue has just been issued to gas companies and lighting authorities, a copy of which we have received.

Mr. Charles E. Botley, M.Inst.C.E., the Engineer and General Manager of the Hastings and St. Leonards Gas Company, has issued a little pamphlet, bearing the title of "Dare Lucem—Fact v. Fiction," in which he sets the "facts" in connection with gas lighting against the "fiction" disseminated by its opponents. He shows that it is possible, under local conditions, to guarantee that gas is not only very much cheaper, but more hygienic than electricity. However, he points out that the Gas Company take note of any progress made in electrical inventions, and all new lamps are tried; so that any consumer can, if he wishes, obtain the "facts" relating to them on application to the Electrical Engineer (Mr. Charles F. Botley, Assoc.M.Inst.C.E.).

In the course of an interview with a representative of the "Berkshire Chronicle," the Engineer and Manager of the Reading Gas Company (Mr. D. H. Helps) said it was a most interesting fact, in connection with the recent long spell of hot weather, that the Company had had bigger increases in the consumption of gas than he had ever experienced since he had been in Reading. This meant that householders were using less coal during the summer time than formerly, and were burning gas to a much larger extent for cooking purposes and for heating water.

WANTED, FOR SALE, CONTRACTS, &c., ADVERTISEMENTS IN THIS WEEK'S "JOURNAL."

Appointments Vacant.

FOREMAN (TAR-WORKS). No. 5438.
SENIOR CLERK. East Grinstead Gas and Water Company.
COLLECTOR AND ASSISTANT CLERK. East Grinstead Gas and Water Company.
INSPECTOR. Weston-super-Mare Gas Company.

Appointment Wanted.

MANAGER. Z. T. 254, c/o Deacons.

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STOKE-ON-TRENT GAS-WORKS. Tenders by Sept. 14.

NOTICES TO CORRESPONDENTS, ADVERTISERS, AND SUBSCRIBERS.

No notice can be taken of anonymous communications. Whatever is intended for insertion in the "JOURNAL" must be authenticated by the name and address of the writer; not necessarily for publication, but as a proof of good faith.

COPY FOR ADVERTISEMENTS for the "JOURNAL" should be received at the Office NOT LATER than TWELVE O'CLOCK NOON ON MONDAY, to ensure insertion in the following day's issue.

Orders for Alterations in, or stoppages of, PERMANENT ADVERTISEMENTS should be received by the FIRST POST on SATURDAY.

Wanted, For Sale, and Tender Advertisements, Six Lines and under, 3s.; each additional Line, 6d.

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See Illustrated Advertisement, Aug. 1, p. 325.

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facturers, Hapton, near Accrington, are MAKERS of Special SULPHURIC ACID, for Sulphate of Ammonia Making. Highest percentage of Sulphate of Ammonia obtained from the use of this Vitriol, which has now been used for upwards of 50 years. References given to Gas Companies.

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E. ALSTON HEAD,
Secretary.

12, Railway Approach,
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E. B. SHARPLEY,
Town Clerk.

Stoke-on-Trent,
Aug. 24, 1911.

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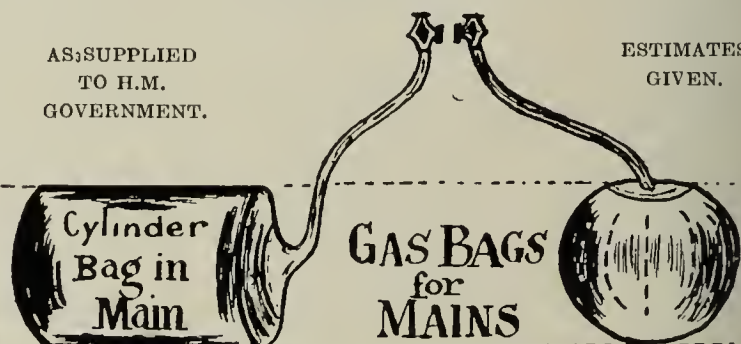
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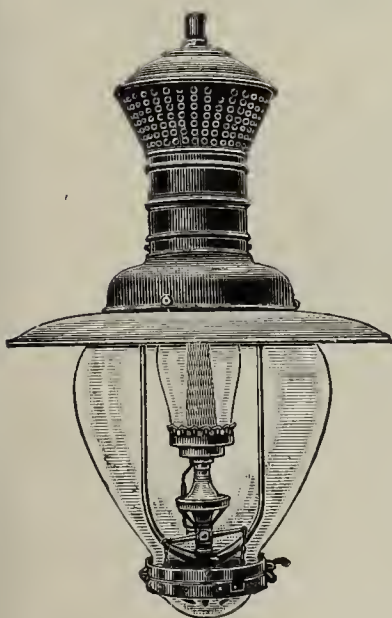
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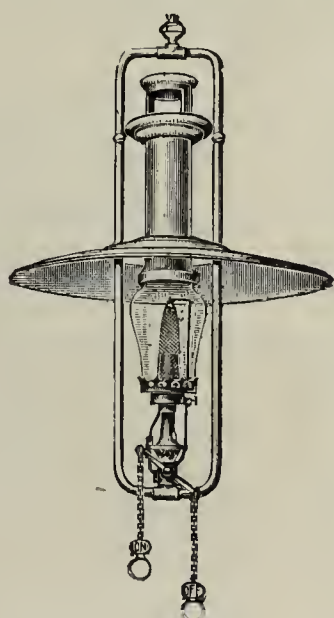
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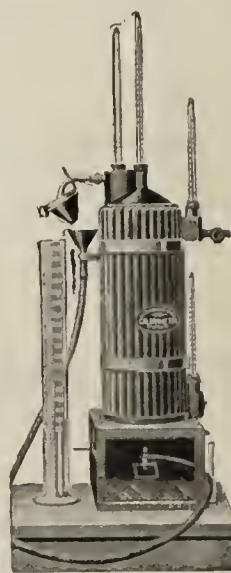
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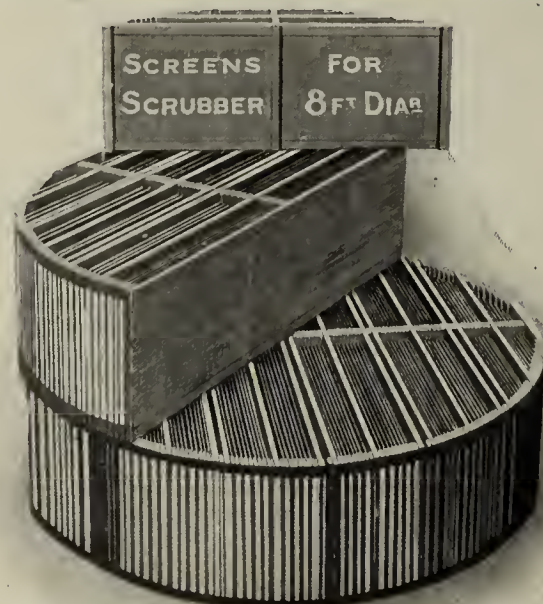
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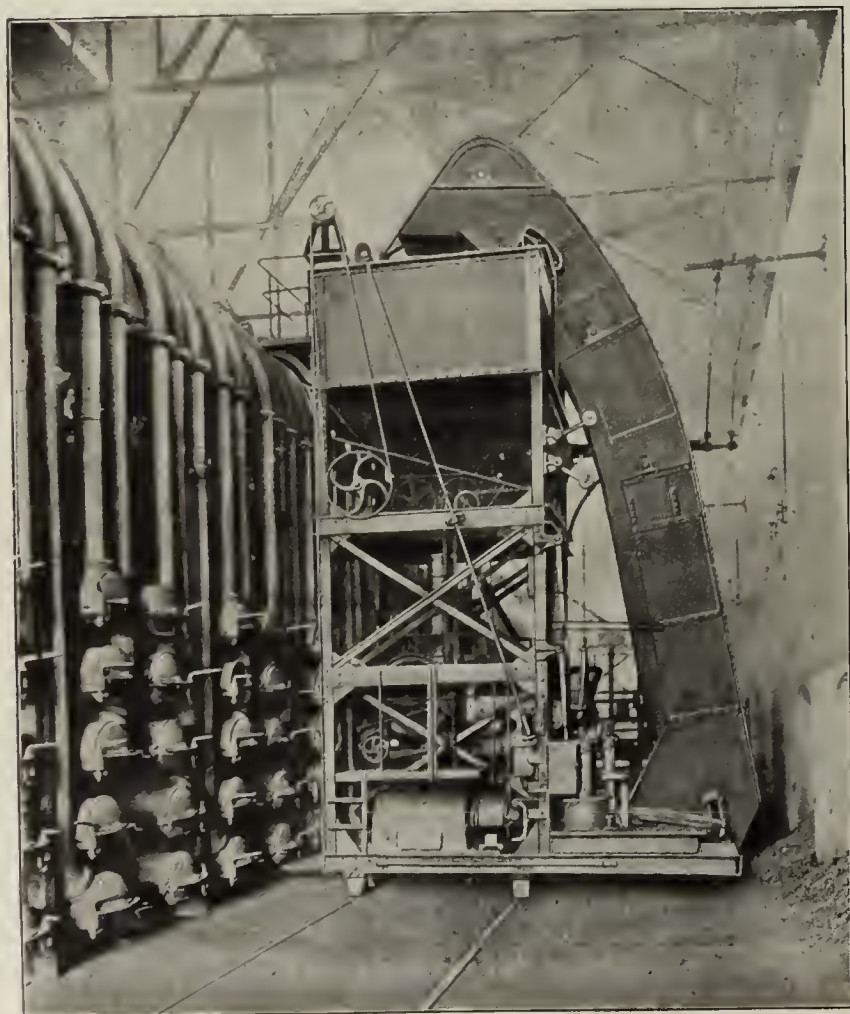
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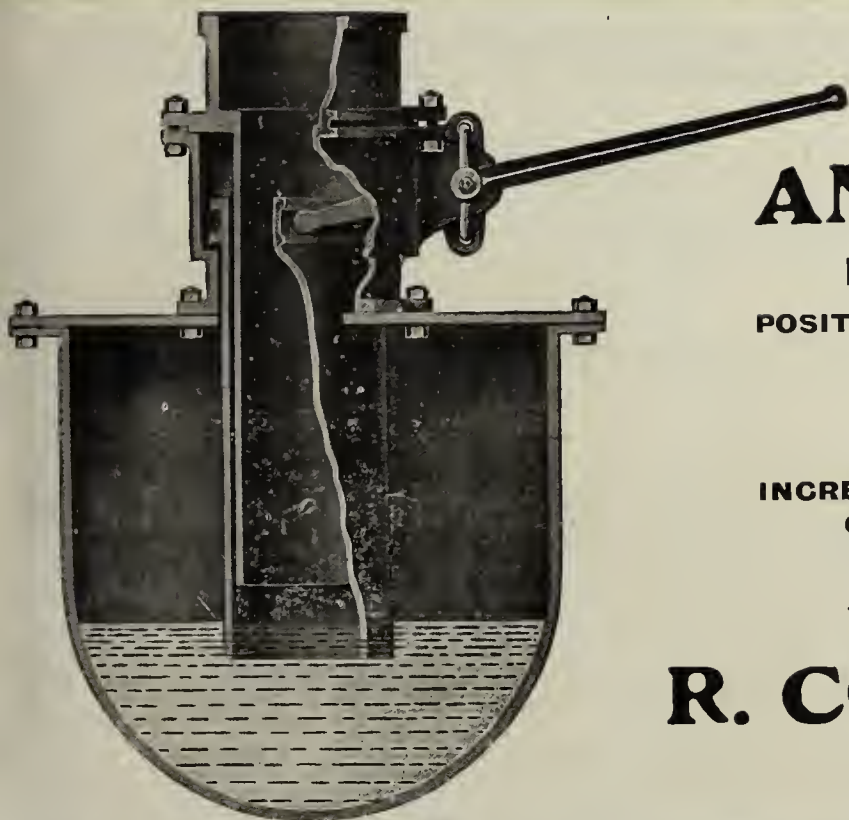
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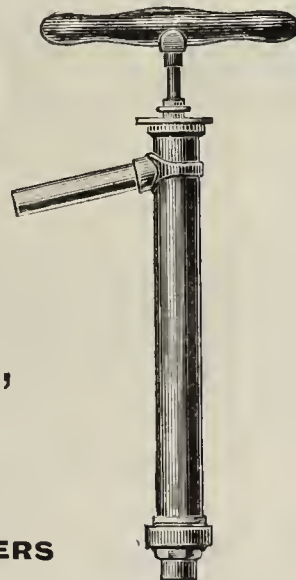
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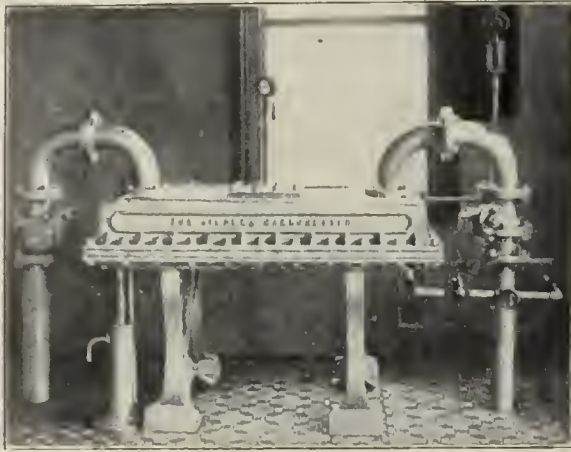
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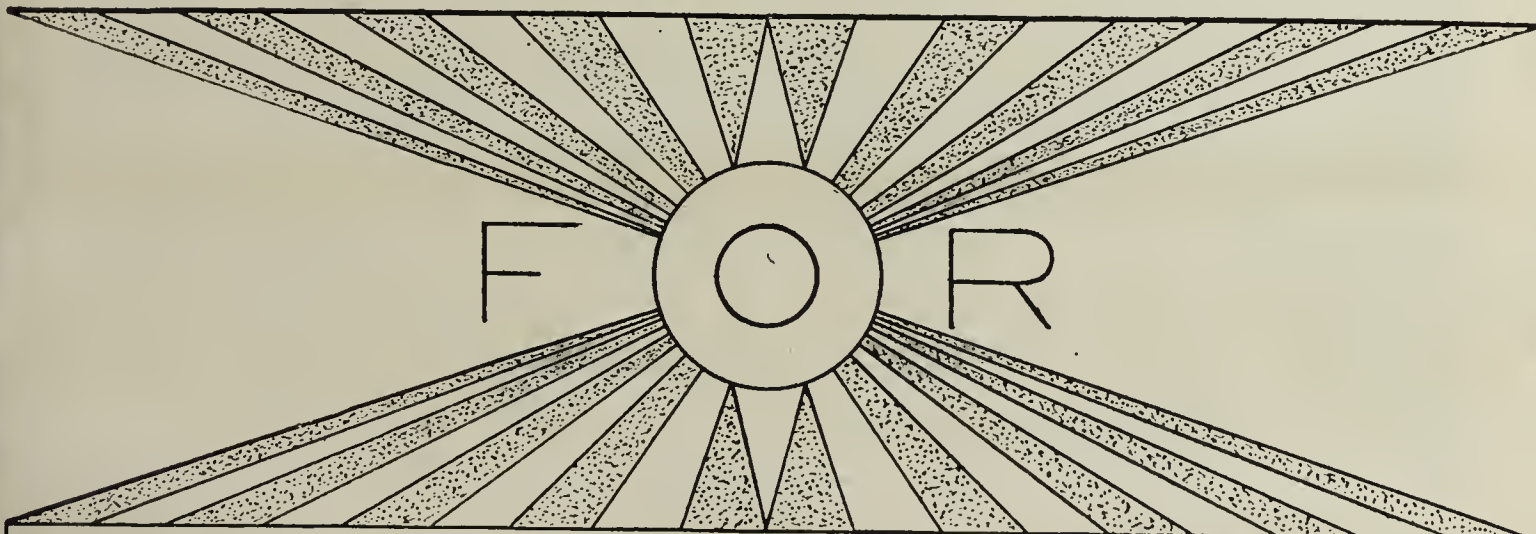
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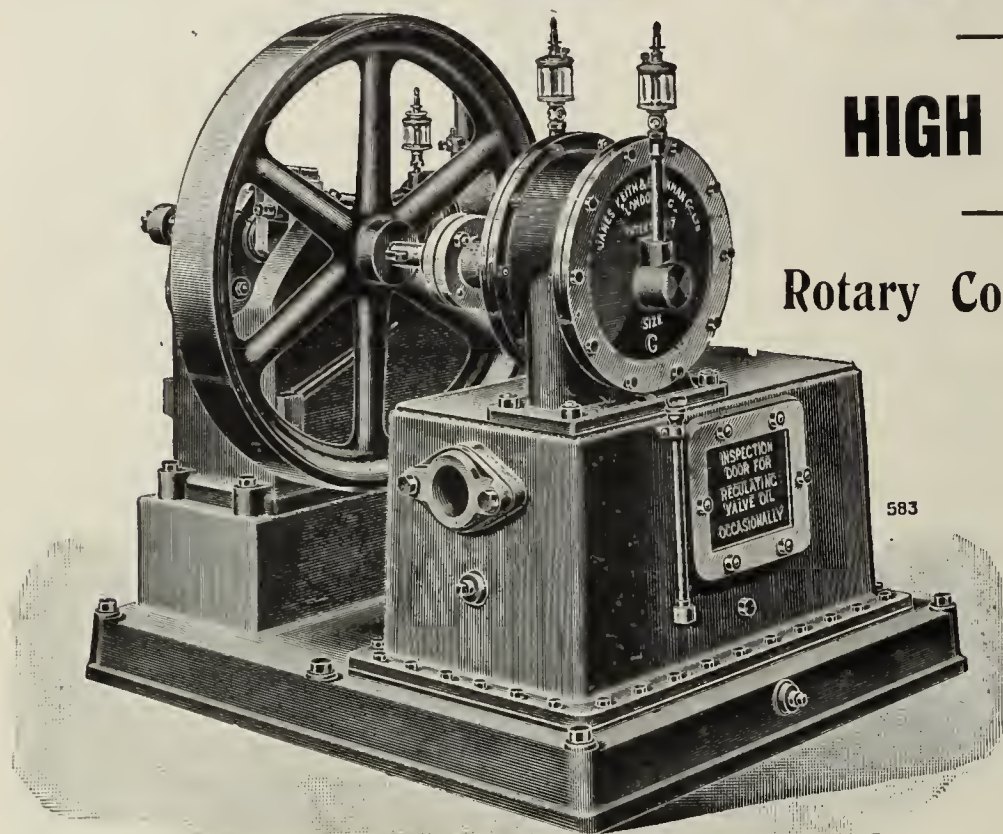


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VOL. CXV. No. 2521.]

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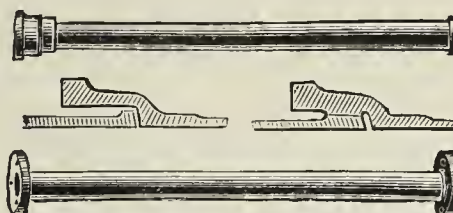
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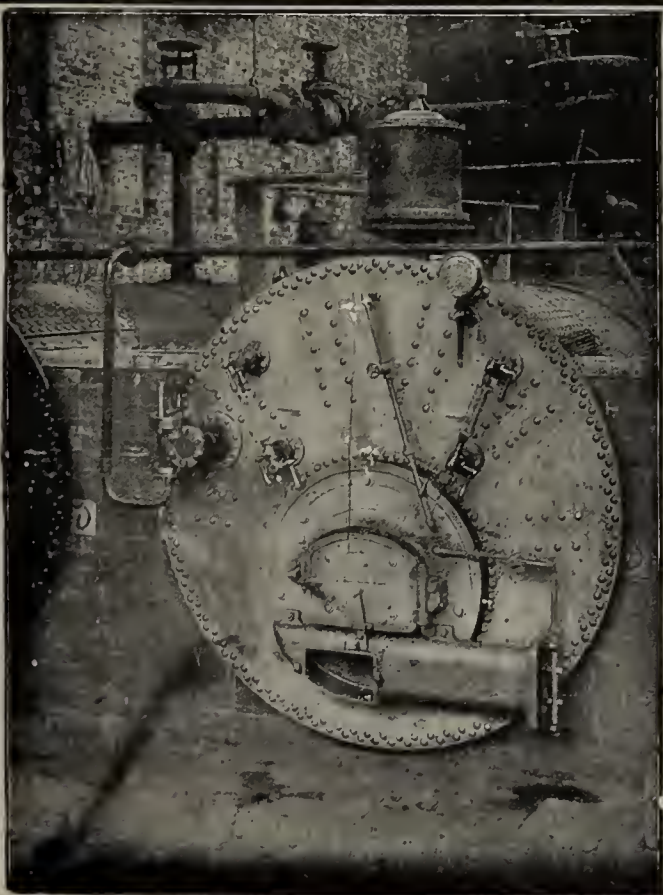
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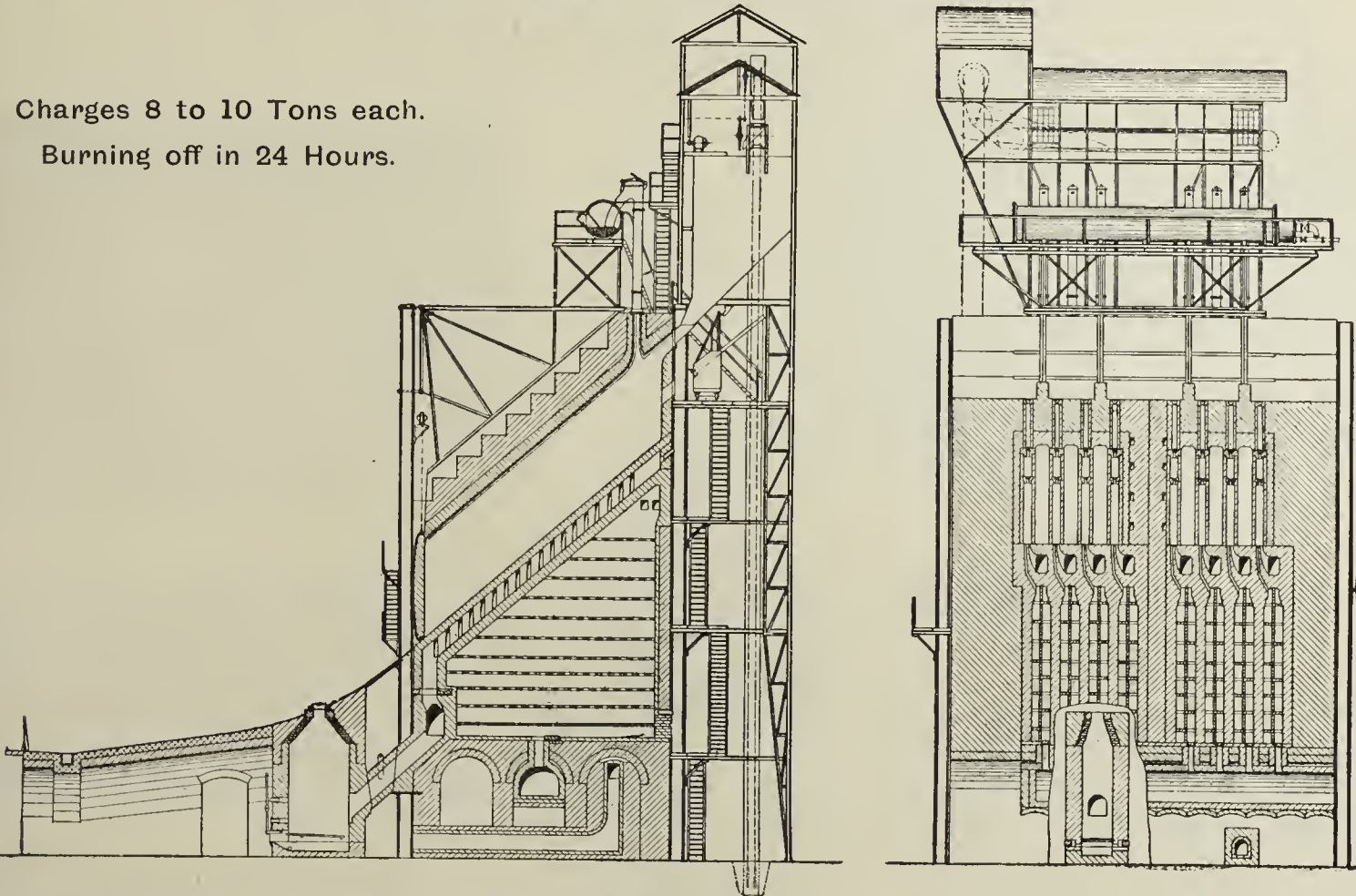
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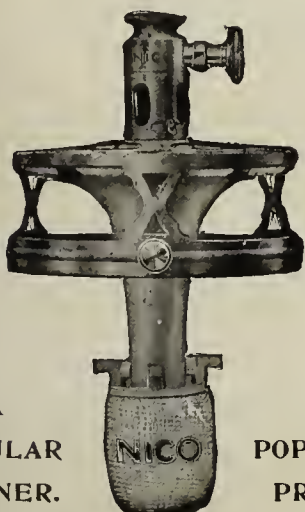
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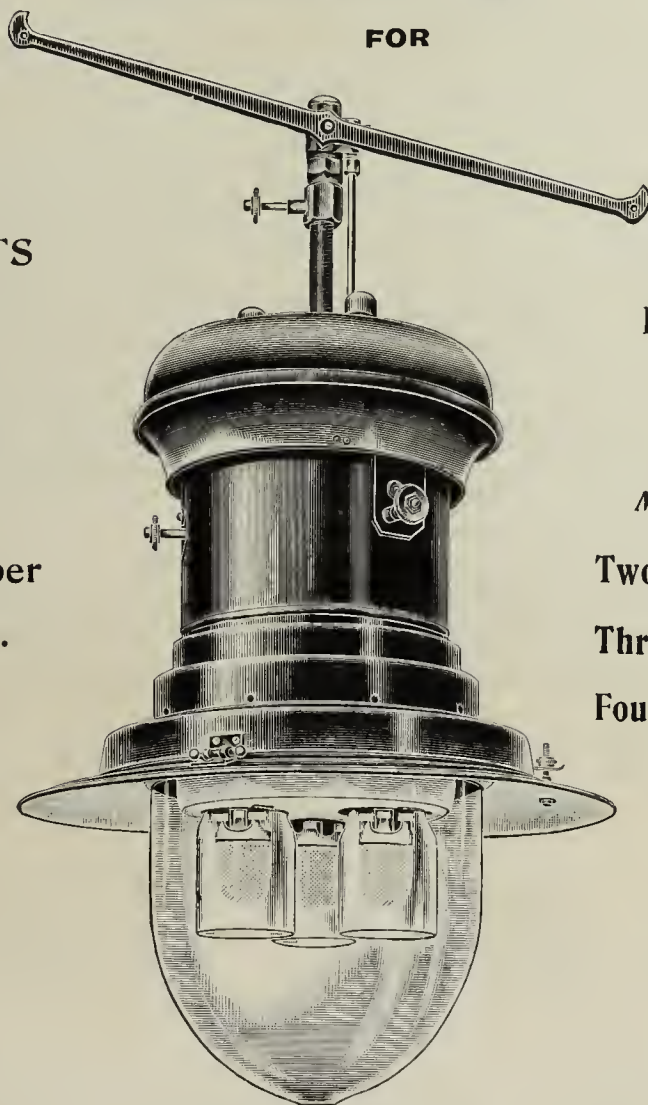
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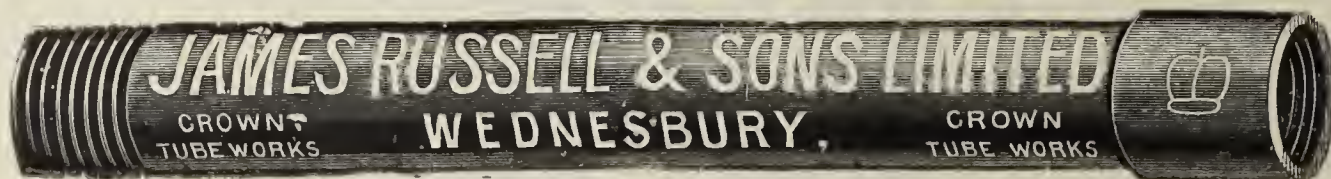
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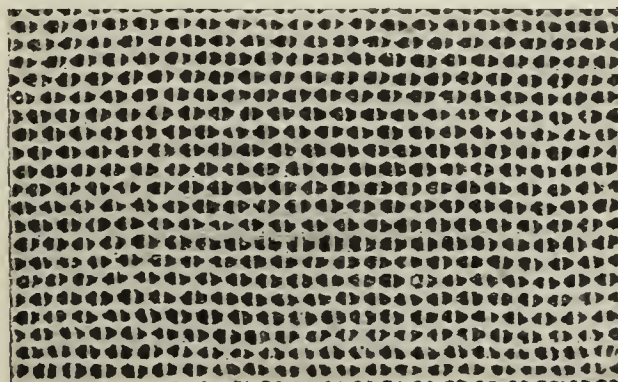
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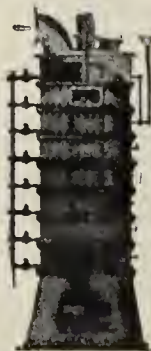


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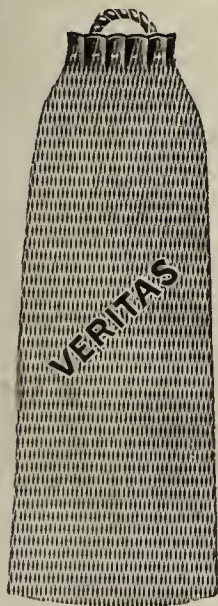
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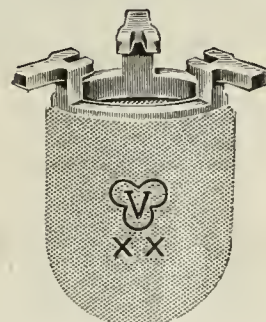


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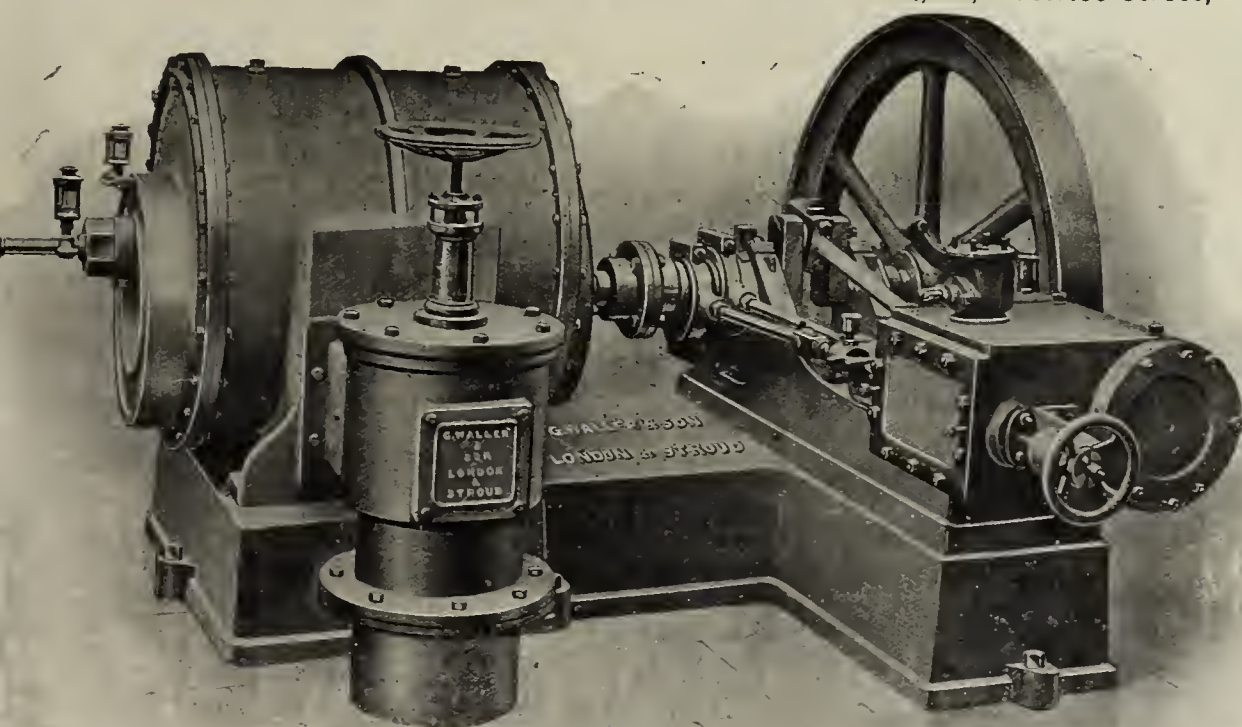
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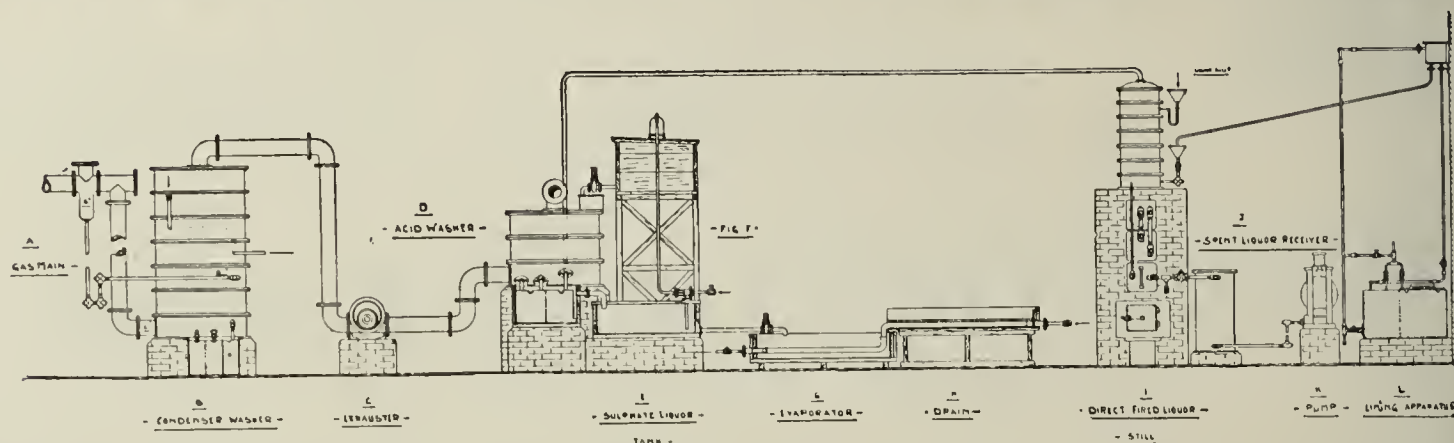
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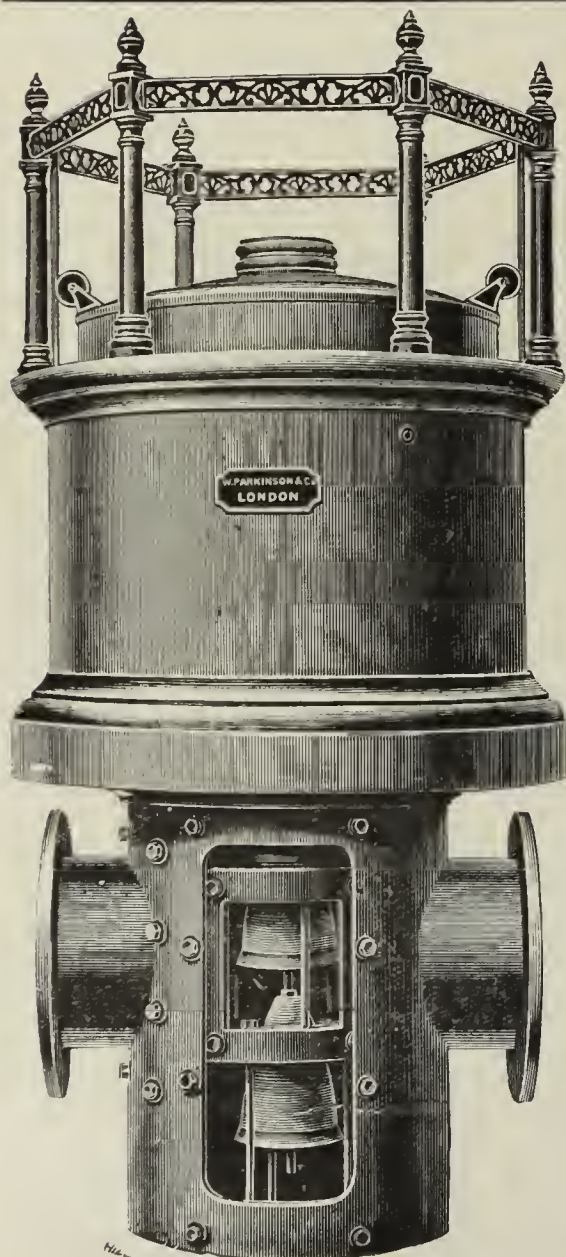
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EDITORIAL NOTES—GAS, &c.

Gas Legislation in the Present Session.

It is a strange fact that the Government Departments in their reports upon Gas Bills should evince a proneness to meddle with matters that can have little concern for them. In the present session, in connection with Gas Bills and Provisional Orders, both the Local Government Board and the Home Office (as indicated in the opening paragraph of last week's article), while admitting the existence of precedent, have pointed to the appearance of stand-by clauses in gas measures as unusual. It may be quite true that they are so; but we are hoping to see them, as usual, in Gas Bills as they are in Electricity Supply Bills and Orders. The Departmental Authorities, however, consistently upon each occasion made their point. And there it ended; for not in any single instance do we remember a Committee this session ruling-out from a Gas Bill any application for stand-by clauses. The matter was pointedly raised more than once before the Unopposed Bills Committee; but Mr. Emmott and his colleagues saw no reason whatever for disallowing the clauses. We see every reason for granting them in one shape or another, and to the fullest possible extent, for exercise should occasion require in obtaining some measure of return for capital and other expenses incurred in connection with such "stand-bys." We have several times discussed this matter, and pointed to the changes that have occurred in the circumstances of gas supply since the compulsory service conditions were imposed in the Gas-Works Clauses Act of 1871. The stand-by clause is a change necessitated by changes, which have brought the uncontrolled producer gas and suction and pressure gas plants and oil-engines, as well as electricity supply, operating against town gas. This being so, we believe in stand-by clauses (to be used when protection is needed) that will comprehend both private gas plants and electricity. The Heywood Act of a few sessions ago gave us the original clause that embraced both comprehensive forms of competition—private gas plants and electricity; and we cannot see any good reason why, in the Swansea Bill this session, there should have been any modification of the clause, so as to eliminate from its operation, domestic consumers who use electricity and keep gas in a secondary position as a stand-by. Heywood has shown how to deal with small consumers by making a tariff of stand-by charges according to size of meter, which charges are not leviable if the consumption is equal to the proposed charge in a quarter. We cannot see any reason for having deprived the Swansea Gas Company of a power, so easily amenable to regulation, that is fair to all concerned. This a matter that was discussed in our "Correspondence" columns on May 30 last (p. 609).

For some years past, county councils have been doing their level-best to bring gas undertakings under new obligations in regard to the subterranean usage of the roadway; and their aims have been peculiarly one-sided. In short, they have wanted autocratic powers of command and supervision, with the gas undertakings doing all the paying, even to the expense of the damage sustained by their property beneath the road surfaces through the extreme operations of the councils. This session has been particularly marked by excessive zeal and demand on the part of county councils in this respect; and there has been no secret made of the fact that every additional twist of the screw that can be obtained in connection with one gas company will be used to secure similar application in the case of others. There must be strenuous resistance against all this; and for what they have done in the current session, thanks are due from the gas industry at large especially to the Tamworth, the Enfield, and the Uxbridge Companies. They made successful stands against the proposed oppression and imposition of, variously, the Staffordshire, Warwickshire, Middlesex, and Hertfordshire Councils. It is a long tale as to what the Councils required; but it will all be

found set out in "Notes from Westminster" as published from time to time during the session, as well as in our parliamentary reports, in an article by Mr. Arthur Valon on special road clauses in Gas Acts in the "JOURNAL" for July 4, and in one on the depth of gas-pipes by Mr. W. R. Herring in our issue for March 28. While there was some difference in form, there was not in substance between the spacious demands of the Councils. They were all extraordinary from beginning to end. The Hertfordshire Council were the most persistent with their application for a steam-roller clause to exempt them from all liability for damage occasioned to any gas-pipes by rollers that did not exceed 15 tons in weight. We think their ideas at one time went as high as 20 tons. And, if there was one council more than another who tried to score off a gas company, no matter in what way, was the Middlesex Council in the case of the Enfield Company. Parliament, as said in last week's article, can be just as well as capricious, or rather inconsistent; and Parliament was just in these cases.

There are several minor matters of interest, which will come up for notice when we have the prints of the Acts before us for review. One noteworthy change has been made in the form of the special purposes fund clause as applied to the Gaslight and Coke Company. It was really brought about by their agreement with the London County Council; and Parliament endorsed it. Instead of 1 per cent. appropriations, and a limit to accumulation of a sum not exceeding one-tenth of the capital, it was agreed that the 1 per cent. and the one-tenth should be halved; while the carry-forward should be unlimited. But this must not be taken by anyone in the light of a precedent. The arrangement was only allowed under the special circumstances of the Gaslight and Coke Company, with their enormous capital, large requirement in the total for dividend, and extraordinary dealings in point of magnitude. One question discussed in relation to this change was: Should loan capital be included as capital in calculating appropriations and total accumulation for the purposes of the fund? Speaker's Counsel (Mr. Ernest Moon, K.C.) thinks lawyers would say it should not be; Mr. Corbet Woodall is of the contrary opinion. We agree with the latter, so long as the loans have existence and some representation in assets. But common-sense and the law do not always harmonize.

A Limited View.

ONCE more attention has been called to the important subject of the prospective exhaustion of our coal supply. Once more warning has been uttered as to the misery and sufferings of posterity through the prodigality of the present. Once more appeal has been made, by a voice to which eminence in scientific attainments and benefit to the world impel us to listen with respect, for a greater consideration for the future, and for a compulsory economy and the ending of the sacrifice of energy to crude and traditional usage. The warner and the appellant this time is Sir William Ramsay, the President of the British Association; and warning and appeal come to us through the channel of his address to the *savants* assembled from all parts of the universe at Portsmouth last week. So unlike Sir William (who is optimistic in most things, who looks upon all that is around him—the very atmosphere that we breathe—as an inexhaustible mine from which wealth by the aid of science is to be drawn) is his pessimism in this matter. He seems to have been fully persuaded that there are evil days in store for this country if something is not done, and that very quickly, to conserve our stores of energy. But as a man of science, as one who is ever searching the unknown for something new, and for something that will yield tangible benefit to the human race, we think that here he is found taking the narrow view, and withholding from progress and discovery any likelihood of further substantially contributing to the saving of the country some 175 years hence from the danger that in his large mind he pictures besetting it. He suggests

means of relief; but his means only offer to us the cold comfort of being able to leave on record for the admiration of posterity the fact that we did something to save the prospective dire situation by an artificial arresting of the waste—and it is still not inconsiderable—of the present day. A much broader view is desirable in this matter.

Sir William estimates that our coal supply—that is to say, the cheaply obtainable supply—will be exhausted in 175 years. That is bringing the vision of the trials and troubles of our successors into close sight of the present. We shall not feel those trials and troubles, nor can anything but sympathy, a patriotic feeling, and a desire to leave behind a good name for prevision in regard to the future destinies of our country, induce us to trouble ourselves in the matter. However, we owe something to our country, and to those who will claim us as their ancestors. We recognize that the future commercial supremacy of our country, its power of competing with other nations, its protection from famine and misery hereafter, depend largely upon the conservation of our native store of energy; but we also recognize the potentiality of progress in its relation to the future, and the extent to which progress is dominated by the wise use of the power which is placed in our hands to exercise in the present. Therefore, we regard the matter seriously; and the first criticism that has to be made is that Sir William only takes count of the visible and readily worked coal supply as the basis of his warning and appeal. He does not give the country credit for holding any as yet undiscovered stores; and he does not see, by applying present knowledge to the measuring of prospects, any way whereby other possible sources of energy can be economically utilized to supplement and to thereby secure the economy of our present main store of energy. From Sir William's standpoint, the prospect is a most unhappy one. We may, however, still hope that the future will reveal fresh native stores that may be economically tapped.

We are bidden to forecast by the present signs and to control the future in some way for the benefit of the human race. It is suggested that there should be an annual stock-taking of our coal supplies. There is no objection to that. Legislation is also put forward as a controlling factor. There is no objection to that within limits. The search for greater economies is also touched upon—but lightly; and it is in this and in the effects that we think Sir William failed to do himself and the future full justice. We cannot regard this matter from any hypothetical point of view that finality in economical use has already been reached, or is approaching. That would be absurd. It is admitted by Sir William that during the past century great progress has been effected in the conversion of one form of energy into others with as little useless expenditure of fuel as possible. That is true; and the past quarter of a century has been more prolific in the replacement of waste by economy than any of the three quarters preceding. We have seen this in the gas industry; we have seen it more in the past five years. We have seen in certain large works a much greater output of gas on a much lower proportional consumption of coal. We have seen the same thing latterly in the electrical industry; we have seen the economy developed by science in connection with the coke-oven and the iron industries. We know that what is being done through the more economical use of coal by the gas industry, and in other directions, is displacing coal barbarously used in industrial and domestic service.

This is all progress, and an aid to the conservation of our stores of energy; and such radical changes in method, and the production of economy, will do more, and that more will be done faster, than any form of compulsion to promote the end in view. We must do nothing to stop the progress of industry through any inflexible laws. The ultimate result might be a greater evil than the present gain. If we did aught to put a spoke in the wheel of progress by having only a single eye to the protraction of the day of coal exhaustion, posterity might have cause to curse instead of to bless. We cannot tell what progress, through the yield of scientific thought and research, has in store for us. The liberty of progress must not be interfered with in any way. If so, we may do an irretrievable wrong to posterity. Looking around, we are making vast strides in the economical use of our stores of energy. Said Sir William: "As charity begins at home, and as I am speaking to the British Association for the Advancement of Science, I would urge that our first duty is to strive for all which makes for the permanence of the British Commonwealth, and which will enable us to transmit to our posterity a

"heritage not unworthy to be added to that which we have received from those who have gone before." We are doing much in these days, by combating waste by progressive means, to swell the heritage that will be transmitted to posterity; and, though the work in some directions may be slow, posterity will have no cause to revile the people of the present for what they did in promoting the very objects for which Sir William so eloquently pleaded.

A Momentous Position.

THE times in the industrial world are of the most momentous. The past week has left no manner of doubt in the minds of all who seriously consider the omens that we are at the brink of very tempestuous days in connection with labour. We are not in pessimistic mood, nor do we despair of a new condition of things being eventually created that will bring about a more felicitous condition of things than that of which we can boast to-day. The resources of intellect are not yet exhausted; and the ultimate formulation of a proper scheme is only a matter of time, which cannot fail to be hastened by the violent and chaotic forces that are being brought to bear upon the unhappy and uncertain conditions of the present. It has been made quite clear that there is no stability of the present conditions, under all the schemes—save one—that have been produced with the view of maintaining industrially a clear sky. The hypothesis that arbitration and conciliation were the paths to lasting peace has been shown to be ill-founded by the insurrection and costly effects of the past few weeks. Mere agreements framing definite conditions have been violated with the same ease as one can break down a silken cord put up as a barrier to progress. Honour in these matters has been unscrupulously and scornfully disregarded as a matter of no moment. In fine, there has been a universal failure of pacification schemes except, we repeat, in the one well-known direction.

What is wanted is initiative—a power of adapting the proper course (as recognized in the gas industry) to all sorts and conditions of employment. But what do we see as the highest form of enhancement of the present conditions that our legislators can devise? Nothing better than an attempt to affix new braces and supports to the fractured structure of arbitration and conciliation. As was seen in last week's "JOURNAL," a Labour Disputes Bill has been introduced into Parliament backed by Unionist, Radical, and Labour members, with the view of improving the machinery by which the settlement of labour disputes may be effected by Boards of Conciliation and Investigation to be duly appointed by the Board of Trade. We have nothing to say against the principles of arbitration and conciliation. We are strongly in favour of them, and would welcome them as one means to a devoutly desired end, were they effective. But they have as processes contributing to that end proved themselves inadequate; and the patching-up by the proposed Bill cannot have any permanent effect. Almost simultaneously with the publication of the terms of the Bill, the Royal Commission that is now sitting to inquire into the working of the Railway Conciliation Scheme of 1907 were being told by one important Union witness that he did not see (there are none so blind as those who will not see) any effective course that could be adopted to prevent stoppages of work. If an arbitration award "was not acceptable to the men, what has occurred this time would occur again." The Commission have been informed as plainly as the leaders of the men can inform them, that arbitration is not required because the men are dissatisfied with it, and find it a costly instrument, and not a very effective one, for the realization of their demands. To them, it is not the same thing as the more brutal method of bringing about such a stoppage that the trade of the country is absolutely paralyzed, labour is demoralized, and the whole country is made to bear the penalty in several caustic ways.

The power to strike it is desired to retain unimpaired, and added to it now is the new policy of attempting to beat down resistance to demand whatever its character by the force of numbers and spreading the effects with a heavy hand. In this new Labour Disputes Bill, the process of arbitration is only intended to be a sort of trial to ascertain what may result, and not a compulsory method of settling disputes and arranging grievances. At the back of it all is to hang the uncertainty of a strike or lock-out. Under clause 37, we see that "either party to a dispute which may

"be referred under this Act to a Board, may agree in writing, at any time before or after the Board has made its report and recommendation, to be bound by the recommendation of the Board, and such recommendation shall be legally enforceable." But under section 32, "except where the parties have entered into an agreement under section 37 of this Act, nothing in this Act shall be held to restrain any employer from declaring a lock-out, or any employee from going on strike, in respect of any dispute which has been duly referred to a Board, and which has been dealt with under section 13 of this Act." So that this is only to be arbitration in a very limited sense, to ascertain what may happen, and then for the use of the uncivilized form of industrial warfare to come into operation if the decision does not satisfy. When will it satisfy, if the full demands of the section of labour dominated by those trade unions governed by ultra-socialists are not awarded? There are not two answers to the question. The more we study the events of the past twelve or eighteen months, the more convinced are we that arbitration and conciliation as applied to union-controlled labour is impotent for lasting good.

We see it further and vividly reflected in the announcement made last week that, at the conference of the Miners' Federation in October, a resolution is to be proposed in favour of a national strike, in order to enforce the demand for a minimum wage. Serious observers have detected this coming for some time. Others have refused to see it. The coal miners have never been enamoured of the terms arranged for them by their representatives and the coal owners in 1909; and the Mines Eight-Hour Act has proved an additional source of unceasing irritation, and is likely to continue so even with well-intentioned amendment. There has been nothing but seething discontent; and here is the threat to bring about a thorough industrial eruption. If upwards of a million miners struck work, and the output of the coal mines of the country were restricted by 850,000 tons a day, without a speedy resumption of work, the whole of the industry of the country would be imperilled, and labour of all kinds would be involved. Coal owners would resist the application for a minimum wage. They could not afford to do otherwise. We hope wise counsels will prevail. But the ominous announcement shows the want of durability in the generally applied schemes for promoting peace in the labour world. It is also a warning that will not be lost on those who have to look after the winter's reserves that stand for continuity of supply of the prime commodity of the gas industry.

The Measurement of the Industry.

NOTHING has statistically emphasized the importance of the gas industry so much as the Blue Book which has just been issued under the Census of Production Act of 1906. This particular issue is of more value than any of its predecessors; and we congratulate those responsible for the work of collection, compilation, and digest on the result of their labours, and the interest and value attaching to it. Every care has been taken in the work; but in view of its vastness, and of the fact that it is initial, no one will feel disposed to be hypercritical over the results, or question them. The data may be accepted, with faith, as approximately correct; and it may further be taken that the experience obtained on this occasion will form a good foundation for greater accuracy at the next census.

The section of the present return relating to the gas industry is of considerable value in that the statistics give, within limits, a more complete view of the position of the gas industry than the Board of Trade returns. These were always deficient, referring as they do only to statutorily controlled concerns. Here we have non-statutory undertakings brought into the reckoning; and the figures appearing in the Board of Trade returns are thus materially enlarged. But there is not much room for comparison between this return and those that have long been the authoritative and acknowledged ones, seeing that the former gives much more information concerning the work of the gas industry in the aggregate (though not in the individual sense) than the latter, which, in turn, impart information appertaining to matters in connection with statutory gas undertakings that are not included in the present document. The features that are particularly welcome in this return are that non-statutory gas undertakings are embraced, that there are statistics as to the labour employed, and that the quantity and value of the bye-products are included. Altogether,

the measurement of the standing of the gas industry is more complete than it has ever been before.

We may return on a convenient opportunity to a fuller examination of this return (the gas section of which is published in other columns to-day); but on this occasion we will satisfy ourselves by a comparison to show the relative positions of the gas and electricity industry. Under the head of gross output, selling value, or value of work done, the gas industry claims £31,607,000; the electricity supply industry, £8,903,000. The value of the materials used in the gas industry is given at £14,329,000; and in the electricity industry, at £3,335,000. The net output is therefore, for the gas industry, £17,278,000; and for the electricity industry, £5,568,000. The labour employed in the gas industry totals to 83,531—that is, so far as the returns allow calculation to be made; but it is admitted that there has been omission in several returns of members of the outdoor staff—the collectors, inspectors, and so on. The electricity industry only employs 22,618 persons. It is not clear whether the statistics as to electricity stations include or otherwise those parts that are utilized for tramway service. However, relatively, we are well content with the position of the gas industry; and may its difference in bulk long continue—and, more, expand.

The Inquiry-Circular Nuisance Again.

Seekers for information "on the cheap" by means of the inquiry-circular do not seem to be deterred by the condemnatory remarks on the practice which have from time to time appeared in the "JOURNAL," and been cordially supported by the sufferers from the annoyance, from again resorting to it. A correspondent forwards copies of two circulars he has just received emanating from the same source, and making a total of at least ten sent out by the same individual during the past three years. These last two ask for certain particulars in regard to show-rooms and the letting of gas appliances on hire. It will interest readers to see the nature of questions, as reproduced in our "Correspondence" columns to-day.

Australian Progress.

From the Melbourne Gas Company there comes an excellent report of progress in the consumption of gas. At the meeting of shareholders (an account of which appears elsewhere), the Chairman was able to make the gratifying announcement that the total sales of gas during the six months to June 30 amounted to 998,193,000 cubic feet, which represented an increase of no less than 13½ per cent. over the corresponding period of the previous year. It is true that a portion of this increase is attributed to an exceptionally cold and wet season; but even so, the result is an extremely satisfactory one, and proves that nothing is wanting on the part of those responsible for the administration of the undertaking to popularize the use of gas for the many purposes for which it can be advantageously employed. For one thing, the benefits of cooking by gas are kept prominently before the public; and of the efforts made in this direction proof is given by the fact that no less than 3718 new stove consumers were placed on the Company's books during the six months. This is stated to be a very large number for the period of the year ending at June. Claims for higher wages are not only heard of on this side; for we learn that the Melbourne Company, together with other large employers of labour, have met the demands for all-round increases in the rates of pay to employees; and various items on the expenditure side of the balance-sheet exhibit a rise owing to this factor. The extent of the influence this matter will exercise on the Company's accounts may be seen in the remark that the cost of manufacture and distribution and the handling of residuals, &c., has been increased by £25,000 per annum—which sum is being paid to the employees of the Company in the form of increased rates of wages, &c.

The Lesson of a Strike.

Following on several meetings of the men last week, an end has, it may confidently be assumed, at last been reached of the extraordinary miners' strike in connection with the South Wales collieries of the Cambrian Combine. This is good news. But before the matter is—finally, it may be hoped—relegated to the past, it may be well, as a guide to the future, to glance for a moment at the results of the stoppage. These are set forth by

the "Western Mail," which says that while, in the main, the strike, which has upset the trade of South Wales for practically twelve months, has undoubtedly had a harmful effect, especially in the direction of frightening business away from the district, certain benefits have accrued from the disaster, though these have not come to the parties most interested—the combine and their workmen—who may, however, probably have learnt valuable lessons which will prevent the repetition of the mistakes of the long period of stoppage. The strike affected nearly 12,000 men, of whom 2000 were idle about a year, and the remainder for ten months. The South Wales Miners' Federation and the Miners' Federation of Great Britain have been taught in an unmistakable manner the disastrous consequences of a big strike on a bad case against resolute employers; and the lesson of this is not likely to be forgotten for some time to come. The funds of the South Wales Miners' Federation have been entirely exhausted, while serious inroads were made into those of the parent organization. It is added that the experience should be valuable to the miners' leaders, who are able to point out to the men—who for ten months carried on a bitter strike rather than accept the terms arranged by their own representatives, and which eventually they agreed to—the folly of throwing aside discipline. In this way, the check may be the means of saving further disaster. The opinion is expressed in the article that very probably the resolute action of the employers has been the means of saving South Wales from a general strike. Before the Cambrian struggle began, a general strike seemed imminent; but now many of the leaders and a large proportion of the workmen realize that to pursue the policy of a general strike in South Wales at the present juncture would be suicidal. If, it is remarked, a general strike has been averted in the manner shown, the Cambrian stoppage has been of benefit, not only to the coal trade, but to the dock and shipping companies, and all other interests dependent upon the maintenance of the industry. Indirectly, the strike might even be regarded as a blessing to the general community. Thus it would seem that out of evil good may come. During the continuance of the dispute, the Cambrian Combine have apparently been receiving from the Associated Collieries an indemnity of something like £1000 a day. But even so, our contemporary calculates that the combine have not done so well as they would if the pits had been working during the period of good trade lately experienced, while it will take a long period to restore the normal output, and meanwhile the undertaking must be worked under great disadvantages.

Wiser Counsels Prevail.

But at the very moment when the Cambrian dispute was being brought to an end, trouble was brewing in another quarter, though serious consequences have happily been averted, for the time, at any rate. At a mass meeting of the workmen employed at the collieries in the neighbourhood of Porth, it was resolved to appoint a Strike Committee empowered to take steps to act on the lines of the railway men and seamen. In accordance with the instruction of the meeting, all the lodges of the South Wales Miners' Federation were circularized, and a manifesto was issued. About two-thirds of the replies received were, it is said, favourable to the convening of an immediate conference in connection with this suggested promotion of a strike policy in South Wales for the purpose of securing a guaranteed minimum wage for all colliery workers. It was therefore arranged that an unofficial coalfield conference should be held at Cardiff on Saturday. But before the time for it arrived, the Committee announced their decision that the replies received were not sufficiently numerous to justify the conference being called; and so it was cancelled. The issue of the "South Wales Daily News" which contained the intimation of the abandonment of the conference had in it also a long appeal from the Right Hon. W. Abraham, M.P., who implored the men to do nothing "so rash, useless, and disastrous" to themselves and to the South Wales community at large as to embark upon an immediate strike for a minimum wage. His view is that the stoppage of the collieries in the South Wales coalfield would not lead to the establishment of a minimum wage, but would more likely than anything else isolate the coalfield from all others in the kingdom, and leave its workers without any participation in the general movement that the Miners' Federation of Great Britain have taken in hand. It is expected that at the annual conference of the Federation next month a resolution agreeing to take common action regarding abnormal places and

rates of pay will be carried and put in force, if satisfactory arrangements are not meanwhile arrived at. This would seem to show that the trouble may not be ended, but merely "shelved." To the attention of Trades Unionists generally the following passages of Mr. Abraham's appeal may be specially commended:

Fellow workers, one need not blink the fact that serious injustice and danger to all will arise if an irregular strike without notice should happen now. The fact is, and it cannot be insisted upon too often, that strikes without notice, if they became much practised, would end in ruining Trade Unionism. If breaches of contract, such as an immediate stoppage of the collieries in South Wales would involve, were but even infrequently acquiesced in by Trade Unionists as a regrettable necessity of war, the privileged position enjoyed by the Unions since the Trades Disputes Act, in their immunity from actions in tort, could not possibly be defended. But not only that, their powers of bargaining would go as well as their privileges. Recognition, collective bargaining, loyalty to general agreements made on behalf of the men, as well as particular terms of service, are all parts of the same structure. We cannot have both recognition and assert a right to break contracts and strike without notice. These may be by some considered to be the commonplaces of the Trade Union spirit; but even Trade Unionists need to be reminded of them, especially when some Trade Union leaders are preaching the doctrine that force is the remedy, and that strikes can be fought without money.

Domestic Hot Water Supply.

An interesting little article on this subject, by Mr. R. Herzfeld, appeared lately in the Engineering Supplement of "The Times." It would have been more interesting still had it divulged on the part of the author a closer acquaintance with what is being done in connection with water heating by gas, and if it had not ended in a suggestion that is impracticable and uneconomical, in comparison with the system of heating water where it is immediately wanted. He favours the old idea of distributing hot water from a central station. The loss that must inevitably result from such a system is quite sufficient to kill it; but Mr. Herzfeld considers the scheme is one that "should especially appeal to gas and electric lighting companies, who labour under the difficulty of ousting the coal-fired kitchen range so long as the generation of hot water is not made a business quite separate from cooking. The separation of these two processes would greatly facilitate the introduction of the gas or electric stove for cooking proper; and the provision of a small heating-stove for use in the winter evenings would effectively meet one objection which might be put forward—that the kitchen range is really necessary for heating as much as for the preparation of the meals." Now, this exactly describes what is being done by gas authorities in the matter; so that Mr. Herzfeld has unwittingly supplied the answer to his argument in favour of central water heating. But a good point of the article is as to the cost of the provision of hot water by the coal range. Few, if any, householders realize what the lighting and upkeep of a fire means in cost in proportion to the hot water used. If they did realize it, we venture to think they would soon turn to such a convenient way of heating water as is provided by the gas circulating-boiler and other means, which can be brought into use and be discontinued just as needed—the consumption of fuel only proceeding when the water is actually required; and when it is required, plenty of it can be had promptly. The economy of this system is found by comparing it with the wastefulness of the coal system. For water heating, electricity is a bad proposition. Mr. Herzfeld should make himself acquainted with the extent to which the gas-cooker has displaced the coal kitchen-range, and how water-heating by gas is progressing.

Fair Wages Clauses in Contracts of Local Bodies.—The Local Government Board have just issued a circular to local authorities, drawing attention to the recommendation of the Advisory Committee of Representatives of Government Departments with reference to the fair wages clauses in contracts. The Committee recommended that clauses such as those inserted in Government contracts should also be introduced into those which involve the expenditure of public money granted by a Government department, or which require their approval. The circular said: "It appears to the Board that the policy adopted in the case of Government contracts should be followed in the cases of all contracts for the execution of works or the supply of materials which are entered into by local authorities or by or on behalf of any committee wholly or in part appointed by a local authority. While they are aware that many local authorities specify in their contracts conditions to be observed by the contractor as to rates of wages and other matters affecting persons employed by him, the Board think that in every case the authority should give the matter careful consideration."

GAS STOCK AND SHARE MARKET.

(For Stock and Share List, see p. 613.)

THERE was little in the course of affairs on the Stock Exchange last week from which any one could extract any satisfaction; and the general tone was one of apprehension and sensitiveness, ready to take alarm upon very moderate provocation. For this, Moroccan affairs and the great Labour question were chiefly responsible. It was account week, and the settlement was looked forward to with some anxiety; but apparently it went through without any catastrophe. Home Railways, however, had a heavy fall. The opening day was languid and dull. Consols fell $\frac{1}{16}$. Railway prices shrank nearly all round; and Americans see-sawed about vaguely. Business on Tuesday continued very quiet; but the tone was not quite so heavy. The leading markets did not mend; but Americans made a recovery. Foreign were firm; and there was some animation in speculative lines. The feature of Wednesday was the big drop in Rails, owing to strike fears and the closing of some weak accounts. Home Government issues were lowered by uneasiness as to foreign relations. Americans fell back again; and Foreign were rather shy. On Thursday morning, Rails fell still lower; but later in the day the tendency amended. Consols closed $\frac{1}{8}$ higher; and the leading markets were better generally. Friday opened pretty firm, but straggled as the day advanced. Consols were a weak spot; but Rails were cheered by the Great Eastern settlement. Saturday was but little changed, except for weakness in some speculative lines. Consols closed at $77\frac{5}{8}-\frac{7}{8}$ *ex div.*—a fall of $\frac{1}{8}$ in the week. In the Money Market, there was a fair demand for the Stock Exchange and the month-end, and discount rates hardened. Business in the Gas Market aggregated about the same as the week before; but it was more largely distributed through the list of undertakings. The strength of the market was yet more abundantly evident; a large number of additional advances in quotation being established, and without any counterbalancing retrogression. In Gaslight and Coke, the ordinary had its full share of attention, and was very firm, marking from $106\frac{1}{2}$ to 107 ; but the quotation was left standing unadvanced. In the secured issues, the maximum realized $84\frac{1}{2}$, the preference $102\frac{1}{2}$, and the debenture from 79 to 81 —a rise of $\frac{1}{2}$. South Metropolitan was quiet and unchanged at $116\frac{1}{2}$ to $117\frac{1}{2}$. The debenture marked $79\frac{3}{4}$. In Commercial, there was only one bargain in the 4 per cent. at 113 . Among the Suburbans and Provincials, Bournemouth "B" was done at $16\frac{3}{8}$ *ex div.*, ditto preference at $14\frac{3}{8}$ *ex div.*, British at $45\frac{5}{8}$, Brighton original at $22\frac{1}{2}$, ditto ordinary at $16\frac{1}{2}$, Portsea Island "B" at $12\frac{3}{8}$, Southampton at $108\frac{1}{2}$, and South Suburban at $118\frac{1}{2}$ and $118\frac{3}{4}$. In Continental companies, Imperial marked from $181\frac{1}{4}$ to $182\frac{3}{4}$, ditto debenture 90 , European $19\frac{3}{8}$ and $19\frac{5}{8}$, and Tuscan 9 and $9\frac{1}{8}$. Among the undertakings of the remotest world, Honkong changed hands at $17\frac{3}{4}$, Primitiva at $7\frac{1}{4}$ and $7\frac{1}{8}$, ditto preference at $5\frac{1}{4}$ and $5\frac{3}{8}$, San Paulo at $21\frac{1}{16}$ to $22\frac{1}{8}$, ditto preference at $12\frac{1}{8}$, and ditto debenture at $49\frac{3}{4}$.

ELECTRICITY SUPPLY MEMORANDA.

Official Statistics—Electricity and Gas Consumers in the Metropo-
is—Public Lights of London—Various Classes of Consumption and
Revenue—Miscellaneous Items—Relation of Electricity and Gas
Capital to Revenue—The Paragon Electrical Canvasser—Purify-
ing the Atmosphere—When on Common Ground.

OTHER matters having demanded attention lately, we have had to defer the interest to be derived from the examination of the annual return of the London County Council relating to electricity supply undertakings. It is a very handy return; but the wish naturally rises that it was a little more up to date. The Board of Trade have made their returns relating to gas undertakings of much more value by bringing their issue into closer relation with the period to which each return refers. The London County Council might do likewise. The return before us covers the year 1909-10. Much water has flowed under the Thames bridges since then; and many other things have happened which may, in some measure, have altered the complexion of things electrical. But still the statistics are of use for comparison purposes, as they indicate the trend, if not the exact position, of present affairs. It is first remarked that the number of consumers possessed by fifteen Borough Council undertakings was returned at 33,920, which is about 3000 more than the preceding year. Concerning the thirteen Companies, we cannot exactly tell how the year progressed in this regard with them, seeing that, on this occasion, the County of London Company do not make a return, while last year the Charing Cross Company kept to themselves their number of private consumers. If we accept the figure now obtained for the Charing Cross Company, and take last year's figure for the County of London with an increase on it of (say) a couple of hundred, the total of the customers of the Companies is only about 78,300, which is an increase of approximately 2500 consumers on the previous year's figures. Thus, the 28 undertakings could only number between them 112,220 consumers at the end of the period upon which report is made; while the three London Gas Companies alone—not reckoning those of other Companies partly within the Administrative County of London and partly without—could, at the close of last year, boast of approximately 1,120,000 consumers. This is extremely interesting. But

another fact that arrests attention is that, in the return now before us, the Kensington and Knightsbridge Company and the Metropolitan Company both actually show a set-back. The first-named Company is credited with having 4149 consumers; a year previously the figure was 4350. The Metropolitan in this return figure for 10,234 consumers; twelve months since the claim was 11,500. Some explanation appears to be required here.

But perhaps the most interesting part of the statistics alludes to public lighting. The number of arc lamps in the districts of the electricity supply Borough Councils was 4775; but in the districts supplied by the Companies, there were only 1768. This tells a tale, which is emphasized by the number of incandescent electric lamps in use—in Borough Council electricity supply districts, 5638; and in Company supply districts, 213. That is to say, at the end of the period, the Borough Councils in the districts of the thirteen Companies had, all told, only 1981 electric lamps in use, or an increase of 54 during the year (accounted for by the experimental lamps in the City), while the Borough Councils who "manage" electricity supply undertakings have a total of 10,413 electric lamps in their areas, or an increase of 2345. We reiterate that this tells a tale. The increase is entirely a metallic filament lamp one; there having been, as a matter of fact, a reduction of 84 arc lamps. The principal contributors to the increase in metallic filaments are Marylebone, Fulham, Hammersmith, and Hampstead. An actual reduction of arc lamps in the streets of the Metropolis shows which way the wind is blowing. Though the efficiency of the metallic filament lamp is not so high as that of the arc lamp, and though the renewal expenses run somewhat heavy, the costs of labour and upkeep in connection with the arcs make the metallic filament lamp the greater favourite with those lighting authorities who (this must be kept well in mind) also run electric supply concerns. The arc-lamp makers are not particularly pleased with the way things are going with them in connection with street lighting and outside shop lighting. What with high-pressure gas lighting, the modern types of inverted burner, and the electric metallic filament lamp, their street lighting trade is being gradually, but surely, throttled. While, however, we see that, for public lighting in the streets of London, the end of the period under review found the electrical industry with, all told, 12,394 lamps—arc and metallic filament—the three Gas Companies at the close of 1910 had 74,517 public lamps to their credit.

But we have a further significant point in connection with the public lighting; and this "gives away" the game of municipal management in the interests of the electricity undertakings, and not in those of the ratepayers. We compile from the return the following, which bring aggregate consumptions and revenue in the electricity supply areas of the Borough Councils into close relationship.

	Units Sold.	Revenue.
Street lighting (revenue including maintenance)	11,711,637	£110,360
Other municipal lighting	1,108,442	13,516
Private consumers for lighting	31,911,458	446,345
Power and heat for municipal purposes	948,351	4,102
Private consumers for power	28,445,205	131,410
Traction	990,875	4,128

It will be observed from this that electricity supplying Borough Councils draw from the ratepayers no less than £123,876 for public lighting and other purposes to which they put electricity. It will be seen, too, how the private lighting consumer fares under the present tariffs. If the last three items in the table are added together, it will be remarked that the aggregate consumption about equals the consumption of private consumers for lighting, yet the receipts only total to £139,640, as against £446,345 for private lighting. This seems unfair and disproportionate; and it very clearly shows the extent to which the private consumers have to bear the financial heat and burden of the day. All consumption other than private lighting is in excess of the private lighting by 11,293,052 units; and yet private lighting paid in the year dealt with in the returns £182,829 in excess of all other custom—municipal, power, or otherwise. We do not hear much in these days about those at one time sacred principles (which were never, no never on any consideration, going to be violated) on which tariffs were founded. The figures produced here show how these principles have gone under, and no longer faithfully apply to the conditions as they have developed.

There are three or four more figures that will be of interest. The units consumed by electricity supplying Borough Councils for public lighting are equal to 26 per cent. of the total number sold for lighting; while those Borough Councils in the areas where companies carry on the electricity business are content for public lighting with 5 per cent. of the total units sold for illuminating purposes. Then, again, the fifteen Borough Councils trading in electricity only pay 0.09d. per unit sold in the shape of rates and taxes, while the Electricity Companies are compelled to pay 0.19d. per unit sold. This is not equitable. The total revenue for the year of the fifteen electricity supplying Borough Councils was £724,205; and of the thirteen Electric Supply Companies, £1,658,319—together £2,382,524. The total income of the three London Gas Companies in 1910 was £7,170,207, and in the year before £6,733,207. To obtain a revenue one-third the amount of the three Gas Companies, the electricity concerns have raised capital amounting to £19,889,671, or, deducting the sum repaid by the Borough Councils, £19,094,617. The capital and borrowed money raised by the three Gas Companies total

to £40,158,151; but if we separate from this the sums added on conversion and the non-dividend bearing (premium) capital, the capital stands at £18,249,151, which is less than the amount of capital shown to be employed in the supply of electricity in the Metropolis.

An article has been published in the "Electrical Engineer" from the joint pens of Mr. A. T. Bullen and Mr. H. E. Goody, which article appears to us as being, though much of it is somewhat well-worn, very fair in its character and tone. It is on "Canvassers and Canvassing;" and first of all we have in it the paragon of canvassers portrayed—all the indispensable virtues (including truthfulness) of such an individual are laid bare. It is not sufficient that an electrical canvasser should be on drinking terms with all the electrical contractors of the locality. The insinuation is not quite a pleasant one. He must be well dressed; and he must be a gentleman. A modification is made by the writers of the latter qualification, in the words "or at least have the manners of a gentleman." He may be fluent; but he must know what he is talking about. He "should be"—the words "must be" are not used—thoroughly conversant with the latest electrical developments. He should be a good conversationalist; he should possess not merely good manners, but many manners—observing the apostolic injunction, he should be "all things to all men." To that the canvasser with any self-respect might in these times object. He must (this is excellent advice to electrical canvassers) "avoid exaggeration, as it is to be hoped he does the devil." We have just been reading about the necessary qualification of being a gentleman, or at least having the manners of a gentleman; therefore the reference to his satanic majesty seems superfluous. The points on which there should not be exaggeration are illustrated. "In neighbourhoods where gas is really cheaper, light for light, than electricity, the point should be 'gracefully' conceded [we can picture this being done]; and the canvasser should persuasively emphasize the qualities, such as cleanliness and convenience, which are the universal monopoly of electricity." Those are the words of the writers of the article; they have forgotten already the virtue of truthfulness. "The sort of canvasser who goes about advising people with very small incomes to instal electric radiators and cookers only does harm; for if he is taken at his word, and the consumers instal apparatus which they cannot afford to use, the reputation of the supply company will be damaged by the persistent denunciations of these unhappy persons." Here is a case in point:

An over-zealous canvasser, in conversation with a lighting consumer of the working class, persuaded him to purchase and use an electric radiator. The canvasser assured the consumer that the radiator might be burned continuously at no greater expense than would be incurred for a coal fire. Current for heating costs 2d. per unit in this particular district. The consumer used the radiator in his living room in place of the fire; and he was disgusted to receive, at the end of his first winter quarter, a heating bill of about £10. He could not, or would not, pay the bill. The supply to his house was disconnected; and to this day it has never been re connected. The company has, in this way, lost irrevocably a consumer who, although small, at any rate gave very little trouble until he made his unfortunate experiment with an electric radiator.

We hope the result of Messrs. Bullen and Goody's article will have good effect. The canvassers of the gas industry will be delighted to meet gentlemen canvassers of the electricity industry who, among their many other good attributes, are truthful. This

characteristic alone will make the work of the gas canvasser much easier than it is at the present time, in many quarters.

The electrical industry look with feelings of sharp and profound envy upon the magnificent contribution the gas industry has made towards the relief of the atmosphere from the smoke nuisance. It came as an awful shock to the competitors to learn from the Right Hon. John Burns more than twelve months ago that two of the Metropolitan Gas Companies had then fixed (to say nothing of privately owned ones) as many as 1,300,000 heating appliances of various descriptions, which must have tended largely to purify the atmosphere of London. He acknowledged that legislation could not have effectively done so much as the Gas Companies had succeeded in accomplishing. There is no doubt that these domestic gas appliances had a substantial influence in bringing about the excellent diminution in foggy days shown by the last report of the Smoke Abatement Society:

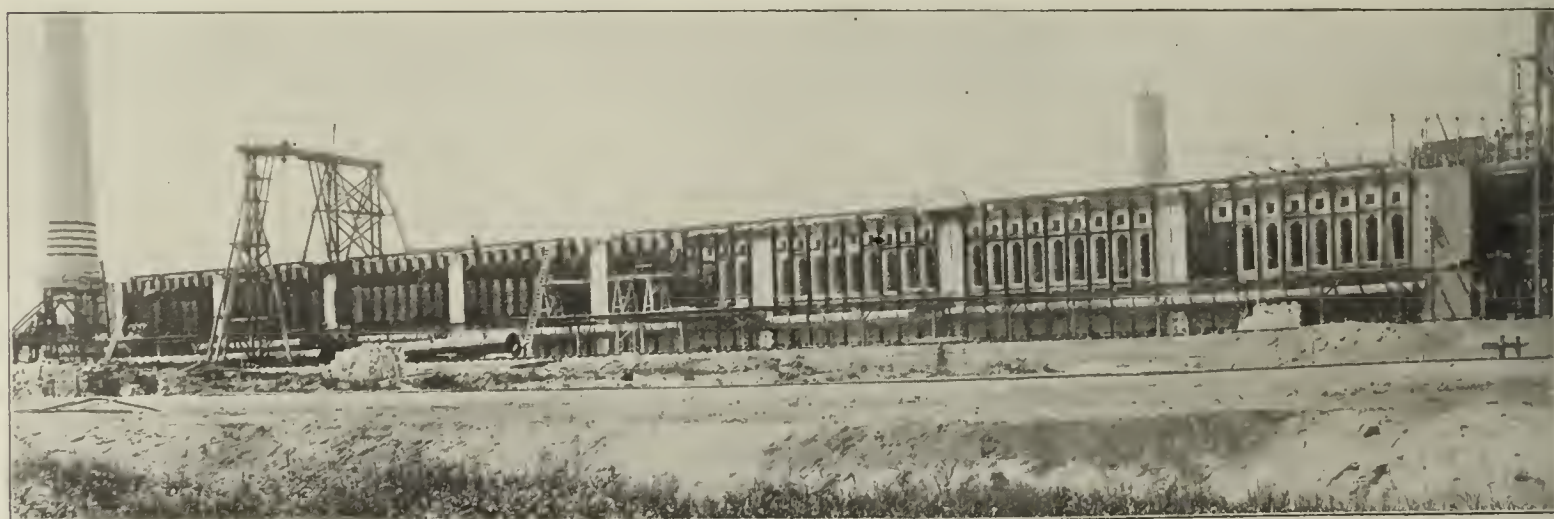
Period.	Average Number of Days with Fog.	Hours of Bright Sunshine.
1883-4 to 1891-2	29'9	55'6
1892-3 to 1900-1	20'7	70'1
1901-2 to 1909-10	10'6	93'5

This is highly satisfactory. For the point we are indebted to a reminder in an article by Mr. John B. C. Kershaw in the "Electrical Review." He very properly places, like Mr. Burns, gas in the superior position among the fuel agents that have rendered service in producing these more healthy atmospherical conditions. His words are: "The domestic chimney, which in the past has been a great offender, has certainly shown remarkable improvement. This is no doubt largely due to the increasing use (for heating and cooking) of gas, electricity, and solid smokeless fuels." How the electricity industry wish they had the power to change places with, and so take precedence of, gas for heating.

But there is that thermal spectre always ranked on the side of electricity, while on the side of gas is a generous thermal value that cannot be disposed of by any process of electrical negation. However, there is a Smoke Abatement Exhibition coming on in Manchester in November next, and in London next May; and the electric appliance manufacturers are being asked to gird up their loins, and assist in demonstrating to the public that electrical appliances, notwithstanding the lower plane occupied by the heating agent in the matter of calorific value, are not more expensive to run than gas appliances, that their first cost is no more, and that the cost of repair is not excessive. Truthfulness is a virtue that electrical exhibition stand attendants should cultivate as well as electrical canvassers. However, gas will be there to protect itself; and the public has not lost all sense of judgment as it is patent some electricians believe it has. It was suggested in the "Memoranda" the other week that the Gaslight and Coke Company should be asked to send a gas cooker and a competent cook to demonstrate, at the Electrical Exhibition at Olympia, the inferiority of the electric cooker side by side with the gas-cooker; but we have not heard that the Exhibition authorities have jumped at the idea. At the Smoke Abatement Exhibitions, the gas cooker and the electric cooker will occupy common ground. There are still weeks in one case, and months in the other, in which the latter can be improved. Will it then show up superior to the gas-cooker in its range of usefulness and economy? We entertain a very confident opinion that it will not.

INCLINED CARBONIZING CHAMBERS IN VIENNA.

Installation at the Leopoldau Municipal Gas-Works.



In the review of the progress of the gas undertaking of the Municipality of Vienna which appeared in the "JOURNAL" towards the close of last year, it was mentioned that, in order to meet the continually growing output of gas, an installation of inclined carbonizing chambers, capable of producing about 1½ million cubic feet of gas per day, was erected in 1908; and that the following year the installation was enlarged by the addition of 19 chambers; making 34 in all, with a daily productive capacity

of nearly 3 million cubic feet. It was also mentioned that further extensions were being made at the municipal gas-works at Simmering; while new works were being constructed at Leopoldau. We give a view of a fine installation of inclined chambers at these works. It has a two-fold interest, as it shows in the background, on the right, the large gasholder which recently collapsed. An account of this accident was given in the "JOURNAL" for Aug. 22 (p. 478), where a better view of the holder will be found.

VERTICAL RETORTS AT HELENSBURGH.

Glover-West Installation Opened.

Readers of the "JOURNAL" may remember that the extensions which have lately been carried out at the Helensburgh Gas-Works, under the supervision of the Corporation Gas Engineer and Manager (Mr. William Blair), comprise an installation of Glover-West vertical retorts of a capacity of half-a-million cubic feet of gas per day, coal-handling plant, gas-engines, and driving gear, and a new coal-store building, covering an area of 9000 square feet, with double-span roof. The following are a few particulars of the installation, to which reference was made in the "JOURNAL" for the 2nd of May last (p. 282).

Arrangements were made with the North British Railway Company to enable the coal-waggons to run direct from the railway siding into the coal-store. The railway track is extended across the store to a point where a hydraulic wagon tipper lifts one end of the wagon and discharges the coal to the mouth of a coal-breaker—thus facilitating the discharge of the coal to the plant. The waggons are weighed on a weighbridge situate inside the store, and there is a turntable to enable them to be diverted to lines leading to other parts of the store and works. The retort-house is constructed of steel stanchions of modern design, with walls of $4\frac{1}{2}$ -inch brickwork built in between longitudinal girders and the main principals or stanchions, except on the coal-store side and the main gable end, which are covered in by galvanized corrugated iron sheeting. There are two settings of Glover-West retorts, each containing eight retorts. The arrangement of the retorts in the settings enables any two retorts to be in operation, and consequently the output of the installation can be readily regulated to meet requirements ranging between the minimum and maximum make of gas. In order to provide for economy in working when the setting is on minimum make, each setting is constructed with a twin producer. The retorts were put into operation on the 4th of July, and within eighteen hours after the starting of the plant the retort-house equipped with horizontals was shut down completely, and has remained so since that date; the whole of the gas supply depending upon the output from the vertical retorts.

Opening Ceremony.

The installation was officially opened last Saturday afternoon. About a hundred ladies and gentlemen assembled for the ceremony; the company including many well-known gas managers, not by any means all drawn from West of Scotland districts.

Councillor G. SELLARS, Vice-Convener of the Gas Committee, in the absence, through indisposition, of the Convener (Bailie T. C. Mitchell), extended a very cordial welcome to the visitors.

Mr. F. J. West, on behalf of West's Gas Improvement Company, Limited, the Contractors for the plant, presented a silver salver, with inscription, to Mrs. Mitchell, as a memento of the occasion.

Mrs. Mitchell, through Mr. Sellars, returned thanks. She then manipulated the handle of the hydraulic appliance by which a wagon of coal was emptied into the breaker; and in this way the opening ceremony was performed. The company then walked over the new works, and witnessed them in operation. Tea was afterwards served by the Corporation in the Council Chambers.

Provost MACLACHLAN, when addressing the company, renewed the welcome to those who had come to grace their proceedings, and at his request the Town Clerk read apologies for absence from, among others, Mr. A. Masterton, of Edinburgh; Mr. D. Vass, of Airdrie; Mr. J. Dickson, of Forfar; Mr. A. Yuill, of Dundee; Mr. S. Dickie, of Dumfries; Mr. J. Ballantyne, of Hamilton; Mr. H. Scott, of Galashiels; Mr. G. R. Hislop, of Paisley; Mr. J. Dunlop Smith, of Belfast; Mr. A. Bell, of Peebles; Mr. W. A. Smith, of Hawick; and Mr. S. Milne, of Aberdeen.

Mr. SELLARS said it occurred to him that he might give some little reason for having the new installation they had opened that day. About three years ago they had a report from the Gas Manager, after a very severe winter, that the works had been making up to their utmost capacity. This report led to their giving a little consideration to the matter, and they had a report drawn up as to what it would cost to put the old works in good order, and perhaps add something to them. They found that it would cost about £7000 to patch up the works and give them a little more retort power. They did not go into the matter, as they had other ideas put before them about something which Mr. Blair, who was a very practical man, had thought of. He was well up to date in all the very latest in gas manufacture. They had several systems submitted to them; and ultimately they fixed on that of Messrs. Glover and West, of Manchester, as being something which would be suitable for a place such as Helensburgh. They sent a deputation to St. Helens, where a small installation was then working; and it satisfied them. They had guarantees from Messrs. West as to what the works would do in the way of production of gas per ton of coal. They then proceeded with the installation the visitors had just seen; and he believed that it would turn out to be a very remunerative undertaking. The ground cost them about £1500; and this sum, with the cost of the works, including a railway across the street, worked by hydraulic power, would be all within £15,500. They had had from Mr. Blair a report which showed that they had made more than a million cubic feet of gas beyond what was produced from the same quantity of coal in the old works. He thought they had every reason to be satisfied with their bargain with Messrs. West; and they were much indebted to Mr. Blair for guiding them to that Company.

Mr. F. J. WEST remarked that the tests they had made showed that they had exceeded their guarantees by at least 10 per cent.

Mr. ALEX. WILSON (Glasgow) proposed a vote of thanks to the Corporation of Helensburgh, and asked to be allowed to add to the congratulations to which utterance had been given. In the first place, he said he considered Mr. Glover was to be congratulated on bringing out such a fine idea for carbonizing coal in vertical retorts. Then he was specially favoured in being associated with Messrs. West in carrying out the idea. He thought they might well congratulate Messrs. West on having a good system to work upon. Those of them who had seen it in operation were entirely satisfied with the way in which the installation was doing its work. The system would improve matters very much in the gas-works. It would not only enable them to sell gas cheaper—which was, of course, a prime consideration—but also to do their work under much more favourable conditions than formerly. He was sure they were all charmed with the way in which the coke was drawn, as compared with the days when they had so much dust and steam thrown about. In residential places like Helensburgh, it was of the greatest consideration that works such as gas-works should be carried on so that nobody might know that they were there. He thought they were going to have this state of things at Helensburgh. Most of them were looking forward to the time when only vertical retorts would be in use. In his opinion, the days of the horizontal retort, even with machinery, were numbered. The Helensburgh Corporation were to be congratulated on leading the way in Scotland in adopting the vertical system. They were also to be congratulated on having so practical a Manager as Mr. Blair. It was not everyone who would have had the courage to adopt, in a town the size of Helensburgh, a process such as the one they had inspected, without having seen it adopted in a good many other places. Most of them who had seen the plant that day knew that Mr. Blair did not advise his Corporation on anything he did not know all about. This being the case, they were bound to have good results.

Mr. T. WILSON (Coatbridge), in support of the resolution, complimented the Corporation and their Manager on their courage—or, he might say, daring—in introducing a system of vertical retorts. He knew a number of gas-works in Scotland, with much more money at their command, who had been waiting the results of the experiments at Helensburgh. He had never seen a more workable installation of retorts than they had just inspected; and he had learned something. His Directors were about to expend a considerable amount in improving the gas supply of their district; and he thought that what they had heard would help them very considerably. He had no doubt that the installation they had seen would, in the hands of their friend Mr. Blair, be a certain success.

Provost MACLACHLAN, in acknowledging the resolution, said that since the gas-works were taken over by the Corporation they had been a success; and the Corporation had been able to reduce the price of gas to 8d. per 1000 cubic feet. They had added plant, all of the newest description, two holders—one spiral, the other telescopic; and he was pleased to say that they stood at present with a capital outlay of £51,930. The total liabilities were £42,048; and they had surplus assets of £13,531. The visitors would see that the Corporation stood in a very good financial position as regarded their gas undertaking. He would like to add his quota of praise to the work which had been done. The guarantee of Messrs. West was a carbonization of 2 tons 15 cwt. of coal per retort per 24 hours; and they had already put through 3.06 tons. With a test of 19 tons 18 cwt. of coal, 253,400 cubic feet of gas were made, which was equal to 12,605 cubic feet of gas per ton. The gas made per retort in 24 hours was 38,610 cubic feet; and the illuminating power was 16.3 candles, tested with a "Metropolitan" No. 2 burner. The yield of tar and liquor was 52 gallons per ton (10-oz. liquor), compared with 48 gallons previously. The coal carbonized in the vertical retorts had amounted to 500 tons. The make of gas had been 6,172,500 cubic feet, which was equal to 12,345 cubic feet per ton. This was 23 per cent. more than they had from the old retorts.

Mr. BLAIR added that tests made from Aug. 29 to 31 showed better results than those which had been given by Provost MacLachlan.

The company were subsequently entertained at dinner in the Imperial Hotel—Mr. F. J. West in the chair. Among the toasts given were "The Corporation of Helensburgh," proposed by Provost Armour, of Johnstone, and responded to by Provost MacLachlan; "The Gas Committee of the Helensburgh Corporation," proposed by Mr. Alex. Wilson, and responded to by Councillor G. Sellars; "The Visitors," proposed by Councillor Bonnar, and responded to by Mr. Alex. Wilson, of Glasgow, and Bailie McNamee, of Wishaw; "The Gas Engineer," proposed by Mr. W. B. McLusky, of Perth, and responded to by Mr. Blair; and "The Contractors," proposed by Provost MacLachlan, and responded to by the Chairman.

Factory Illumination in Holland.—The law for factory illumination in Holland stipulates that the employment of women and young children is forbidden in works in which the artificial light is normally required between 9 a.m. and 3 p.m. An illumination of $1\frac{1}{2}$ foot-candles is specified as the minimum for certain processes exceptionally trying to the eyes—such as type setting, engraving, drafting, instrument making, &c.; and a minimum of 1 foot-candle in less exacting occupations.

Telephones in Gas-Works.—The Committee of the German Association of Gas and Water Engineers have sent an inquiry sheet to the members, and to the postal authorities, in order to ascertain whether any accidents had been caused by the installation of telephones and electric bells in their apparatus-rooms. No case of gas being lighted by sparks from these instruments was reported. In special experiments, ignition sometimes (but only rarely) resulted when gas was blown on instruments in action. The Association have resolved to permit the installation of telephones in the apparatus-rooms of gas-works. They should, however, be fixed outside, and the bells, if inside, be provided with guards of gauze.

THE LATE MR. RAPHAEL HERRING.

THE funeral of Mr. Raphael Herring, of Dover, whose death on the 27th ult. was briefly announced in the "JOURNAL" last week, took place at Buckland Church on Thursday, when the Directors of the Dover Gas Company, the staff, and all the men who could be spared from work, were present. In addition to the large number of beautiful floral tributes from members of the family and personal friends, wreaths were sent by the Chairman, Directors, and Secretary of the Company, the employees at the Buckland works, the head office staff and the distribution department, and the members of the benevolent and other societies connected with the works.

The few particulars that were given last week in regard to the late Mr. Herring may be supplemented by the following brief sketch of his lifework: At the outset of his career he was in the service of the Equitable Gas Company, at their works at Pimlico, and later on in that of the Commercial Gas Company. He left this position in order to give more attention to several of his inventions connected with appliances used in gas manufacture. In 1877, however, he once more entered the ranks of gas managers, under Mr. Hack, at the Saltley station of the Birmingham Corporation. Ten years later, however, he was appointed Resident Manager of the Dover Gas Company, in succession to Mr. Ravenhill, who retired on account of ill-health. On leaving Birmingham, he was presented with a testimonial. As mentioned last week, Mr. Herring was a member of the Southern District Association of Gas Managers; and in addition to the paper then referred to, he read one, at the autumn meeting in 1905, on "A High-Speed Exhauster for Pressure-Raising in Gas-Mains." Mr. Herring, who was 74 years of age, leaves a widow and family of four sons and two daughters. One son, Mr. W. R. Herring, as readers are aware, is now in practice in Westminster as a Consulting Engineer, and another, Mr. E. C. Herring, is Assistant Engineer and Manager at Dover.

In the course of the obituary notice of Mr. Herring which appeared in the "Dover Express" last Friday, the following reference was made to his work at Dover: "He was very successful, owing to Mr. Willsher Mannering, the Chairman of the Company, and his co-Directors working hand-in-hand with their Engineer and Manager. At the same time, Mr. Herring cultivated a good feeling of loyalty and comradeship among the under officials and workmen; there being a centre of union on the works in the form of a reading and recreation room, which he was the means of establishing soon after he took charge of the works."

OBITUARY.

The current number of the "Co-Partners' Magazine" of the Gaslight and Coke Company records the death, on the 9th ult., after a short illness, of Mr. W. STEPHENSON, the station head clerk at Stratford. He entered the service of the late Imperial Gas Company in September, 1871, and when the Company was absorbed by the Gaslight and Coke Company in 1876, he became station head clerk at Shoreditch, and afterwards assistant chief of the store department at Westminster. He resigned his appointment in July, 1903, owing to ill-health; but later on he enjoyed the almost unique experience of returning to the Company's service after having been pensioned. Some time after retiring, he found his health sufficiently restored to enable him to accept an appointment with the West Ham Gas Company; and when the amalgamation of that Company with the Gaslight and Coke Company took place in January last year, Mr. Stephenson's knowledge of station work eminently fitted him for the appointment he then received, of station head clerk at Stratford. Thus he returned to the old service, and died in harness at the age of 68.

Exports of Mineral Oils from the United States Last Year.—According to the Bulletin of the United States Geological Survey, the exports of mineral oil last year were as follows: Crude, 119,630,159 gallons; illuminating, 932,343,617 gallons; naphtha, 79,059,528 gallons; lubricating and paraffin, 158,866,676 gallons; residuum, 107,095,460 gallons—total, 1,396,995,440 gallons, compared with 1,496,795,106 gallons in 1909.

Eastern Counties Gas Managers' Association.—We learn from the Hon Secretary and Treasurer (Mr. T. A. Guyatt, of Ely) that the next meeting of the Association will be held at Felixstowe on Friday, the 29th inst., and that the programme will include the Inaugural Address of Mr. F. Paternoster, the Manager and Secretary of the Felixstowe Gas Company, and a paper by Mr. W. B. Farquhar, of Ilford, on "High-Pressure Lighting."

New Edition of "Michael and Will."—We have received from Messrs. Butterworth and Co., of Bell Yard, E.C., the sixth edition of "Michael and Will on the Law Relating to Gas and Water." The preceding edition was produced under the editorship of the late Judge Shiress Will; but his judicial duties and lamented death necessitated the selection of a successor. The services of Mr. Joshua Scholefield, of the Middle Temple and the North-Eastern Circuit, and Editor of "Lumley's Public Health," were secured; and under his supervision the present edition of the book, a fuller notice of which will appear in a subsequent issue, was prepared.

PERSONAL.

On the 1st of May last, the Chairman of the Romford Gas Company—Mr. JOSEPH SMITH, J.P.—reached his Jubilee as a Director; and his colleagues on the Board felt that the shareholders would naturally wish to mark this interesting event by offering Mr. Smith some proof of the regard and esteem which they feel for him, and in grateful remembrance of his long and able services. On behalf of the Company, he was presented with a set of decorative silver for the table, of the value of 50 guineas; and in the report presented at the recent half-yearly meeting, the Directors expressed the assurance that this presentation would have the cordial approval of the shareholders.

As noted in another column, it was resolved at the recent annual meeting of the Barnsley Gas Company to place on record the shareholders' appreciation of the fifty years' services of Mr. W. W. HUTCHINSON with the Company, and regretting that ill-health had caused him to resign the position of Secretary and General Manager. The Chairman (Mr. E. G. Lancaster, J.P.), at the opening of his address to the proprietors, said that Mr. Hutchinson had spent practically all his life with the Company. He was born on the place; and the whole of his working life had been devoted to the interests of the undertaking. The positions he had held were now divided; Mr. HAROLD HUTCHINSON having been appointed Manager of the productive part, and Mr. T. W. ROYSTONE Secretary. They would work in conjunction; and the Directors hoped that the results might be still more satisfactory than in the past.

Electrolysis of Water-Mains in Chicago.

Electrolysis of water-mains has been investigated in Chicago by the Bureau of Public Efficiency, in order to ascertain if it is a factor in the great leakage from pipes which is believed to be taking place. This loss of water has been estimated to amount to two-thirds or three-quarters of the whole quantity pumped. Last year, Mr. Dabney H. Maury reported that about 170 million gallons a day were probably wasted through leaks in street-mains and service-pipes. As a result of an electrolysis survey by the Bureau's Chief Engineer, Mr. A. J. Hammond, it is stated in the report on the investigation that numerous pipes were found to be leaking owing to damage by electrolysis, and that the mains were in many cases found to be carrying sufficiently heavy currents to render this source of injury to the distribution system something to be studied carefully and at regular intervals. It is considered particularly important to take up the subject just now, because the city is contemplating installing a high-pressure fire-protection system, and any failure of pipes under 300-lb. pressure would probably be very destructive. The pipes will probably be made of steel, which, according to the Bureau, is more easily affected by electrolysis than cast iron; and no precaution should be spared to protect them from such injury. It is stated in the report that no remedy can be prescribed definitely until the trouble has been investigated thoroughly; and therefore a comprehensive electrolysis survey is urged to determine the existing conditions.

Proposed Formation of an Institution of Water Engineers.—

Application has been made to the Board of Trade, under the Companies (Consolidation) Act, 1908, for a licence directing an association about to be formed under the name of the Institution of Water Engineers to be registered with limited liability, without the addition of the word "limited" to the name. The objects for which the proposed Institution is to be established are: (1) To acquire and take over the whole or any of the assets and liabilities of the Association of Water Engineers, established in 1896; and (2) to promote the advancement of water engineering in all or any of its branches, and all matters connected with or relating to water undertakings.

Friction Losses in Elbows and Tees in Small Pipes.—This is a subject which has not often been investigated, though the importance of friction losses in certain classes of construction has been frequently emphasized. Experiments made some nine or ten years ago by Mr. C. W. L. Alexander, at the University of Birmingham, showed that Weisbach's formula for these losses gave results which were too large for sharp bends and too small for long ones. But his work was limited in scope, and made with pipes of varnished wood. We learn from "Engineering Record" that further investigations into this subject have been carried out at the hydraulic laboratory of the University of Wisconsin, under the direction of Professor George J. Davis, who has published the results in one of the University "Bulletins." The experiments were conducted with 2-inch pipe, a number of standard commercial fittings, and several bends of different radii made from pieces of 2-inch pipe. These were inserted between runs of pipe of sufficient length to permit the determination of the entire distance, above as well as below the bend, in which the latter affected the regularity of the flow. The losses at many different velocities were determined for each bend or fitting; and the results are tabulated, and also plotted logarithmically. With 10 feet velocity, the loss of head due to curvature first becomes apparent when the radius of the bend is about 32 times the diameter of the pipe, and increases very slowly until the radius is about six diameters. Then it grows in a rapidly increasing amount until at a radius of two diameters it is three times what it was at six diameters, and at one diameter is about nine times what it was at six diameters.

WAGES AND HOURS OF LABOUR IN 1910.

LABOUR statistics of one kind and another are certainly just now much in evidence; but this fact would not justify the overlooking of the yearly volume of the Labour Department of the Board of Trade, dealing with changes in wages and hours of labour. It is a useful guide to trade conditions, and so some of the principal points from the latest issue (which was published a few days ago) may be noted.

It is the eighteenth annual report, and bears the signature of Mr. G. R. Askwith; and it deals with the changes, during the year 1910, in the rates of wages and recognized hours of labour of workpeople in the United Kingdom for a full week's work, exclusive of overtime. Before noticing the figures, it should be mentioned that, for the purposes of the report, a "change in wages" is defined as a change in the rate of remuneration of a certain class of workpeople, apart from any change in the nature of the work performed. Changes affecting less than five workpeople in each case are not included; and the report does not deal with changes in average earnings arising out of variations in the extent of employment obtainable by workpeople. It is pointed out that the Department received returns from employers and Employers' Associations, Trade Unions, its own correspondents, and other sources; and the daily and trade papers were searched for references to any movements in wages or hours. As soon as there was any reasonable ground for believing that some change had taken place, forms of inquiry were issued to the parties concerned, inviting them to state the facts; and as a general rule they readily complied. The statistics may therefore, it is added, be said to rest on the basis of the replies received at first-hand from those best able to furnish exact particulars at a time when the facts were fresh in their memories. It is not suggested that the records used in the report are complete; but owing to the general prevalence of collective bargaining between organizations of employers and of workpeople, it has been found possible to obtain particulars of changes covering, in most industries, a large proportion of the industrial population, and consequently affording an indication of the direction of the movement in the market rate for labour. The year 1910 was one of improving trade and employment; and Mr. Askwith remarks that this fact is reflected in the changes in rates of wages, which showed a net increase of £14,500 per week, as compared with net decreases of £69,900 and £59,200 in 1909 and 1908. The net amount of the changes in 1910 was largely affected by the fact that the prices of coal and iron did not show such a marked upward tendency as other commodities, with the result that the net increase in weekly wages in these industries was only £7352. Since 1896 there have been three periods of rising wages (1896-1900, 1906-7, and 1910) and two periods of falling wages (1901-5 and 1908-9); the net effect being an increase of £353,985 in an ordinary week's pay of the workpeople directly affected. The downward movement in wages which commenced in 1908, and continued during the greater part of 1909, was checked towards the end of the latter year. Early in 1910 it gave place to a slight upward tendency which was, on the whole, maintained during the remainder of the year, with the result that the general level of wages at the end of the year was, with two exceptions (1907 and 1908), higher than at the end of any year since 1893, when statistics of changes in rates of wages were first systematically collected by the Department. The net effect of the changes in hours of labour reported last year was a reduction of 47,575 in the weekly working time of the persons affected.

As already remarked, the net result of all the changes reported to the Department as taking effect in 1910 was an increase of £14,500 per week in the wages of 548,900 workpeople. Agricultural labourers, seamen, and railway servants are not included, as the numbers affected are not known. Of the total named, 391,200 received a net increase of £16,400 per week, and 137,400 sustained a net decrease of £1900 per week; while the remaining 20,300 workpeople had upward and downward changes which left their wages at the same level at the end as at the beginning of the year. In 1909, 1,154,800 workpeople sustained a net decrease of £68,900 per week. If, says the report, the effect of the changes in rates of wages be calculated from the date of each change to the end of the year, the aggregate increase in wages due to these changes is computed at £138,000 in 1910, as compared with decreases of £2,757,400 and £873,800 in 1909 and 1908 respectively, and increases of £5,821,000 and £1,419,000 in 1907 and 1906. As in previous years, the changes in the coal-mining industry accounted for a large proportion of the number of workpeople affected, and also of the total amount of the changes, though the proportion of the latter accounted for by coal mining in 1910 was considerably smaller than in most of the previous years. Of the total number of workpeople whose wages were changed, 70 per cent. were employed in this industry; the amount of their net increase forming 38 per cent. of the total. The engineering and shipbuilding trades accounted for 9 per cent. of the number affected and 18 per cent. of the amount of change. The corresponding percentages for the manufacture of pig iron and iron and steel were 8 and 13, and for the textile trades 5 and 13. The changes in the fifteen years, 1896 to 1910, show a net increase in every group of trades dealt with. The total net increase, as already stated, is £354,000 per week; and of this, coal mining accounts for £168,000, or nearly one-half, while the building, engineering and

shipbuilding, and textile trades account for £117,300, or nearly one-third of the total.

The proportion of the total industrial population (5·6 per cent.) affected by ascertained changes in rates of wages in 1910 was lower than in any of the previous ten years; and the proportion of the workpeople so affected was as usual largest (38·4 per cent.) in coal mining. The actual number of persons connected with this industry who were affected by changes in wages last year was, however, smaller than for several years past. This is due to the fact that no changes were recorded in the Federated Districts (comprising Yorkshire, Lancashire, Cheshire, Nottinghamshire, Derbyshire, Leicestershire, Warwickshire, Shropshire, parts of Staffordshire, and North Wales), Scotland, or the Forest of Dean. In Durham wages fell; while there was an increase in Northumberland and South Wales. The number of workpeople affected in 1910 was 383,586; and the net effect of the changes was an increase of £5488 per week. In all cases wages stood at a higher level at the end of 1910 than at the end of 1896. In every instance, however, with the exception of the Federated Districts, South Staffordshire and East Worcestershire, and Bristol, they were below the high level attained in 1900. In the districts named, wages stood at the same level as at the end of 1900. In 1910, 10,512 workpeople engaged in the mining of ironstone and iron ore had their wages changed; the net result being an increase of £414 per week. In the previous year, the 9521 workpeople sustained a net decrease of £236 per week. In the quarrying industry, 5806 workpeople received a net increase of £289 per week; while the figures for 1909 showed a net increase of £147 per week in the wages of 3123 persons.

In the metal, engineering, and shipbuilding trades, the number of workpeople affected by changes in wages in 1910 was 97,343; and the net result was an increase of £4732 per week. In the previous year, 93,484 persons sustained a net decrease of £4325 per week. The most important changes in the engineering trades were increases affecting 20,000 people on the North-East Coast and 13,000 on the Clyde. The amount of the change was 2½ per cent. on piece rates and 1s. per week on time rates in the former case, and 5 per cent. on piece rates and ¼d. per hour or 1s. per week on time rates in the latter. In addition, 1279 engineers and boilermakers at Birkenhead, 1500 engineers at Bradford, and 1200 ironmoulders at Sheffield received an increase of 1s. per week; and 3000 boilermakers on the Clyde received 5 per cent. on piece rates and ¼d. per hour or 1s. per week on time rates. Employment in the engineering and shipbuilding trades in the first part of 1910 showed a marked improvement as compared with 1908 and 1909; but it was adversely affected in the latter months of the year by the boilermakers' dispute. The mean percentage of trade unionists unemployed in the engineering industry in 1910 was 5·8; and in the shipbuilding industry, 13·2. The corresponding figures for 1909 were 11·6 and 22·1 respectively. The changes in rates of wages in the textile trades in 1910 affected 29,220 workers, and resulted in a net increase of £1848 per week. Increases amounting to £1864 per week affected 28,662 persons; while 558 sustained decreases amounting to £16 per week.

The tables set forth that 43 gas workers in company employ received a total weekly rise in wages amounting to £3. With regard to local authorities, there are recorded various instances of advances. At Shipley, gas-works labourers received rises of 8d. to 2s. 9d. per week, making the wages 22s. 8d. to 24s. 9d.; coke-wheelers, 2s. or 3s., making the wages 24s. and 27s. per week; stokers, 4d. to 6d. per shift, making the pay 5s. 4d. and 5s. 6d.; and meter inspectors, 2s. per week, making the wages 28s. and 30s. In connection with the Leeds Corporation gas undertaking, the following advances were made: Stokers, firemen, drawers, and attendants, 2d. per shift, to 5s. 6d.; chargers, 2d. per shift, to 5s. 8d.; machine-men, 1d. per shift, to 5s. 9d.; coal-wheelers and purifiers, 2d. per shift, to 4s. 6d.; coke-wheelers, 3d. per shift, to 4s. 7d.; coke-trimmers, 2d. per shift, to 4s. 4d.; yard-labourers, 2d. per shift, to 4s. 2d.; horsemen and cartmen, 1s. per week, to 27s. The lamplighters at Devonport have enjoyed rises of 1s. or 1s. 6d. per week, making the wages 22s. and 22s. 6d.; at Eastleigh, of 1s. or 2s. per week, to 20s. to 23s.; and at Johnstone, of 1s. per week, to 24s.

As to the methods by which changes in wages were arranged last year, 7·3 per cent. were under sliding-scales, against 3·3 per cent. in 1909; 69·5 per cent. were by conciliation boards, mediation, arbitration, &c., against 68·2 per cent.; and 23·2 per cent. by other methods (direct arrangement, negotiation, &c.), compared with 28·5 per cent. It is pointed out that the diminution shown in the last eight years in the number of persons whose wages were regulated by sliding-scales (from 19·2 to 7·3 per cent.) is almost entirely accounted for by the alteration in the method of arranging the changes in rates of wages of the South Wales coal-miners. Up to the end of 1902, their wages were regulated by a sliding-scale; but since then they have been arranged by a conciliation board. The number of workpeople in 1910 whose changes in wages were preceded by a stoppage of work was small (10,275, or 1·9 per cent.); but in this calculation no account is taken of strikes or lock-outs that failed to produce a change in wages, or of threatened strikes or lock-outs that may have influenced the changes.

Turning now to the section of the report which deals with changes in hours of labour, it is found that the number of workpeople affected in this way in 1910 was small compared with that of those whose wages were changed. But, of course, the changes recorded do not include temporary alterations in the working

hours owing to variations in the state of trade, or the regularly recurring seasonal alterations, as in the building trades. The changes reported affected 27,366 workpeople, of whom 8006 had their aggregate working time increased by 7086 hours per week, and 19,360 had reductions amounting to 54,661 hours per week. The net effect of all the changes was thus a reduction of 47,575 hours in the weekly working time of the persons affected. Of the total number affected by changes in hours of labour, 12,918 were in the building trades. A table covering the last ten years shows that in each year there has been a net reduction in working hours per week of people affected by such changes.

A TREATISE ON SHALE OIL.*

DR. W. SCHEITHAUER is manager of one of the largest works in the Saxony-Thuringian district in which brown coal or lignite is distilled for the production of oil. The manufacture of this brown coal crude oil, or tar, is carried out much in the same way as the production of crude shale oil in Scotland; and the work by Dr. Scheithauer, which is before us, deals with the manufacture of oil by the distillation of shale, brown coal, and certain descriptions of bituminous coal.

The author is already well known as the writer of a text-book on the manufacture of mineral oils, which was noticed in the "JOURNAL" some years ago (Vol. LXVI., p. 871). The present work is of a rather more specialized character, and closely follows in style and execution the already published examples of the new series of handbooks on chemical technology issued by the publishing house of Otto Spamer, of Leipzig, under the general editorship of Dr. Ferd. Fischer. The present volume is well worthy to take its place in this excellent series.

At the outset, the author traces the history of dry distillation processes, beginning with the distillation of wood by Boyle in 1661. In 1681, a patent was granted for the production of pitch and tar from ordinary bituminous coal; but it was not until the beginning of the Nineteenth Century that the distillation of shale or lignite was conducted on a large scale. Its development was due in Scotland to the labours of James Young, and in Germany to those of Carl von Reichenbach. As is well known, the Scotch industry has had a hard struggle to survive in the face of the competition of imported mineral oils. The German industry has benefited by the protection afforded by a high import duty on mineral oils; but owing to the limited supply of high-grade raw material and other causes, it has proved quite unequal to meeting the native demand for burning oil, and the importation of the latter into Germany is extremely large. A more recent, and in many respects more important, development of the shale-oil industry is that which has taken place in Australia, where the rich native bituminous shale is distilled in large quantities for the production of oil, and may eventually keep imported oils out of the Australian market. This Australian shale was at one time imported on a small scale into Great Britain as a substitute for cannel, and considerable quantities of it were until quite recently used by the Frankfort-on-Maine Gas Company for the manufacture of the gas which it supplied, and which was required to be of an illuminating power of about 35 candles. The reorganization of the Frankfort gas supply about two years ago incidentally involved the abolition of this high-grade gas, and no doubt since that time Australian shale has been less in demand than hitherto for gas making in Frankfort.

Dr. Scheithauer reviews the bituminous raw materials available for the production of crude oil. These are the bituminous lignites or brown coals of Saxony and the bituminous coals of Messel, the Scotch bituminous shales, the bituminous shales of Autun and Buxières les Mines in France, and the bituminous shales of New South Wales already referred to. There are reported also to be deposits of bituminous shale in French West Africa, and in New Brunswick. The origin of these deposits is discussed, and the properties and composition of the brown coals and shales are dealt with fairly fully. The author proceeds in the third chapter of the book to deal with the distillation process for the production of the crude oil or tar. The methods followed when brown coal or lignite is the raw material are first dealt with, then the different methods followed with bituminous coal at Messel near Darmstadt, and finally the Scotch shale processes. The French and Australian shale oil industries follow the Scotch procedure.

The author next reviews the methods of investigating the crude oil or tar and the liquor obtained in the first distillation of the lignite or shale, and the evaluation of the residues. He then goes on to describe the distillation of the crude oil or tar for the separation therefrom of commercial products. Tables are given showing the average proportions of different grades of oil obtained from brown coal tar and Scotch crude oil. In the sixth chapter, the chemical treatment of the distillates is dealt with.

The important branch of paraffin manufacture is the subject of the seventh chapter. This refers more particularly to the crystallization, pressing, and purification of solid paraffin from the brown coal oils; but there are a few pages also with reference to the recovery of paraffin from Scotch shale oil. The eighth chapter discusses the yields and results of the industry, especially the Saxony-Thuringian branch of it. In the ninth chapter, candle manufacture is dealt with; and the tenth chapter refers to the

chemical composition of the crude oil and its distillates. The laboratory work involved in the industry is the subject of the eleventh chapter, and is adequately treated. The twelfth chapter gives statistics of different branches of the industry.

In Saxony-Thuringia, 62,363 metric tons of crude oil or tar were produced during 1909 in eleven factories. The crude oil produced in Scotland is over four times this quantity. There are now only six companies at work in Scotland; but they have about 1500 retorts in action. In regard to the development of the industry, the author points out that the distillation apparatus has played a far more important part in Scotland than in Saxony-Thuringia. Since the seventies, there have been no considerable changes in the distillation retorts of Saxony-Thuringia; while new types of retort have been continually introduced into Scotland up to the most recent years. The reason for this difference, he says, is that in the working-up of brown coal or lignite the production of coke takes an important place, and this is effected quite satisfactorily by the old apparatus. On the other hand, the recovery of ammonia takes the place of coke production in the Scottish shale oil industry, and there have been constant and successful efforts in Scotland to improve the yield of ammonia by changes in the retorts and methods of distillation.

In conclusion, we may say that Dr. Scheithauer has prepared in this volume an excellent account of the shale and brown coal oil industries. The account is necessarily more exhaustive and authoritative in respect of the brown coal branch of the industry; but within the limits of his space, he has dealt very satisfactorily also with the Scotch shale branch of the industry.

CONSTRUCTION AND MANAGEMENT OF SMALL GAS-WORKS.*

IT must be conceded that Mr. Norton H. Humphrys, in his book on "The Construction and Management of Small Gas-Works," has satisfied a want. It is a very common complaint, by men in charge of small works, that little is written to help them in their special difficulties. It is but natural that the managers of these works who are both competent in their duties and in the production of journalistic matter are few and far between; hence the comparative lack of technical fare for the small works' man. It must, therefore, obviously be left to men of the calibre of Mr. Humphrys to supply the deficiency.

The book under review is good in every respect, and deals very ably with the whole question of the management of small works; carefully explaining such matters as the "Legal Position of Small Gas Companies," "Raising and Spending Capital," "Selling Prices and Terms of Supply," and "Accounts—Forms and Tables," in addition to the details of the manufacture and distribution of gas. A Supplement on the "Actual Costs and Capacity of Recently Erected Gas-Works," by Mr. Brearley, who gives valuable information on this subject in his description of the construction of three gas-works, greatly adds to the usefulness of the book.

Mr. Humphrys explains in his "Introductory" chapter that his remarks are chiefly addressed to those who are in charge of small works making less than 10 million cubic feet of gas per annum. He states that there are no less than 450 undertakings in the United Kingdom making 5 millions or less in the period named. To deal briefly with the subject-matter of the respective chapters, Chapter IV. relates to "Laying-Out Design of Gas-Works," and contains some useful advice. Then follows a comparatively short chapter on "Distribution." In another short chapter (VI.) on "Commencing Operations" is discussed the type of man best suited for the position of working manager. The writer is at his best in Chapter VII., on "The Manager on the Works." Lax methods—so often observed in the past—are condemned; and much sound common-sense advice is given on the important details of small works management. Then follows "The Manager in the District;" and it is shown that it is as necessary to keep one's temper with exacting consumers as it is to properly regulate district pressures. In a chapter on "Selling Prices and Terms of Business," Mr. Humphrys shows how erroneous is the "very general idea that the working expenditure plus the sum required for dividend will represent a fair selling price." Much-needed advice is also given on the question of "slot" meter prices and unprofitable consumers. In dealing with "Public Lighting," it is shown how prevalent is the practice in villages of short and intermittent lighting hours, and how necessary it is to take this custom into account in framing the price of gas for this purpose. In Chapter XI., on "Unaccounted-for Gas," we meet with the statement that "there is too great a tendency to suppose that a loss of 15 to 20 per cent. must be accepted as unavoidable;" preparing the reader for much wise counsel on the necessity of carefully watching the sources of leakage and loss both in works and district. It will be news to some that the installation of a sulphate plant in a 3 million gas-works may prove a good investment. Mr. Humphrys deals with the subject, and briefly describes Wilton's plant for the direct production of sulphate in small works.

Not the least useful part of the book is the reproduction of

* "The Construction and Management of Small Gas-Works." By Norton H. Humphrys, Assoc.M.Inst.C.E., F.C.S. With a Section on "Actual Costs and Capacity of Recently Erected Works," by John H. Brearley. London: John Allan and Co.; 1911. [7s. 6d.]

* "Die Schmelteere, ihre Gewinnung und Verarbeitung," von Dr. W. Scheithauer, Direktor. Leipzig: Otto Spamer; 1911.

seventeen specimen forms suitable for keeping accounts and records relating to works and district.

Mr. Brearley has but a small portion of the book in which to give details of the construction of three small works; and there is little doubt that this useful and practical information will be referred to by those engaged in the erection of gas-works. Drawings and plans are given, and also details as to the cost of each part of the plant, and other expenditure.

Both portions of the book will doubtless prove valuable to those engaged in the management of small undertakings.

MANUFACTURE OF SULPHATE OF AMMONIA.

It is a curious fact that, while there are few gas-works of any size without a sulphate plant, there has been until recently no book on the subject to which either the student or the practical man could refer for information. Mr. Gascoigne T. Calvert, the late Manager of the Nechells Chemical Works, Birmingham, has supplied the demand with a publication which is likely to prove popular and may be of some assistance to those without much practical experience on the subject.* In this book of 153 pages there is contained much information profusely illustrated.

The author deals first of all with the composition and analysis of sulphate of ammonia, and passes on to the raw materials—ammoniacal liquor, sulphuric acid, and lime. Chapter III. treats of the plant in general and superheaters in particular; and attention is drawn to the tachometer—an interesting little instrument by means of which it is possible to record on a chart the revolutions of pumps. There is no need to question the utility of such a tell-tale in a sulphate plant working at night. The various types of stills are described in chapters IV. and V., followed by details of liming apparatus, waste liquor valves, and well-known types of saturators and the different methods by means of which they are discharged. It is particularly noteworthy, from a perusal of this work, that modern apparatus has played its part in greatly reducing the amount of labour required in making sulphate. Nowadays, with up-to-date plant of large size there is, practically speaking, little need for manual labour; all the work being carried out by mechanical appliances merely requiring skilled attention. The author deals in an interesting manner with methods of drying, storing, and packing sulphate.

In Chapter IX., the author explains the means of disposing of the waste gases from the saturator. In this connection, conversion into sulphuric acid, the Claus process, and oxide purification are all discussed; and the advantages and disadvantages of each method are explained. A chapter on "Starting, Working, and Stopping the Plant—Difficulties in Working and their Remedies," will be helpful to readers. It is this practical information which is valuable, but which the practical writer is often chary of imparting to his readers from reasons of false modesty, under the impression that "everyone knows that."

The work may be confidently recommended to all those who have any part in the management or working of sulphate plants. The information contained in it proceeds from a source which is decidedly reliable, trustworthy, and experienced; and the clear style in which the book is written renders the subject matter easy of grasp by the reader.

* "The Manufacture of Sulphate of Ammonia." By Gascoigne T. Calvert. London: John Allan and Co.; 1911. [7s. 6d.]

Alderman Thomas Briggs, of The Cedars, Bowdon, Cheshire, Lord Mayor of Manchester from 1899-1900, the Chairman of the Brynn Hall Colliery Company, Limited, and a Director of the Manchester Ship Canal Company, whose death on May 28 last, aged 80, was announced in the "JOURNAL" for the 6th of June, left estate valued at £69,911 gross, with net personalty amounting to £54,198.

The "Co-Partners' Magazine" of the Gaslight and Coke Company says that Mr. J. Hunter, Inspector-in-Charge at the Camden Road office of the Company, will retire on the 1st of November next on account of ill-health, and that Mr. R. Willsmer, Inspector-in-Charge at Mare Street, will succeed him. Mr. Hunter entered the service of the Imperial Gas Company in May, 1870, and completed 41 years' service on the 17th of July last.

Mr. M. McCallum Fairgrieve, of the Edinburgh Academy, has written to "Nature" to direct attention to the inaccuracy of a common statement in elementary text-books describing the action on litmus of carbon dioxide in solution. The writer says it is generally stated that the action of carbon dioxide is to turn litmus "wine red;" while the fact is that carbon dioxide dissolved in distilled water turns neutral litmus red, just like any other acid. The cause of the wine-red colour usually obtained is the presence of alkaline bicarbonates as impurities. That this is the case can be seen by adding a drop of ammonia or sodium carbonate solution to the carbon dioxide solution, when the colour changes, first, from red to blue, and then, after an interval which depends on the amount of alkali added, to the wine red usually associated with the action. A weak solution of lime water acts similarly; and this would seem to be the origin of the error, as if hard waters are used to make up the solutions the wine-red colour is produced.

MANUFACTURE OF SULPHATE OF AMMONIA BY THE DIRECT PROCESS.

A Study of the Modern Methods.

By G. STANLEY COOPER, B.Sc., F.C.S.

To the German chemist, Brunck, is due the credit for having originated a process which has completely revolutionized the methods of manufacture of sulphate of ammonia, and, indeed, one might say, the whole coke-oven industry. Probably in a few years' time, the improved process will have spread to gas-works, where at present the old method of distillation of liquor holds almost universally.

Brunck's installation cannot be said to have been a success practically; but he sowed the seed of revolution, and later workers have benefited by it. Perhaps the two chief processes in operation at the present time on the direct method are those of Koppers and the Otto-Hilgenstock Company respectively. In another direction, and based on entirely different principles, are the processes of Feld, Burkheiser, and Burstall. In this article, only the two direct processes of Koppers and Otto-Hilgenstock and Burkheiser are dealt with—the others being at present in a more or less experimental stage, and much information concerning them not being available.

Undoubtedly, the ideal process is that put forward by Burkheiser, and carried out by him at Berlin, Hamburg, &c. Here we have crude coal gas containing all the materials necessary for the manufacture of sulphate of ammonia. Why then should it be necessary to have recourse to the aid of outside agencies? The sulphur in coal gas is capable of being transformed into a compound which will combine with ammonia directly to form sulphate of ammonia. In ordinary processes, this sulphur is removed by oxide and converted into sulphuric acid; and then this acid is used to neutralize the ammonia. Theoretically, therefore, the process is an ideal one, and must commend itself to all scientists as being the final aim of sulphate makers. Unfortunately, the process does not seem to be quite as easy to work on a practical scale as it is to map-out on paper; and numerous difficulties are met with, which lie outside the theoretical process. However, the Burkheiser Company are confident of the ultimate success and value of the process; and a few years may see great developments in this direction.

By a truly direct process, one would understand a process in which all the ammonia is absorbed from the gas by the sulphuric acid, and converted into sulphate of ammonia. There would be no distillation of liquor at all—indeed, there would be no liquor. Accepting this definition, the Koppers' process would be classified as a semi-direct process; for condensation does take place, and about half the usual amount of liquor is produced. This liquor contains practically the whole of the "fixed" ammonia salts which are present in the crude gas. The liquor is distilled, and the ammonia evolved is mixed with the stream of crude gas and passes into the saturator with it. In this way, the whole of the ammonia in the gas—both "free" and "fixed"—is recovered in the saturator, with a minimum amount of distillation.

The reaction between sulphuric acid and ammonia is exothermic; but Koppers found that the heat produced was not sufficient to maintain the liquor in the saturator at a temperature requisite for the production of solid sulphate, so long as the crude gas was passed into the saturator cool. He, therefore, devised the process of heating-up the gas after leaving the condensers, and passing it into the saturator at a higher temperature. Such conditions he found quite satisfactory for the production of a good salt; and it is upon this principle that the Koppers' process works.

The Otto-Hilgenstock process claims to be a truly direct process, in that no distillation is evolved—there being no condensation and no effluent liquor. On leaving the ovens, the gas is sprayed with hot tar; and this is said to remove practically all traces of tar-fog from it. From this tar spray, the gases go direct to the saturator; and here the ammonia is extracted.

One or two questions suggest themselves in connection with this process. It is stated that the gases are maintained throughout at a temperature above the dew-point, and hence there is no condensation of aqueous vapour and no solution of ammonia. This being so, it necessarily follows that the fixed ammonia salts are carried forward into the saturator. Of the fixed ammonia salts, 70 to 80 per cent. consist of ammonium chloride; and if this reacts with the sulphuric acid in the saturator, some hydrochloric acid gas would be produced and carried forward. This gas would be a source of great trouble in the mains, owing to its high corrosive power. If no hydrochloric acid is produced, then the ammonium chloride would eventually be precipitated along with the sulphate; and hence the latter would be partially contaminated.

To the writer, this seems to be the possibility if there is no condensation. On the other hand, if there is condensation, then if the ammonia is to be recovered at all, recourse must be had to distillation or evaporation. It has been suggested that the liquor should be evaporated, and solid ammonium chloride recovered in this way; and hence all the ammonia would be accounted for.

The above outline shows briefly the trend of the development in sulphate manufacture and ammonia recovery; and one must

admit that the methods are far ahead of those adopted for ammonia recovery on gas-works. No scrubbing plant is here required, and no water; and so alone, the annual saving on a big installation would be enormous. Apparently, too, according to several observers, the quality of the gas is not affected.

It is to be hoped that in the near future some enterprising gas-works will come forward and adopt one of these modern plants for ammonia recovery. Once adopted, the development will be very rapid indeed.

THE LOSS OF AMMONIA FROM ITS SOLUTION.

By A. V. HENDRICKSON.

IN view of the statements that have recently been made with regard to the loss of ammonia that occurs when a solution containing it is heated, the experiments detailed below were made to gain further information on this point.

R. Rempel ("Zeits. f. angew. Chemie," 1889) stated that a solution of semi-normal ammonia may lose about 20 per cent. of its content of ammonia in five minutes, when exposed to the air in a shallow porcelain basin at ordinary temperatures. Quite recently J. T. Sheard stated that in twenty-four hours, with a still atmosphere, 3 to 5 per cent. of the amount exposed may be lost; while in the "JOURNAL OF GAS LIGHTING" for May 9, G. M. Gill reports the following figures obtained by heating a liquor containing 4 "ounces" free ammonia, and 8.4 "ounces" fixed ammonia. As, however, the "fixed" ammonia would not be affected by heating, the "free" only is considered. From the "ounce" strength figures given, the ammonia in grammes per 100 c.c. of liquor has been calculated:

Original strength 4.0 "ounces" = 0.867 grammes per 100 c.c.				
Heated to 150° Fahr.	4.0	"	= 0.867	" " = 0.00 p. ct. loss
160°	3.8	"	= 0.824	" " = 4.96 " "
176°	3.3	"	= 0.715	" " = 17.54 " "
184°	3.0	"	= 0.650	" " = 25.03 " "
194°	2.8	"	= 0.607	" " = 29.99 " "

No details are given as to the method of testing or of the vessel used.

In the following series of experiments, the test liquid was made by diluting ammonia solution of 0.88 specific gravity with distilled water. The strength of such solution was 9.6 "ounces," approximately, and contained "free" ammonia only.

For the experiments, three vessels were used—

- (1) Glass beaker, 3½ inches diameter by 3 inches deep.
- (2) Small narrow-neck flask, 3 inches greatest diameter; the neck being 2½ inches long by ¾ inch diameter.
- (3) Large porcelain evaporating dish—the diameter of the liquid being about 3½ inches, the greatest diameter of the dish being 5 inches.

The solutions were supported on the usual wire gauze, and gradually heated by an ordinary bunsen flame. The details of one experiment are shown in the beaker test below. Normal sulphuric acid was used for titrating, and the loss of ammonia is stated as a percentage of the original content.

	Beaker.		Flask.	Dish.
	Grammes per 100 cc.	Total Loss per Cent.	Total Loss per Cent.	Total Loss per Cent.
Original	2.090	..	..	..
Heated to 100° Fahr.	1.768	15.4	0.0	8.2
120°	1.717	17.8	0.0	20.1
140°	1.666	20.3	..	31.1
160°	1.632	21.9	0.0	..
180°	1.445	30.9	2.6	33.7
200°	1.105	47.1	7.7	49.0
210°	0.935	55.3	25.5	66.0

As to the tests with the beaker and flask given above, the liquid was agitated after each addition of acid; and with the evaporating dish, mixture was brought about by the use of a glass stirring rod. This agitation, with large surfaces, causes a great loss of ammonia, as proved in the following experiment, in which the same quantity of the ammonia solution was placed in the evaporating dish and (1) titrated direct, the acid being run in until practically the neutral point was reached, and then mixed with the least possible agitation; and (2) titrated after stirring slowly with the stirring rod for one minute.

- (1) Titrated direct = 2.00 grammes per 100 c.c.
 - (2) Titrated after storing = 1.87 " "
- Loss. 0.13 " " = 6.5 per cent.

With this result in mind, the next series was made—avoiding agitation as much as possible during the titration; the acid being run in until the neutral point was almost reached, the last few drops being added with the minimum amount of stirring. The bulb of the thermometer was, in every case, rinsed with water on its removal from the solution.

	Beaker.	Flask.	Dish.
	Total Loss of Ammonia per Cent.		
Heated to 100° Fahr.	2.4	1.04	8.0
120°	3.7	1.04	10.7
140°	3.7	1.88	16.2
160°	10.4	3.29	31.0
180°	18.5	3.43	31.8
200°	23.1	5.64	82.5

The tests at 210° were omitted as the reading of the thermometer was not considered definite enough. It may be remarked here that the solution was heated with the thermometer suspended at about the centre of the depth of the liquid.

In the next tests, some of the ammonia solution was allowed to stand in the three vessels, on a shelf in the laboratory for twenty-four hours. The temperature of the room during this period did not vary more than 5° (60° to 65° Fahr.), and the solutions were not in a direct draught, other than that caused, during a part of the time, by people moving about.

The original solution, titrated in all cases immediately before the test, contained 2.108 grammes of ammonia per 100 c.c. After standing twenty-four hours—

- The beaker contained 0.136 grammes = 93.6 per cent. loss
- The flask " 1.870 " = 11.3 " "
- The dish " 0.085 " = 96.0 " "

These tests are important as showing the effect of evaporating surface, the dish having lost 96 per cent. of its ammonia content in twenty-four hours.

The following figures were obtained with actual samples of ammoniacal liquor. They were heated in the same vessels as previously, account being taken of the "free" ammonia only.

Ounce strength, "free"	4.31		5.72		
Grammes per 100 c.c.	0.935		1.241		
—	Flask.	Dish.	Beaker.	Flask.	Dish.
Heated to 100° F., total loss p. ct.	0.0	2.84	0.00	0.0	2.76
" 120° "	0.0	..	1.37	0.0	..
" 140° "	0.0	8.39	2.74	0.65	6.90
" 160° "	..	12.97	8.22	0.65	12.34
" 180° "	..	24.08	13.70	0.65	27.60

Further samples of other liquors were then exposed on the Laboratory shelf for the given period.

Ounce strength, "free"	6.03	8.62
Grammes per 100 c.c.	1.309	1.87
Temperature	70°	75°
Time exposed, hours	2	40
Beaker, total loss per cent.	8.5	73.21
Flask	1.9	18.19
Dish	13.9	100.00

The tests therefore show that considerable loss of ammonia occurs when its solution is exposed to an atmosphere free from direct draughts; such loss, even after the lapse of but two hours, amounting to 14 per cent. where the surface exposed is large. Large losses also occur on agitation; a liquor of approximately 9-oz. strength, "free" ammonia, having lost 6.5 per cent. after one minute's gentle agitation in the cold. With hot liquor the loss is considerably greater.

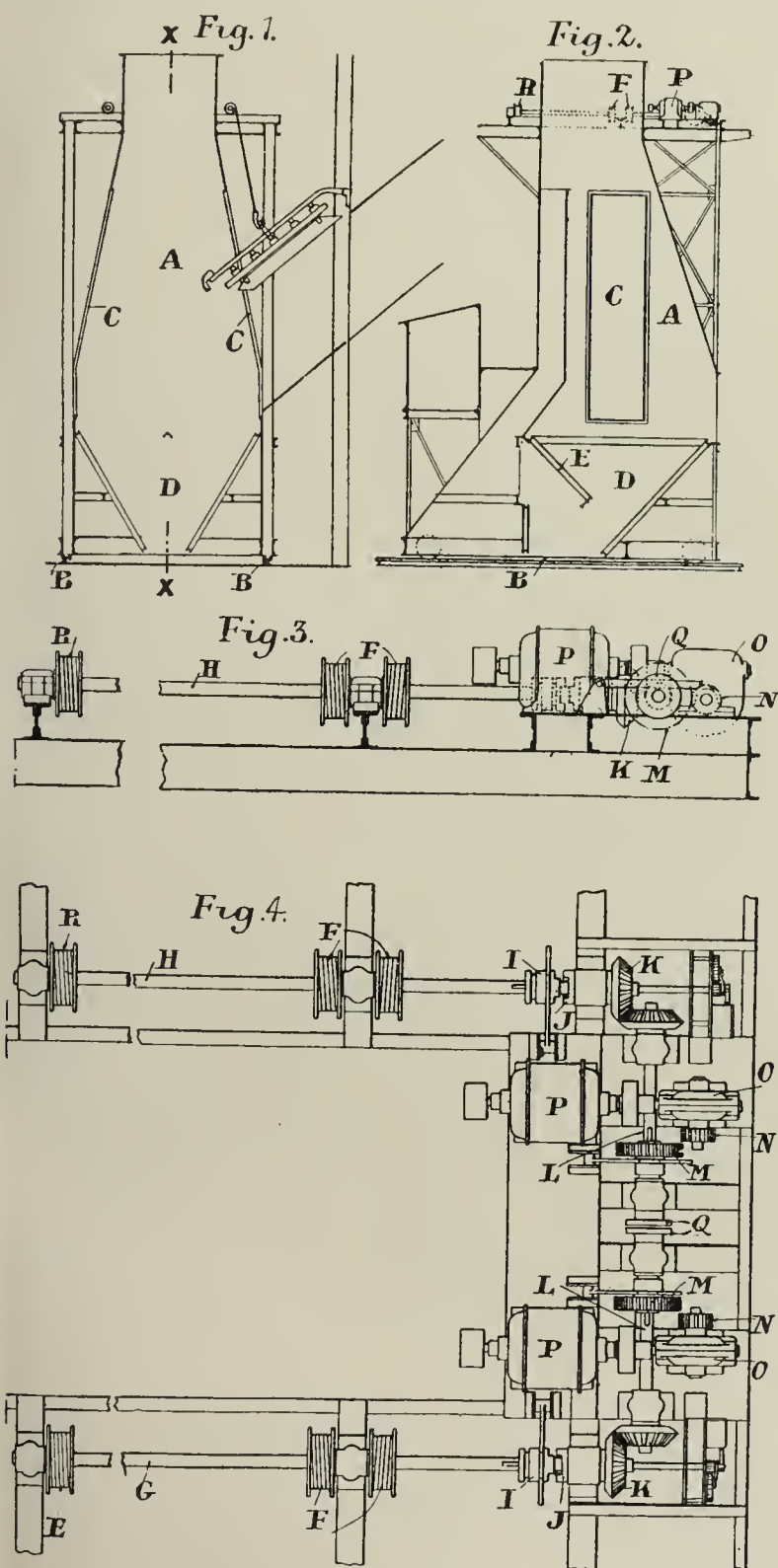
The method of heating has also large influence on the ammonia driven off, as apparently also does the depth of the liquid.

Presentation to Mr. G. Marvin.

The current number of the "Co-Partners' Magazine" of the Gaslight and Coke Company contains an account of a recent presentation to Mr. G. Marvin, who at the end of last year retired from the position of Divisional Mains Inspector in the Distributing Engineer's Department of the Company, after 45 years' service. The testimonial took the form of a handsome English eight-day mahogany chiming clock, bearing the following inscription: "Presented to G. Marvin, Esq., by Fellow-Officers and Employees, as a token of esteem, on his retirement from the service of The Gas Light and Coke Company, 31st December, 1910;" together with a pair of electro-plated candlesticks. It was subscribed for by officers and employees in the distribution and gas sales departments. The presentation, which took place at the Chief Office, Horseferry Road, was made by the Distributing Engineer (Mr. H. S. Reeson). In asking Mr. Marvin's acceptance of the gifts on behalf of the subscribers, he expressed the hope that Mr. Marvin would be spared for many years to enjoy his well-earned retirement, and referred to the valuable assistance Mr. Marvin had always given him. The Controller of the Sales Department (Mr. F. W. Good-enough) desired to associate himself with everything Mr. Reeson had stated. He also, he said, had had pleasant recollections of Mr. Marvin in connection with the Provident Club and other matters. Mr. Marvin briefly thanked the subscribers. He remarked that he was born in 1849 on the site of the old London Gas-Works at Vauxhall, where his father was Manager, entering in 1865 the service of the Company, which was amalgamated with the Gaslight and Coke Company in 1883.

RAISING THE DOORS OF CHAMBER RETORTS.

The system at present employed to open the discharging doors of chamber retorts consists of lifting appliances, moving on gangways constructed along the two parallel benches of retorts, and worked by suitable mechanism, preferably driven by electricity. Sufficient space must be left between the gangways to allow free passage of the truck in which the coke is carried away to be quenched. The plant consequently requires not only a set of lifting appliances with a motor for each bench of retorts, but one or more reserve motors to be in readiness in case some of those in use get out of order or are not sufficient. Moreover, the plant must have a special site for the passing of the lifting apparatus between the front of the setting and the coke truck. The Compagnie Générale de Construction de Four, of Paris, have patented in France a device which makes it possible to reduce the space needed for the plant, and consequently the cost of its installation, while at the same time giving the maximum degree of safety in normal working of the discharging doors of the chambers. It consists, first, in utilizing the coke-truck as a movable support for the two sets of lifting appliances corresponding to the parallel benches of the same settings; and, secondly, in working these appliances by means of motors arranged so that they can either act separately for either of the two appliances or simultaneously for one of them. With the arrangement it is possible to dispense with stand-by motors, which are replaced by others which work.



The general arrangement of the plant is shown in the accompanying diagrams. Fig. 1 is a vertical section of a coke-quenching truck to which the device is adapted; fig. 2, a vertical section of the truck on the line X of fig. 1; fig. 3, a longitudinal section of the motor mechanism fixed on the truck; and fig. 4, a plan of the entire mechanism.

In order to quench the coke coming from the retort chambers,

trucks are generally used, similar to that represented in figs. 1 and 2, running along a track B laid between the two benches of retorts. These trucks are made in the form of hoods or cowls, furnished along two of their sides with openings C through which the coke from the retorts is discharged. After having entered the box A, the coke falls into the hopper D formed by the hood at its top part, and thence on to a suitable conveyor. The steam and other products given off by the coke during its quenching or fall are discharged through the chimney inside the hood, passing under the inclined plate E (fig. 2). A truck, constructed as described, being run to the front of the chambers the coke from which has to be quenched, the doors are opened so as to cause them to enter the openings C, and then the mass of coke is pushed into the truck, where it is watered in any suitable way. To allow of the doors of the chambers being easily opened, they are furnished with bars to which hooks on the ends of the lifting-ropes are secured.

According to this invention, the winches F, on which the ropes are wound, instead of forming part of a machine moving along a gangway parallel to the front of the settings, are placed on an upper platform of the truck, which then serves as a movable support. The winches are arranged in pairs on two shafts G H, supported by the upper platform of the truck and on each side of the discharging shoot. Each of the shafts is furnished with a clutch I, revolving with it, which will engage with corresponding claws J on the axis of a bevel pinion K, with which gears another pinion, keyed on a transverse shaft L. This shaft carries a toothed wheel M, revolving with it, which can be moved along lengthwise so as to gear with a pinion N or be removed from it. The pinion is operated by a speed controller O, enclosed in a case, and worked by an electric motor P. Stoppage of the wheel M, in its two extreme positions of gearing and un gearing, is effected by means of a bolting lever, engaging with grooves made in the hub of the wheel.

The parts described form a group of motor mechanism to open the doors of one of the two benches of retorts in the same plant. Another group, exactly similar, is placed symmetrically on the platform of the truck to allow of the opening of the doors of the other bench. The shafts L of both groups are laid one after the other, and are separated in normal working. They are provided with plates Q, which, as will be explained later, can be connected by means of bolts or other suitable device.

When the winch drums F are to be set in motion to open the door of one of the chambers, the wheel M is made to engage with the pinion N, and the clutch I with the claws J of the pinion K. A motor having been started, its movement is transmitted to the transverse and longitudinal shafts connected with it, on which are the drums F—the ropes then acting to open the door, which remains motionless when quite open. To shut it, the mechanism being in gear, all that is necessary is to operate the current reverser so as to make the motor revolve in the opposite direction. The motor stops automatically just before the door is completely closed. Should the motor for one of the winches fail to work, the plates Q at the end of the transverse shafts are coupled up, and the controller connected with the useless motor cut off; the other controller being geared. Motion is then transmitted by the two transverse shafts to the longitudinal shaft opposite that of the motor at work. By this general arrangement, everything necessary to provide against the stoppage of a motor can be readily found on the truck itself. At a certain distance from the drums F, there are others R, to allow of the opening of the retort-doors outside the truck, in case of this being required for scurfing the framework of the door—an operation which could not be safely performed from inside the truck.

Jubilee Meeting of the North British Association.

The fiftieth annual meeting of the North British Association of Gas Managers will be held in the Philosophical Society's Hall, Bath Street, Glasgow, on Thursday; the date having been changed at the meeting held last year. We learn from the programme issued by the Secretary and Treasurer, Mr. Lawrence Hislop, of Uddingston, (which is an artistic production, in a coloured wrapper, with blank leaves for notes), that the proceedings will be opened by the President, Mr. George Keillor, of Broughty Ferry, at 10.30 a.m.; and, after the disposal of the usual routine business, he will read his Inaugural Address. The technical presentation will consist of two papers—"A Short Experience with Vertical Retorts at Helensburgh," by Mr. William Blair, of that town, and "Notes on the Attitude of the Air Question in Relation to Gas Manufacture, Purification, and the Reduction of Quality," by Mr. William Key, of Glasgow—and a discussion on "The Need of Publicity," to be opened by Mr. W. M. Mason, of Glasgow, and Mr. J. Napier Myers, of Saltcoats. In the evening, the members and their lady friends will dine together at the Atholl Restaurant in the Scottish Exhibition; and next day there will be an excursion to Arran. An interesting feature of the meeting will be the presentation of the appreciation of the late Mr. William Young, prepared by Dr. Alfred Daniell, which, however, will not be read or discussed, but be included in the "Transactions."

At the annual meeting of the Institution of Mining Engineers, to be held at Cardiff from the 13th to the 15th inst., the paper submitted at a previous meeting by Mr. Ernest Bury, on "The Otto-Hilgenstock Direct-Recovery Process and its Applications," an abstract of which was given in the "JOURNAL" for the 13th of June last (p. 748), will be open for discussion.

SOURCES OF ENERGY AND THEIR EXHAUSTION.

[Extracts from the Presidential Address of Sir William Ramsay
at the British Association.]

The Eighty-First Annual Meeting of the British Association for the Advancement of Science was opened last Wednesday at Portsmouth, under the presidency of Sir WILLIAM RAMSAY, F.R.S., who took for the subject of his address, "The Sources of Energy." Having offered some remarks on the present position of science and education, the President reviewed the progress of chemistry; and in this connection he dealt with the attributes of radium as a source of energy. This led to speculation as to the extent of the world's supply of energy, and the exhaustion of the coal supply. These portions of the address are given below.

THE STORED-UP ENERGY OF RADIUM.

Attention has repeatedly been drawn to the enormous quantity of energy stored up in radium and its descendants. This in its emanation—niton—is such that if what it parts with as heat during its disintegration were available, it would be equal to $3\frac{1}{2}$ million times the energy available by the explosion of an equal volume of detonating gas—a mixture of one volume of oxygen with two volumes of hydrogen. The major part of this energy comes apparently from the expulsion of particles (that is, of atoms of helium) with enormous velocity. It is easy to convey an idea of this magnitude in a form more realizable, by giving it a somewhat mechanical turn. Suppose that the energy in a ton of radium could be utilized in thirty years, instead of being evolved at its invariable slow rate of 1760 years for half-disintegration, it would suffice to propel a ship of 15,000 tons, with engines of 15,000 H.P., at the rate of 15 knots an hour, for thirty years—practically the lifetime of the ship. To do this actually requires $1\frac{1}{2}$ million tons of coal.

It is easily seen that the virtue of the energy of the radium consists in the small weight in which it is contained; in other words, the radium-energy is in an enormously concentrated form. I have attempted to apply the energy contained in niton to various purposes. It decomposes water, ammonia, hydrogen, chloride, and carbon dioxide, each into its constituents. Further experiments on its action on salts of copper appeared to show that the metal copper was converted partially into lithium, a metal of the sodium column. Similar experiments indicate that thorium, zirconium, titanium, and silicon are degraded into carbon: for solutions of compounds of these, mixed with niton, invariably generated carbon dioxide, while cerium, silver, mercury, and some other metals, gave none. One can imagine the very atoms themselves, exposed to bombardment by enormously quickly moving helium atoms, failing to withstand the impacts. Indeed, the argument *a priori* is a strong one. If we know for certain that radium and its descendants decompose spontaneously, evolving energy, why should not other more stable elements decompose when subjected to enormous strains?

THE WORLD'S SUPPLY OF ENERGY.

This leads to the speculation whether, if elements are capable of disintegration, the world may not have at its disposal a hitherto unsuspected source of energy. If radium were to evolve its stored-up energy at the same rate that gun-cotton does, we should have an undreamt-of explosive. Could we control the rate, we should have a useful and potent source of energy, provided always that a sufficient supply of radium were forthcoming. But the supply is certainly a very limited one; and it can be safely affirmed that the production will never surpass half-an-ounce a year. If, however, the elements which we have been used to consider as permanent are capable of changing with evolution of energy—if some form of catalyzer could be discovered which would usefully increase their almost inconceivably slow rate of change—then it is not too much to say that the whole future of our race would be altered.

Great progress has been made during the past century in effecting the conversion of one form of energy into others, with as little useless expenditure as possible. Let me illustrate this by examples. A good steam-engine converts about one-eighth of the potential energy of the fuel into useful work; seven-eighths are lost as unused heat, and useless friction. A good gas-engine utilizes more than one-third of the total energy in the gaseous fuel; two-thirds are uneconomically expended. This is a universal proposition: In order to effect the conversion from one form of energy into another, some energy must be expended uneconomically. It is eminently desirable, therefore, to keep the useless expenditure as small as possible. It can never equal zero; but it can be made small.

The middle of the Nineteenth Century will always be noted as the beginning of the Golden Age of Science—the epoch when great generalizations of the highest importance (philosophical, economic, and scientific) were made on all sides. Carnot, Clausius, Helmholtz, Julius Robert Mayer abroad, and the Thomsons, Lord Kelvin and his brother James, Rankine, Tait, Joule, Clerk-Maxwell, and many others at home, laid the foundations on which

the splendid structure has been erected. That the latent energy of fuel can be converted into energy of motion by means of the steam-engine, is what we owe to Newcomen and Watt. That the kinetic energy of the fly-wheel can be transformed into electrical energy, was due to Faraday; and to him, too, we are indebted for the reconversion of electrical energy into mechanical work. It is this power of work which gives us leisure, and which enables a small country like ours to support the population which inhabits it.

THE EXHAUSTION OF THE COAL SUPPLY.

We have in this world of ours only a limited supply of stored-up energy; in the British Isles a very limited one—viz., our coal-fields. The rate at which this supply is being exhausted has been increasing very steadily for the last forty years, as anyone can prove by mapping the data given in the General Report of the Royal Commission on Coal Supplies (1906). In 1870, 110 million tons of coal were mined in Great Britain; and ever since then the amount has increased by $3\frac{1}{3}$ million tons a year. The available quantity of coal in the proved coalfields is very nearly 100,000 million tons. It is easy to calculate that, if the rate of working increases as it is doing, our coal will be completely exhausted in 175 years. But, it will be replied, the rate of increase will slow-down. Why? It has shown no sign whatever of slackening during the last 40 years. Later, of course, it must slow-down, when coal grows dearer owing to approaching exhaustion. It may also be said 175 years is a long time. Why, I myself have seen a man whose father fought in the '45 on the Pretender's side nearly 170 years ago! In the life of a nation, 175 years is a span. This consumption is still proceeding at an accelerated rate. Between 1905 and 1907, the amount of coal raised in the United Kingdom increased from 236 to 268 million tons—equal to 6 tons per head of the population, against $3\frac{1}{2}$ tons in Belgium, $2\frac{1}{2}$ tons in Germany, and 1 ton in France. Our commercial supremacy and our power of competing with other European nations are obviously governed, so far as we can see, by the relative price of coal; and when our prices rise, owing to the approaching exhaustion of supplies, we may look forward to the near approach of famine and misery.

OTHER SOURCES OF ENERGY.

Having been struck some years ago with the optimism of my non-scientific friends as regards our future, I suggested that a Committee of the British Science Guild should be formed to investigate our available sources of energy. This Guild is an organization founded by Sir Norman Lockyer, after his tenure of the presidency of this Association, for the purpose of endeavouring to impress on our people and their Government the necessity of viewing problems affecting the race and the State from the standpoint of science; and the definition of "science" in this as in other connections is simply the acquisition of knowledge, and orderly reasoning on experience already gained and on experiments capable of being carried out, so as to forecast and control the course of events, and, if possible, to apply this knowledge to the benefit of the human race. The Science Guild has enlisted the services of a number of men, each eminent in his own department, and each has now reported on the particular source of energy of which he has special knowledge. Besides considering the uses of coal and its products and how they may be more economically employed—in which branches the Hon. Sir Charles Parsons, Mr. Dugald Clerk, Sir Boverton Redwood, Dr. Beilby, Dr. Hele-Shaw, Professor Vivian B. Lewes, and others, have furnished reports—the following sources of energy have been brought under review: The possibility of utilizing the tides; the internal heat of the earth; the winds; solar heat; water power; the extension of forests, and the use of wood and peat as fuels; and, lastly, the possibility of controlling the undoubted, but almost infinitely slow, disintegration of the elements, with a view to utilize their stored-up energy.

However interesting a detailed discussion of these possible sources of energy might be, time prevents my dwelling on them. Suffice it to say that the Hon. R. J. Strutt has shown that, in this country at least, it would be impracticable to attempt to utilize terrestrial heat from boreholes. Others have deduced that from the tides, the winds, and water power small supplies of energy are, no doubt, obtainable; but that, in comparison with that derived from the combustion of coal, they are negligible. Nothing is to be hoped for from the direct utilization of solar heat in this temperate and uncertain climate; and it would be folly to consider seriously a possible supply of energy in a conceivable acceleration of the liberation of energy by atomic change. It looks utterly improbable, too, that we shall ever be able to utilize the energy due to the revolution of the earth on her axis, or to her proper motion round the sun.

Attention should undoubtedly be paid to forestry, and to the utilization of our stores of peat. On the Continent, the forests are largely the property of the State. It is unreasonable, especially in these latter days of uncertain tenure of property, to expect any private owner of land to invest money in schemes which would at best only benefit his descendants, but which, under our present trend of legislation, do not promise even that remote return. Our neighbours and rivals, Germany and France, spend annually £2,200,000 on the conservation and utilization of forests; and the net return is £6,000,000. There is no doubt that we could imitate them with advantage. Moreover, an increase in our forests would bring with it an increase in our water power; for without forest land rain rapidly reaches the sea instead of distributing itself, so as to keep the supply of water regular and more easily

* The President had explained, in a preceding portion of the address, that the formation of niton from radium would be represented by the equation: Radium (atomic weight 226.4) = helium (4) + niton (222.4).

utilized. Various schemes have been proposed for utilizing our deposits of peat. I believe that in Germany the peat industry is moderately profitable; but our humid climate does not lend itself to natural evaporation of most of the large amount of water contained in peat, without which processes of distillation prove barely remunerative.

MEANS OF ECONOMIZING COAL.

We must therefore rely chiefly on our coal reserve for our supply of energy and for the means of supporting our population; and it is to the more economical use of coal that we must look in order that our life as a nation may be prolonged. We can economize in many ways—by the substitution of turbine engines for reciprocating engines, thereby reducing the coal required per horse power from 4 or 5 lbs. to $1\frac{1}{2}$ or 2 lbs.; by the further replacement of turbines by gas-engines, raising the economy to 30 per cent. of the total energy available in the coal (*i.e.*, lowering the coal consumption per horse power to 1 or $1\frac{1}{2}$ lbs.); and by creating the power at the pit mouth, and then distributing it electrically, as is already done in the Tyne district. Economy can also be effected in replacing beehive coke-ovens by product-recovery ovens. This is rapidly being done; and Dr. Beilby calculates that in 1909 nearly 6 million tons of coal out of a total of 16 to 18 millions were coked in recovery ovens—thus effecting a saving of 2 to 3 million tons of fuel annually. Progress is also being made in substituting gas for coal or coke in metallurgical, chemical, and other works. But it must be remembered that for economic use gaseous fuel must not be charged with the heavy costs of piping and distribution.

The domestic fire problem is also one which claims our instant attention. It is best grappled with from the point of view of smoke. Though the actual loss of thermal energy in the form of smoke is small—at most less than one-half per cent. of the fuel consumed—still the presence of smoke is a sign of waste of fuel and careless stoking. In works, mechanical stokers which ensure regularity of firing and complete combustion of fuel are more and more widely replacing hand-firing. But we are still utterly wasteful in our consumption of fuel in domestic fires. There is probably no single remedy applicable; but the introduction of central heating, of gas-fires, and of grates which permit of better utilization of fuel, will all play a part in economizing our coal. It is open to argument whether it might not be wise to hasten the time when smoke is no more by imposing a fine of 6d. for each offence. An instantaneous photograph could easily prove the offence to have been committed; and the imposition of the fine might be delayed until (say) three warnings had been given by the police.

The members of the Coal Commission in 1903 showed the gravity of our case; but we have turned a deaf ear to them. It is true that the self-interest of coal consumers is slowly leading them to adopt more economical means of turning coal into energy. But I have noticed, and frequently publicly announced, a fact which cannot but strike even the most unobservant. It is this: When trade is good, as it appears to be at present, manufacturers are making money. They are overwhelmed with orders, and have no inclination to adopt economies which do not appear to them to be essential, and the introduction of which would take thought and time, and would withdraw the attention of their employees from the chief object of the business—how to make the most of the present opportunities. Hence improvements are postponed. When bad times come, there is no money to spend on improvements; and so they are again postponed until better times arrive.

THE SQUANDERING OF NATIONAL RESOURCES.

What can be done? I would answer: Do as other nations have done and are doing—that is, take stock annually. The Americans have a permanent Commission, initiated by Mr. Roosevelt, consisting of three representatives from each State, the sole object of which is to keep abreast with the diminution of the stores of natural energy, and to take steps to lessen its rate. This is a non-political undertaking, and one worthy of being initiated by the ruler of a great country. If the example is followed here, the question will become a national one. Two courses are open to us: First, the *laissez-faire* plan of leaving to self-interested competition the combating of waste; or, second, initiating legislation which, in the interest of the whole nation, will endeavour to lessen the squandering of our national resources. This legislation may be of two kinds—penal, that is, imposing a penalty on wasteful expenditure of energy supplies; and helpful, that is, imparting information as to what can be done, advancing loans at an easy rate of interest to enable reforms to be carried out, and insisting on the greater prosperity which would result from the use of more efficient appliances. This is not the place, nor is there the time, to enter into details. The subject is a complicated one, and it will demand the combined efforts of experts and legislators for a generation. But if it be not considered with the definite intention of immediate action, we shall be held up to the deserved execration of our not very remote descendants.

METHODS OF CONCENTRATING ENERGY.

The two great principles which I have alluded to in an earlier part of this address must not, however, be lost sight of. They should guide all our efforts to use energy economically. Concentration of energy in the form of electric current at high potential makes it possible to convey it for long distances through thin, and therefore comparatively inexpensive, wires; and the economic

coefficient of the conversion of mechanical into electrical, and of electrical into mechanical energy is a high one—the useless expenditure not much exceeding one-twentieth part of the energy which can be utilized. These considerations would point to the conversion at the pit mouth of the energy of the fuel into electrical energy; using as an intermediary turbines, or preferably gas-engines, and distributing the electrical energy to places where it is wanted. The use of gas-engines may, if desired, be accompanied by the production of half-distilled coal—a fuel which burns nearly without smoke, and one which is suitable for domestic fires, if it is found too difficult to displace them, and to induce our population to adopt the more efficient and economical systems of domestic heating which are used in America and on the Continent. The increasing use of gas for factory, metallurgical, and chemical purposes points to the gradual concentration of works near the coal mines, in order that the laying-down of expensive piping may be avoided. An invention which would enable us to convert the energy of coal directly into electrical energy would revolutionize our ideas and methods; yet it is not unthinkable. The nearest practical approach to it is the Mond gas-battery, which, however, has not succeeded, owing to the imperfection of the machine.

A PLEA FOR THE STUDY OF PURE SCIENCE.

In conclusion, I would put in a plea for the study of pure science, without regard to its applications. The discovery of radium and like radioactive substances has widened the bounds of thought. While themselves, in all probability, incapable of industrial application, save in the domain of medicine, their study has shown us to what enormous advances in the concentration of energy it is permissible to look forward with the hope of applying the knowledge thereby gained to the betterment of the whole human race. As charity begins at home, however, and as I am speaking to the British Association for the Advancement of Science, I would urge that our first duty is to strive for all which makes for the permanence of the British Commonwealth, and which will enable us to transmit to our posterity a heritage not unworthy to be added to that which we have received from those who have gone before.

INCREASING EFFICIENCY OF WATER-GAS PLANT.

By J. S. HAUG, of Montreal.

[A Paper read before the Canadian Gas Association.]

The problem of increasing the efficiency of water-gas plant is not always one for elaborate mathematical calculations, as one might suppose in these days of scientific methods. Of course, these calculations are necessary to ultimately obtain the best results; but one can often make great improvements by simply locating and eliminating unexpected causes of trouble that are not taken account of at all in calculations. These troubles may be of the most unexpected and surprising nature, and may be due to accident, to carelessness in operation, or minor defects not easily detected; and they must be rectified before any permanent improvement can be obtained. This was the case in the plant under consideration, which consists of four sets of the Merrifield-Wescott-Pearson type, with oval generators 8 ft. 6 in. by 11 ft. The superheater is built above the carburettor, and the oil is injected into a space between the two; some of it trickling down against the current of gas, and some of it being carried up to the superheater.

The principal dimensions of the machines are as follows: Grate surface, 45 square feet; depth of fire, 7 ft. 6 in.; fixing surface of carburettor, 1200 feet; do. of superheater, 5100 feet; air connection, 12-inch; steam connections, $1\frac{1}{2}$ -inch; diameter of down pipe, 14 inches; blast pressure at fan, $27\frac{1}{2}$ inches water-gauge. The guaranteed capacity of the machines was 1,000,000 cubic feet per day with broken anthracite, and 800,000 cubic feet per day with gas coke. At the time the present management took charge, these machines were making 600,000 cubic feet per day, and at present they are making 1,300,000 cubic feet.

The conditions found in the machines were as follows: They were badly choked with clinker; in some cases the thickness was as great as 18 inches, reducing the grate area by 60 per cent. Each machine was clinkered once in twelve hours; the time of clinkering was about three hours. Once a week it was necessary to let down a machine to remove the accumulation of clinker formed on the side of the brick lining. The time consumed in removing this clinker was 12 hours, and in several cases it took 24 hours. The supply of steam to the machines was restricted by small piping and a three-way cock designed to deliver the steam either to the top or the bottom of the generator. The method of running was to blow four minutes and steam five minutes; and with such a high blast pressure and restricted steam, these conditions accounted to a great extent for the hard clinker. There was also considerable trouble with the fire-bars and bearer-bars. One down-run was made for about every six up-runs.

The first change was to alter the time of running to three minutes blow and six minutes steam, and to make one down-run for every three up-runs. Under the old way of running, there were nine hours of gas making out of every twelve; and with $6\frac{3}{4}$ runs per hour there were 60 runs of five minutes each, giving 300 total minutes of steaming. Under the new arrangements,

the time of clinkering was $1\frac{1}{2}$ hours, giving $10\frac{1}{2}$ hours gas making out of 12 hours; and with $6\frac{3}{4}$ runs per hour there were 70 runs of six minutes each, giving 420 total minutes of steaming—an increase of 40 per cent.

The next step was to do away with the three-way valve, and substitute two independent valves—one for the up-run and one for the down-run. To these changes was added the increase of grate area to the normal. This was due to the more efficient clinkering now made possible. A great increase in the make of gas was obtained; but it was found that the stack-valves leaked badly, especially when two machines lapped. This was due to a heavy back-pressure. The connections to the condensers, &c., were 16 inches in diameter from each machine, and very tortuous and complicated. The inlet and outlet pipes to the relief holder were 20-inch and 16-inch, and full of bends; but even these small pipes could not be held accountable for the heavy back-pressure. Some pressure readings were taken along the inlet to the relief holder; and it was found that while the holder only threw $6\frac{1}{2}$ inches, there was a violently fluctuating pressure of about 36 inches just at the holder inlet. The inlet was dug up, and the cause of the pressure brought to light in the shape of a large block of concrete which almost entirely closed the pipe. The only explanation anyone could give for its presence was that it had fallen in during repairs and partial reconstruction of the holder. After this there was very little trouble from leakage from the stack-valves, except when three machines lapped which were connected to the same condensers.

The next step was to provide some means of measuring the air supply and the steam supply to the machines, and so ensure uniformity of operation. It is well known that in a fire of uniform structure, without holes or black eyes, the rate of combustion and heat evolved is proportional to the quantity of air supplied, so that if the same quantity of air is supplied every blow, the same amount of heat will be produced in the machine. The usual way to regulate the amount of air supplied is by opening the blast-valve a certain number of inches or the same amount each time. It is also well known that, owing to the increase of resistance due to clinker in the fire, a clean machine will take a much larger quantity of air than a dirty machine with the blast-valve open to the same extent in each case. The result is that the clean machine takes more air than its share; and this tends not only to waste fuel, but to fuse the clinkers into a hard slag. Again, when the machine is dirty, it takes less than its share of air, and the heats fall rapidly unless the steam is correspondingly reduced. A dirty fire will always make less gas than a clean one, because the air and steam that should be forced through the fire partially escape through dead spaces in the fire which may exist below the surface, even if they are not visible as black eyes. Then if to this is added an actual decrease of air supplied, it is no wonder that the make of a machine drops rapidly a few hours after clinkering.

This latter cause of decreased make can be absolutely removed, and considerably more uniform results obtained, by measuring the air. There are two kinds of air-meters in use. One is the Venturi meter, which has been employed on water since about 1887; and the other is the Pitot tube, which was originally used on water. [The author described these meters.] The latter type of meter was the one we adopted, as there was no place in which to put up a Venturi meter. The Pitot tube was inserted into the air-pipe for a distance of one-third the diameter, to give about the average velocity. The velocity-tube was connected to one side of a water-gauge, and the pressure-tube to the other side. In operating the machine, the gas maker was instructed not to open his blast-valve until he got a certain differential pressure on the gauge, and to pay no attention to the number of notches on his valve-stem. One of the first results was to show that the carburettor blast robbed the generator blast; in other words, the supply-pipe was a little too small.

The argument for air-meters applies to steam-meters in the same degree. The usual way of running before was to open the steam-valve about a turn-and-a-half. If the steam pressure was low on the boilers, the make would drop away without any apparent cause. The steam-meter adopted was a standard diverging tube turned from brass, and screwed in place of the nipple going into the shell of the machine. There were four of these tubes to each machine—two for the top and two for the bottom steam. The pressure on the meters was obtained by $\frac{1}{4}$ -inch gauge-pipes running from the meters to the operating floor, with two steam-gauges to each machine. When the gas maker opens the steam-valve, he can see just what pressure he is putting on the meters; and if the steam is down, he opens the valve a little wider.

The meters were not on the first machine very long before it was seen the $1\frac{1}{4}$ -inch pipes were too small; so the next machine was equipped with $1\frac{1}{2}$ -inch pipes and larger meters. It was now possible to reduce the time of steaming to five minutes (owing to the increased flow obtained), while retaining the blow at three minutes. This increased the number of runs per hour from $6\frac{3}{4}$ to $7\frac{1}{2}$ —increase 12.4 per cent. With this machine, 740,000 cubic feet of gas were made between cleanings on one occasion, equivalent to a make of 1,480,000 cubic feet per day.

The most important use of steam and air meters is to keep conditions constant, and to make it always possible to reproduce any condition. The knowledge of the actual amounts of air and steam passed is quite a secondary consideration, though also important. Nothing has been done in this respect as regards exact calibration of the meters, owing to press of reconstruction work; and no tests have been made on the machines as regards steam and air consump-

tion for a given make of gas. Accounts of similar tests have appeared many times in the Technical Press. But it is always instructive to make them on a given plant, as indicating directions in which improvement can be effected; and they will be carried out when an opportunity is afforded.

Several other improvements have been made in matters which, though outside the province of gas generation, are vital to its successful manufacture. The original relief holder of 60,000 cubic feet capacity was far too small for the amount of water gas made; and our smallest commercial holder of 360,000 cubic feet capacity was converted to this purpose—thus giving more space for cooling the gas and separating out of tar fog. The old exhausters were of the reciprocating type, built by Messrs. R. & J. Dempster, and had given first-class service for twenty years. After the make of gas was increased, they flew to pieces several times, and were finally replaced by a 5 million cubic feet exhauster of the rotary four-blade type built by Waller and Son. A Pelouze and Audouin tar-extractor was added to the equipment, and eliminated a great deal of trouble in purification caused by fouling of the oxide with tar. The old condensers were inadequate for the amount of gas made, and gas frequently went into the purifiers at 140° Fahr. A set of four condensers, arranged two in tandem, with about 8300 square feet of total cooling surface, has been put into the room next to the generators, and the gas is cooled down to about 115° Fahr. A 24-inch steel header runs behind the machines with a 20-inch branch to each, and forms the inlet to the condensers. This header replaces the old combination of 16-inch and 20-inch piping from the machines.

The overflows from the wash-boxes are now being re-arranged at the stage-floor level, so that the machine man can see if any oil is coming through unfixed; and an 8-inch pipe to the tar-separators replaces the present one, which is 4 inches diameter. A 4-inch water-main has been connected to the inlet of the condensers, with a 3-inch branch to each. This does away with a perfect network of 1-inch, $1\frac{1}{4}$ -inch, and $1\frac{1}{2}$ -inch piping behind the machines. The overflow water from the condensers furnishes a good supply to the boilers at 170° Fahr.; and the surplus runs to the sewer. In winter there will probably be just about enough for the boilers. In addition, it is proposed to replace the present underground galvanized iron blast-pipe with overhead steel piping with explosion heads. The present piping is full of holes, and water accumulates in it quickly when the plant is shut down.

The fuel supply to the machines, which is gas coke, is obtained from the coke-storage hopper by a runway at the stage-floor level. There is, however, no convenient way of elevating the unburnt fuel recovered from clinkering. This deficiency will be supplied, and the fuel consumption can be somewhat reduced. After these things are done, experimental work on the machines will probably be continued, with a view to increase still further the gas-making capacity.

Coal Tar Oil as Locomotive Fuel.

A note has recently appeared in the "Frankfurter Zeitung" with reference to the smokiness of the coal now used as fuel on locomotives, and its ill-effects on the atmosphere and thence on vegetation and the public health. The disagreeable character of the air in railway tunnels is pointed to as proof of the objectionable character of the smoke; and the sulphur acids in it are said to be injurious even in the country, and still more so in the already vitiated air of towns. The electrification of railways would in this respect constitute a great advance, but from the military standpoint, the independent steam locomotive is preferred, because the mere cutting of an electric cable by the enemy would render the whole section of an electrified line useless. On the other hand, the adoption of a smokeless fuel for steam locomotives would overcome the hygienic objections to the present system. Tar-oil is mentioned as being a suitable fuel; and it is reported that the Prussian State Railway Administration has equipped a number of locomotives with apparatus for oil firing. The tar-oil, which is a distillate from ordinary coal-tar, has a higher calorific power than coal—about 16,200 B.Th.U. per pound. On the other hand, its price is much lower than that of foreign gas-oil. Practical trials have demonstrated that the increased efficiency realizable with oil-firing renders oil a competitor with coal in respect of price. The production of tar-oil in the German Empire is said to amount to 450,000 tons per annum. This oil has recently found extensive application as fuel in Diesel engines; and it now seems possible that it may be used for locomotive firing in Germany, just as the petroleum residue or Masut is used for the purpose in Russia.

Testing the Calorific Power of Paris Gas.—The current number of "Le Gaz" contains an illustration, accompanied by a few particulars, of the apparatus which has been put up in the testing-rooms of the Paris Gas Company, under instructions from the municipal authorities, for making daily tests of the calorific power of the gas, in accordance with directions issued by the Municipal Testing Laboratory. The calorimeter is of the Junkers type, and the burner is a Méker. Similar installations have been put up by the Company in their works, in order to allow of check tests being made. It is not intended to abandon for the present the photometric apparatus, as it is thought that simultaneous tests of the lighting and heating power of gas will probably show an interesting relation between these two qualities of the illuminant. The installation has been supplied by MM. Velter Frères et Cie., of Paris.

MANCHESTER JUNIOR GAS ASSOCIATION.

Inspection of a Model Gas-Works at Eaton Hall.

The Council of the Manchester and District Junior Gas Association arranged a picnic for members to Chester last Saturday; the programme including a visit to Eaton Hall and grounds and an inspection of the model gas-works on the estate. Mr. J. C. Belton, Engineer to the Chester Gas Company, met the party (which included a number of ladies) at Chester Station, and acted as guide through the city to the landing stage on the River Dee, where the steamer was boarded for a sail up to Eccleston Ferry. The majority of the male members proceeded after landing to the gas-works on the Duke of Westminster's estate; and the other section made a visit to the Hall and gardens. Mr. E. K. Willett, Clerk of Works for the Duke, took charge of those who decided to inspect the gas-works, which are situate on the banks of the river. It is only a small plant, but a very complete model of a gas-works. The buildings are substantial in construction, and have an ornate frontage. Last year, under the supervision of Mr. Belton, a new plant, supplied by Messrs. R. & J. Dempster, was put down.

Prior to the actual inspection of the works, Mr. Belton, for the benefit of those present, gave a brief description of them before the extensions were carried out, and as they are now.

Works as they were:—Retort-house, 13 retorts, 4-inch mountings, capacity 40,000 to 50,000 feet per diem. No exhauster. Two 8-inch outlets for hydraulic main, reduced outside to 5 inches, and connected to a horizontal condenser much too small, tar passing forward into the scrubber. Area of the two sets of condensers, 200 super. feet, or just half the theoretical area of 400 super. feet. The scrubber, coke filled, was occasionally supplied with water by pumping, but was clogged with tar. There were four purifiers, 5 ft. by 3 ft. by 2 ft. 6 in., which could only be worked as two pairs—too small to be effective. There was no washer.

Works as they now are:—Retorts as before, but with 6-inch mountings. One 8-inch outlet from the hydraulics. Two tube annular condensers, 18 feet. Tubes, 21 in. by 30 in. Exhauster, 2000 feet per hour, gas-engine driven single-blade "Beale." Hydraulic governor, countershaft, pulley, and belt to drive pump. Vertical liquor pump, 2 inches diameter, 4 inches stroke. Livesey washer for 100,000 cubic feet per diem. Four Green's purifiers. Continuous box, each 6 ft. by 3 ft. by 3 ft. Two tiers of grids. Three-inch tar-drain to tar-tank in yard from seal-pots. The old scrubber was cleaned out and re-filled; the 4-inch connections being removed and 6-inch ones substituted.

There are two holders; and the consumption, Mr. Willett said, in reply to a question, is about $3\frac{1}{2}$ million cubic feet.

Subsequently the party visited the "rival show," as Mr. Willett described it, the model electricity works, and then had an opportunity of seeing in a neighbouring shed part of the rolling stock of the toy railway which runs from Balderton, about $3\frac{1}{2}$ miles away, to Eaton. The railway is 15-inch gauge, and is used to bring up from Balderton coal (about 2000 tons a year) and other material required on the estate. It should be added that the gas-works and the electric power station not only supply the needs of the Hall, but the different buildings on the estate.

At the conclusion of the inspection, Mr. Willett was cordially thanked for his courtesy by Mr. A. H. Holton, President of the Manchester and District Junior Gas Association, on behalf of the members—supported by Mr. J. Alsop, the Hon. Secretary, and Mr. Belton. After having tea together at the Iron Bridge, the party returned to Chester by steamer, and spent the intervening period to train time in viewing the Rows in the City or the walls. Altogether it was a very pleasant half-day; the weather conditions being all that could be desired.

Coal Resources of the Pas de Calais.—On the occasion of the congress of the Société de l'Industrie Minérale, some interesting particulars relating to the Pas de Calais coalfield were published by the Chamber of Collieries of the Nord and the Pas de Calais. They showed that the production of coal last year was 19,900,549 tons of various qualities; the fat gas coal containing from 30 to 33 per cent. of volatile matter. There were in operation 1240 by-product coke-ovens, and 302 ovens without recovery. The quantities of products were: Tar, 32,451 tons; benzol, 5696 tons; and sulphate of ammonia, 13,674 tons. The daily output of the briquette factories was 2136 tons.

Rules as to Chimneys.—Some rules regarding chimneys are given in a paper read before the Franklin Institute by Mr. H. C. Brinckerhoff. One rule is that a chimney 100 feet high will give a draught at the base of 0.6 inch of water. This assumes 60° air temperature and 450° stack temperature. This latter is a trifle low for average conditions, and in many cases it would be safe to estimate on 0.7 inch, though in designing new plant it is always wise to have plenty of draught rather than too little. For any other height of chimney, the draught is just in proportion to the height of the chimney, measured, of course, above the grate. These figures assume reasonable cross-sectional area; otherwise the chimney will absorb a considerable proportion of its own draught. The author suggests from 16 to 20 square feet per 1000 H.P., though half of these areas has frequently proved sufficient. The horse power is apparently based on 4 lbs. of coal per horse-power-hour.

REGISTER OF PATENTS.

Retorts.

EMANUEL, P. A., of Aiken, South Carolina, U.S.A.

No. 18,201; July 30, 1910. Date claimed under International Convention, Aug. 2, 1909.

This invention relates particularly to the class of retort utilized for the treatment of all kinds of clays, bauxite, corundum, and similar ores—in fact, it is of general application in the process of making soda, a double sulphate of soda and alumina, aluminium fluoride, metallic sodium, aluminium, gas, coke, gas-retort carbon, and for many other purposes.

The retort is capable of being heated to an exceedingly high temperature, and the simplicity of the structure is said to be so predominant that the replacing of any broken or damaged part is rapidly and easily accomplished. Another object of the invention is to provide means for mixing and stirring the contents of the retort at any desired time whether it be at a high temperature or not.

The invention consists in constructing a furnace portion and a smoke-stack connection portion both adapted to detachably connect with the retort at opposite ends so as to permit of the retort being effectively heated, while the removal of the furnace portion and the smokestack connection portion completely detaches the retort from the heating means and renders it capable of being rotated on its transverse axis for the purpose of mixing the products in it.

The invention also includes the provision of a perforated plate so arranged as to prevent the coal or other fuel from getting from the furnace into the retort; the provision of an asbestos covering, held in place by wire netting around the retort itself; and the arrangement of the entire apparatus, and suspending means, so that the apparatus may be moved bodily from one part of the plant to the other.

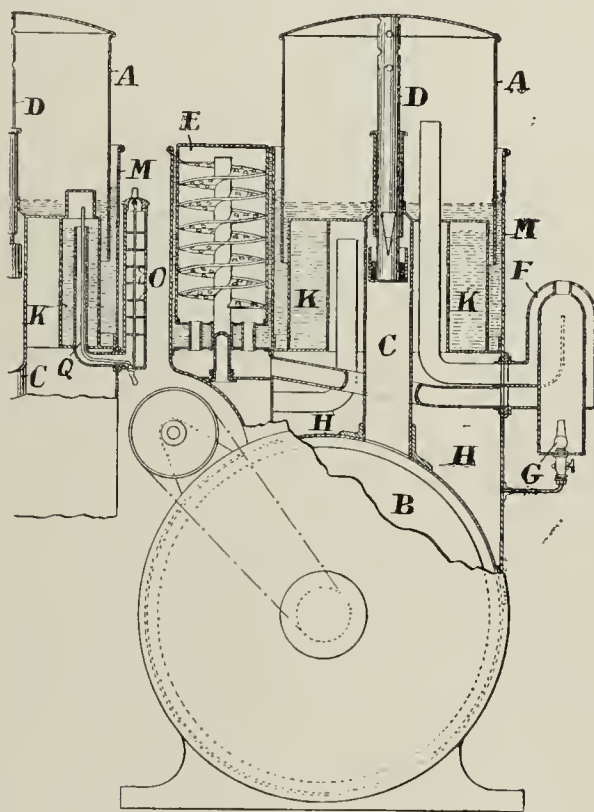
Air Carburetting Apparatus.

WILLIAMS, J., of Newport Pagnell.

No. 18,735; Aug. 9, 1910.

This invention relates to a special construction of mixing-chamber wherein the less volatile ingredient of the carburetting liquid has "a prolonged opportunity of becoming evaporated by the air on its entry to the mixing-chamber while at its highest temperature." The invention also comprises the provision of a tank for the carburetting liquid, which tank is immersed in the water which serves to provide the liquid-seal and vary the air-occupied volume of the bell-chamber.

The apparatus is shown in vertical sectional elevation, taken through the mixing-chamber and the air-heating or drying contrivance, and taken along another vertical plane so as to show the means provided for re-charging the carburetting storage vessel.



Williams' Air-Carburetting Apparatus.

A is a floating bell-chamber to which air is supplied by a rotary blower B through a pipe C and a telescoping pipe D secured to the roof of the bell-chamber; admission to the bell-chamber through a slit and apertures being closed by a mercury seal when the bell-chamber is fully charged. This portion of the apparatus forms the subject of patent No. 17,416 of 1910, and is there particularly described.

The bell-chamber is in permanent communication with one mixing-chamber E by a pipe leading from the bell-chamber and another pipe leading to the lower end of the mixing-chamber E; the two pipes being interconnected by an annular space F surrounding a heating chamber within which some of the carburetted air manufactured by the apparatus is consumed at a burner G capable of being regulated by hand or by a thermostat. The mixing-chamber E (which is a vertical cylinder) contains a helical surface the upturned external border of

which fits the cylindrical chamber. The inner border of the helical surface is secured to a vertical tube which serves to convey to a storage-chamber H the carburetted air from the upper end of the mixing-chamber. The helical surface is perforated by a number of apertures which, being produced by a punch which is forced upwards through the metal of the helical surface, are formed with upwardly directed borders which prevent liquid flowing downwards along the helical surface from falling through the apertures.

Carburetted liquid is delivered to the mixing-chamber E by being dropped on to the higher portion of the helical surface, from which it descends along the helical surface and becomes evaporated on the way by the up-flowing air which passes partly along the space between the convolutions of the helical surface and partly through the apertures, the intermixture of the streams "serving to produce a very homogeneous product." The resulting carburetted air is delivered to the storage-chamber H.

By the contra-flow of the carburetted liquid and air, prolonged by the circuitous route provided, the less volatile ingredient of the carburetted liquid will, it is said, have augmented opportunity to undergo evaporation, as it will eventually meet the incoming air in its warmest condition and without carburetted vapour in suspension.

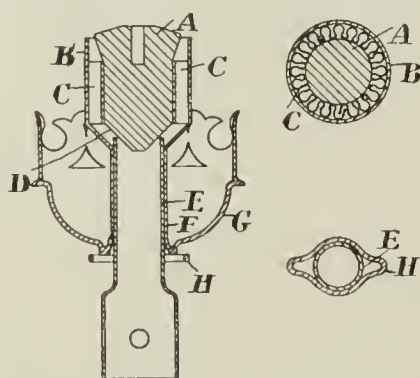
The carburetted liquid may be fed by any suitable devices, but preferably it is fed at a rate proportional to the air supply according to an arrangement which forms the subject of patent No. 18,057 of 1910. The liquid is stored in an annular vessel K which is immersed in water contained in a tank M, into which dips the lower border of the chamber A to a depth which depends on the air-occupied volume of the bell-chamber. The vessel K is re-charged by means of a U-shaped passage, which comprises an external branch in which is fitted a removable filter consisting of a series of wire-gauze shelves O carried on a rod. The inner branch of the U-passage rises to the level of the carburetted fluid in the vessel K when fully charged.

Incandescent Gas-Burners.

HEATON, C., of Skegness.

No. 428; Jan. 6, 1911.

This invention relates to incandescent gas-burners in which a central block is surrounded by a strip of corrugated metal and in which the block is itself cone-shaped at the bottom, with means to allow the relative movement between the block and the mixing-tube to regulate the amount of mixture passing up the sides of the block.



Heaton's Incandescent Gas-Burner.

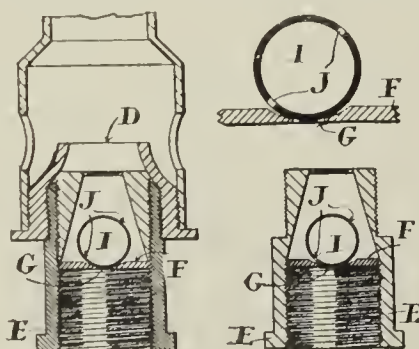
The block A is located (as usual) in the burner cup B and held therein by a corrugated, and preferably sheet-iron strip, bent round into an annulus C. The block has a conical bottom D. The mixing-tube E fits with a sliding fit in the tube F which connects the cup B and the gallery G and projects up beyond the bottom of the cup B. On the bunsen tube is arranged a spring clip H, upon which the gallery G or bottom of the tube F rests. By adjusting the clip on the bunsen tube, the tube F, and therefore the tube B, the block A, and its bottom D, will be adjusted relative to the top of the bunsen tube, and so the flow of the mixture of air and gas will be regulated. This regulation is found, in addition to regulating the flow of the gases, to regulate the mixture, and so dispense with the necessity of valves for regulating the amount of air admitted to the bunsen tube.

Atmospheric Gas-Burners.

MARTIN, W., of Manchester.

No. 1280; Jan. 18, 1911.

This invention has particular reference to the type of burner provided with a bunsen tube having air inlet holes at the sides near its lower end and a nipple or gas-nozzle at its extreme lower end—the invention consisting in providing a regulator of the floating ball type



Martin's Atmospheric Gas-Burner.

within a nipple or thimble secured to the nozzle for regulating the passage of gas towards the bunsen tube in accordance with the pressure of the gas from the supply pipe.

The bunsen burner-tube is of the ordinary construction, except that the disc at the upper end of the nipple, through which the usual holes are formed for the gas to pass into the tube, is dispensed with, and the upper end of the nipple is entirely open at D. In conjunction with the nipple is a thimble E connected to it—the lower end being connected to the gas-supply pipe. The invention consists principally in arranging in the interior of the thimble a disc F formed with a central hole G and with cut-out portions H connected with it; the portions of the disc corresponding with the cut-out portions being hollowed out or dished, to receive a hollow ball I made of light material, and provided with two or more holes J. The dishing of the disc is carried out to a larger radius than that of the ball, so that when the pressure of gas is very low, the ball rests on the plate; but being light it can be lifted more or less, and be sustained by the gas in the lifted position so as to allow more gas to pass beyond the ball. The ball is therefore caused to revolve and "so break up the gas into small atoms," in which condition it takes up more air into the mixing-chamber of the bunsen burner proper, and so gives "a greater heating flame" with less gas." On the other hand, if the pressure of the gas is high the ball is lifted towards the top of the conical chamber within the thimble, making joint with the sides or interior of the cone. At this time gas is only allowed to pass through the ball by means of the holes, whereby a more regular supply of gas is allowed to pass to the burner and a more even flame is produced. The upper end of the thimble is provided with discharge holes for the gas, and whether the ball be resting on the disc or be lifted by the pressure of the gas, the object is to cause diffusion of the latter throughout the conical chamber and a further breaking up of the gas prior to passing through the discharge holes.

Separating Solid Hydrocarbons from Naphtha Residues and Tars.

TANNE, J., of Galizia, Austria, and OBERLÄNDER, G., of Berlin.

No. 1687; Jan. 23, 1911.

This invention relates to a process for separating solid hydrocarbons—such as paraffin, ceresin, and ozokerite—from naphtha residue and tars, as described in patent No. 27,116 of 1909.

According to the present process, instead of the solution of glacial acetic acid in benzene, a solution of a fatty acid homologous with the acetic acid—such as propionic acid, butyric acid, or the like in benzene—is used as the separating agent, without the process being changed in any other way. The new separating agents are employed in the same manner as in the original process.

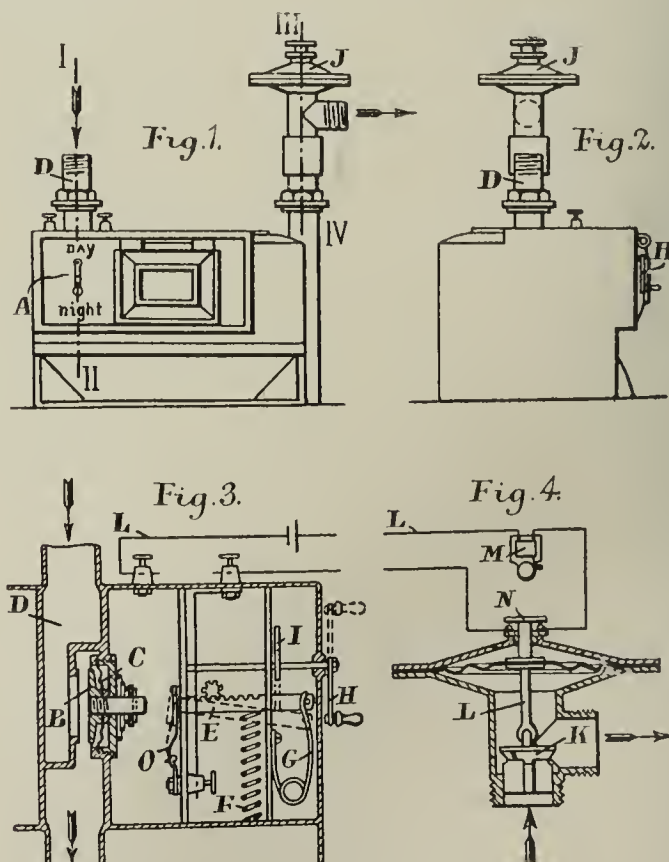
The present process is said to be "remarkable for the fact that the solid hydrocarbons will crystallize out better, and the product obtained be harder."

Automatic Control Valves for Gas Supply.

RUTTEN, J., of The Hague, Holland.

No. 2892; Feb. 4, 1911.

This invention consists in a method of "automatically controlling the closing of gas-valves, gas-pipes, and the like, wherein gas enters the meter through a first controlling device which admits predetermined or non-predetermined quantities of gas as desired and passes through a second controlling device to the service pipe, which second device is so designed that should a burner cock be left open, or a leakage occur in the service pipe, the supply of gas to the latter will be almost entirely shut off."



Rutten's Gas-Escape Indicator.

Fig. 1 is a front elevation, and fig. 2 a side elevation of one form of the apparatus fitted to a gas-meter. Fig. 3 is a vertical section on the line I.—II. of fig. 1; and fig. 4, a vertical section on the line III.—IV.

A is the first controlling device fitted on the upper part of the meter. It comprises a valve B fitted with a spring having a tendency to open the valve. In its normal (open) position, it allows gas to pass freely from the supply pipe into the gas-meter as indicated by the arrow; but when the valve is closed, no gas can enter the meter or service pipe. The valve is connected to a diaphragm C, which prevents the gas escaping from the pipe D past the valve-spindle.

Facing the back of the valve is the front end of a rack E capable of sliding towards the valve to close the latter by a pinion gearing with the rack, which is also capable of being moved transversely into, and out of operation with, the pinion; while a spring F has a tendency to move the rack into engagement with the pinion. A spring G tends to draw the rack back into the position shown in dotted lines in fig. 3; the valve B being then open by its own spring.

The operation of the apparatus is as follows: Normally the handle H for operating the cam I is placed in the "day position," in which the controlling device A is out of action as the pinion is disengaged from the rack E. The controlling device J, however, is permanently in operative position. Should therefore too much gas escape from the service pipe, the valve K will shut off the gas supply to the service pipe, and only a small quantity of gas can enter it through the groove (or bye-pass) of the valve L.

The controlling device makes it possible to shut off the gas supply to the service pipe by opening an ordinary big gas-cock, which is in connection with the atmosphere. On opening this cock, the pressure in the service pipe and under the diaphragm or bell diminishes to such an extent as to cause the second valve to shut off the gas supply. By this means the gas in the service pipe of a house can be shut off from any bedroom or other room. As soon as the big cock is closed and if no burner has been left open, the pressure in the service pipe increases and the second valve will open.

When the cam handle is placed in the "night position," the gas supply to the service pipe is maintained until the valve B is automatically closed. The quantity of gas flowing into the service pipe after the cam handle is thus placed is sufficient to keep a bedroom burner alight for a considerable time, but is not sufficient "to poison the atmosphere in the bedroom." The burner being extinguished before the valve is closed, the gas in the service pipe maintains the normal pressure causing the valve K to remain open. On replacing the cam handle H into the "day position," the rack E is disengaged from its pinion and is drawn backwards by the spring G. The valve thereupon opens again, and gas flows freely into the service pipe. The electric alarm M cannot be operated thereby, as the bridge piece N does not make contact with the terminals of the controlling device.

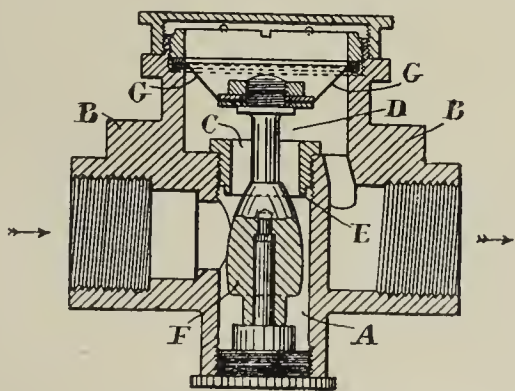
Should, however, a bedroom burner be left open after the valve has been closed by the rack, the pressure of the controlling device J and the service pipe falls; and, in consequence, the valve K will be closed. The bridge piece N then makes contact between the contact pieces, and then, when the cam handle H is placed into the "day position" (figs. 1 and 3), the rack will be drawn backwards by its spring, and the tongue O will make contact with its contact piece and the alarm M will be operated. The valve B is now open, but the valve K remains closed, as no pressure can be produced in the chamber or service pipe so long as the bedroom burner is open, since the small quantity of gas passing the valve escapes through the open burner. As soon as the bedroom burner, however, is closed, sufficient pressure will be produced in the chamber, and the valve K will open fully and the electric alarm circuit broken—gas passing freely into the service pipe.

Gas Pressure Governor.

GOODSON, J. H., of Thornton Heath, Surrey.

No. 9450; April 18, 1911.

This gas pressure governor consists of a cylindrical valve chamber A interposed in the body B between the inlet and communicating, through the valve controlled opening C, with a diaphragm chamber D provided on the barrel and having an opening communicating with the outlet. Around the opening C a seating E is formed; and when the conical



Goodson's Pressure Governor.

valve F is raised against this seating by the diaphragm G, the gas is shut off. The lower end of the valve chamber is closed by a screw plug carrying a fixed guide stem or pin which enters a cylindrical bore in the valve and serves to guide it vertically. The diaphragm chamber is closed by a removable cover provided with vent-holes.

In operation, gas on entering passes between the top of the valve and the seating E through the opening C into the diaphragm chamber D, raising the diaphragm more or less under the influence of the pressure from the main or back-pressure from the outlet pipe, and finally passing through the opening in the bottom of the diaphragm chamber to the outlet. The valve works quite freely in the chamber A, plenty of clearance being left around it.

CORRESPONDENCE.

[We are not responsible for opinions expressed by Correspondents.]

The Abolition of Sunday Labour in Gas-Works.

SIR,—I am sure your readers were, as I was, very pleased to see Mr. William King's reminder, in your current issue, that Sunday labour at the Liverpool Gas-Works was abolished by his late father as long ago as 1843. All honour to Mr. Alfred King, and to any others who may have done likewise.

I need hardly assure his son that there is not the least desire on my part to ignore anyone's memory in connection with this matter; but to my mind the most notable fact in relation to it is the one to which I endeavoured to direct attention the other evening—namely, that to Messrs. Livesey and Morton's initiative in 1871, and their subsequent crusade, we owe the present wide-spread recognition of this most humanizing and beneficial reform.

17, Victoria Street, S.W., Aug. 31, 1911.

CHARLES HUNT.

Inquiry Circulars.

SIR,—I enclose copies of two circulars of inquiry received to-day, and may say that this makes a total of at least ten I have received from the same undertaking during the past three years.

You may make any use you think proper of the enclosed; but please suppress my name in connection therewith.

Aug. 30, 1911.

ENGINEER.

[ENCLOSURE.]

Show-Rooms—Hire of Gas Apparatus.

DEAR SIR,—The question of utilizing vacant premises in the centre of the town as a combined show-room for the Gas and Electricity Departments (both under the same Committee) is under consideration here, together with the practicability or otherwise of having the Distribution Department's stores, workshops, and offices in the same block.

As I understand that you have a show-room in your town, I shall be very grateful for any information which you may care to give me on the matter.

Do you supply any gas apparatus besides gas cooking-stoves on hire or hire purchase? We have not done so here up to the present; but the matter is under consideration.

The enclosed list of inquiries may possibly save your time in answering my letter.

Apologising for troubling you, and assuring you that I shall be very pleased to reciprocate your kindness should an opportunity occur.—I am, &c.

Show-Rooms.

Do you exhibit gas-fittings and gas appliances generally, or only cooking and heating stoves?

Do you sell the fittings, or how can consumers obtain them?

Is your show-room some distance from the gas-works?

If so, have you any of the following in connection with it in the same block of buildings? Complaint and order office, stores for outdoor department, gas-fitters' workshops.

What class of man do you have in charge—clerk, gas-fitter, or shopman; and do you expect him to have much technical knowledge of the applications of gas?

How many men and boys do you have all day at the show-room?

Can you favour me with picture post-cards or similar views of your show-room?

Hire of Gas Apparatus.

About how many makers' gas appliances do you supply?

Do you supply on both simple hire and hire-purchase, and which do you find the more satisfactory?

Can you favour me with printed matter showing your terms and copies of your agreements, stating the amount of stamp duty required?

Gas-Workers' Wages at Huddersfield.—A deputation of workmen has waited on the Huddersfield Gas Committee with reference to a request of the employees for higher wages; both stokers and general labourers desiring an advance amounting to about $7\frac{1}{2}$ per cent. It was explained on behalf of the men that the Corporation were not paying as high wages as other municipal gas undertakings, and that the cost of living in Huddersfield was more than in other towns of similar size. It is stated that the question was discussed in a friendly manner; and after the deputation had left, the Committee appointed a small Sub-Committee to go into the matter and report to an early meeting of the Committee. As the Council will not meet again until October, it was understood that the men would defer any action until after the matter has been submitted to the meeting of the Council that month.

Barnsley Gas Company.—At the annual meeting of the Barnsley Gas Company, Mr. E. G. Lancaster, in moving the adoption of the report and balance-sheet, said there was a surplus of £175, after paying the usual dividends. This was not unsatisfactory, considering they had allowed £644 in discount for the prompt payment of accounts—an amount equal to one-thirteenth of the sum paid in dividends. They had sold 3 million cubic feet more gas. The present time, however, was a rather difficult one. They had not been able to complete the work of fixing mechanical stokers. Cudworth, who had been a good customer, had decided to make their own gas, though the Company had offered to supply them for a term of years at 1½d. per 1000 cubic feet less than the actual cost price at the present time. Then the Barnsley Corporation were evidently going to introduce electricity for street lighting, as they had given notice for the discontinuance of the supply of gas for the public lamps. The Directors were going to increase the discounts to customers for prompt payment by another $2\frac{1}{2}$ per cent., which would mean that the consumers would receive in discount one-sixth of the amount handed to shareholders. A resolution was adopted expressing appreciation of the fifty years' service of Mr. W. W. Hutchinson, Secretary and Manager of the Company, and regret at his retirement owing to ill-health.

MISCELLANEOUS NEWS.

GASLIGHT AND COKE COMPANY'S EMPLOYEES.

Higher Pay for Carbonizing Men.—Increased Holiday Allowances.

We understand that the Directors of the Gaslight and Coke Company have resolved to increase the pay of all classes of workmen regularly employed in the carbonizing department (both coal gas and oil gas) by 6d. per shift of eight hours.

When making this announcement at a meeting of representatives of the staff of carbonizing men which was held at Horseferry Road on Monday of last week, the Governor (Mr. Corbet Woodall) made a further interesting communication on the subject of workmen's holidays, which is set out in a notice subsequently posted at the Company's works. This was to the effect that the attention of the Governor and the Court of Directors has been recently given to numerous withdrawals of the "withdrawable" portion of the co-partnership bonus, which they understand have been mainly for the excellent purpose of contributing to the expenses of the annual holiday of the co-partners' families. The Directors are to the fullest extent in sympathy with this object; but, at the same time, they are anxious that individual co-partnership accounts, as well as the general co-partnership funds, shall not be weakened by withdrawals, except in cases which may be fairly considered as urgent. The Directors have resolved, in order to obviate the necessity of using the withdrawable account for holiday purposes, to anticipate in some measure their celebration of the Centenary of the Company, which will fall next year, and to forthwith increase the usual holiday allowance of their workmen at manufacturing stations to a fortnight's pay at the usual current rates—the period of the holiday (one week) remaining as hitherto. They trust that this will carry with it an honourable understanding that the money granted will be used for the purpose named. The additional holiday allowance will be made, subject to the usual conditions of good time-keeping, to all those manufacturing station workmen who, by the end of September in any year, will have completed three years' consecutive service. Those workmen who have already had their holidays, and whose length and regularity of service comply with the foregoing conditions, will therefore be paid an additional week's wages at once, while those whose holidays are still to come will receive two weeks' pay at the time of starting. The holiday allowance to workmen of less than three years' service will remain as heretofore; but the period of service which will entitle a man to a holiday will be calculated up to Sept. 30 in any year, and not, as heretofore, from the commencement of the holiday season.

This alteration in the pay of the carbonizing men, as well as in the holiday allowance of all workmen at the manufacturing stations, was received by the representatives present at the meeting with expressions of satisfaction and thanks.

STATISTICS RELATING TO GAS UNDERTAKINGS.

Returns under the Census of Production Act, 1906.

The ninth, and last, of the series of tables summarizing the preliminary results of the returns received by the Board of Trade under the Census of Production Act, 1906, was issued early last week. It relates chiefly to the building and contracting trades, quarries, and public utility services, including those of gas, water, and electricity supply. The tabulated statistics are preceded by a report by the Director of the Census (Mr. A. W. Flux); and this follows one addressed to the Secretary of the Board of Trade by the Comptroller-General of the Labour department (Mr. G. R. Askwith, C.B., K.C.).

In the course of his report, Mr. Askwith points out that the statistics are to undergo revision before they are submitted in their entirety, but he thinks they are sufficiently close to the final figures to afford a good indication of the quantity and value of the principal products of the industries to which they relate. Some idea of the work involved in the production of this series of Blue-books may be had when it is mentioned that to obtain the information embodied in the tables, about 144,000 schedules were issued to firms and companies engaged in the various industries, and also to public authorities. The returns are mainly for the year 1907, and they show that the average number of persons employed in the work covered by the tables was then about a million; and the total output of that year represented an addition of about £104,250,000 to the value of the materials purchased. The completion of the preliminary tables affords an opportunity of summarizing the principal figures, and showing their magnitude; and this is done in a table of which the following are the totals for the United Kingdom: Gross output, selling value, or value of work done, £1,757,000,000; cost of materials used, £1,019,000,000; amount paid to other firms for work given out, £26,000,000; net output, £712,000,000; average number of persons employed, excluding about 100,000 outworkers, 6,936,000. The average number of persons employed on the work covered by the census was thus about 7,000,000; and the total output in the censal year represented an addition of about £712,000,000 to the value of the materials purchased.

We give below the portion of the Blue-book just issued which deals with gas undertakings. As already mentioned, the returns are normally for the year 1907; but where the financial period of a firm, company, or authority was not a calendar year, permission was given to furnish particulars for twelve months ending not earlier than June 30, 1907, nor later than June 30, 1908. The returns for the gas undertakings of His Majesty's War Office are for the year ended March 31, 1908. Mr. Flux gives a table showing, for the United Kingdom as a whole, the gross output, the cost of material used, the net output, the

number of persons employed, and the net output per person. It contains the following figures relating to gas undertakings:—

	Companies.	Public Authorities.
Gross output selling value, or value of work done	£20,838,000	£10,769,000
Cost of material used	9,292,000	5,037,000
Net output	£11,546,000	£5,732,000
Number of persons employed	54,946	28,585
Net output per person	£210	£201

The tables are based on returns received in respect of gas made by companies and by public authorities for sale and for public lighting. Returns were not required from collieries, factories, and other establishments possessing plant for the generation of gas for their own use, except in the case of railway companies. The returns received in respect of the gas-works at the Royal Arsenal, Woolwich, and the Royal Small Arms Factory, Enfield, are included with those received from local authorities in the tables relating to public authorities. Separate tables are given showing the particulars furnished in respect of the undertakings conducted by companies, and in regard to those conducted by public authorities. The following statement shows the particulars furnished as to the aggregate output of gas undertakings of both classes, and is free from duplication:—

	Quantity.	Value.
Coal gas and water gas	(a)	£23,157,000
Coke and breeze	7,590,000 tons	4,434,000
Crude tar	653,000 "	667,000
Ammoniacal liquor	(a)	322,000
Ammoniacal liquor and crude tar, not separately distinguished	(a)	179,000
Bye-products—		
Ammonia, sulphate of	105,000 "	1,078,000
Anthracene	296,000 lbs.	2,000
Benzol and toluol	46,000 galls.	2,000
Carbolic acid	18,000 "	25,000
Naphtha	281,000 galls.	8,000
Naphthalene	44,000 cwt.	12,000
Pitch	85,000 tons	110,000
Tar (refined) and tar varnishes	642,000 galls.	6,000
Tar oil, creosote, &c.	7,877,000 "	84,000
Other bye-products	(a)	166,000
Other products	(a)	33,000

(a) Recorded by value only.

The total value of the above-mentioned products amounts to £30,285,000, and is exclusive of the value of any gas and coke used in the gas-works where they were made. The crude tar and ammoniacal liquor included in the statement do not represent the total quantities made, but only the quantities not subjected to further treatment at the works where they were made. In addition, £1,322,000 was received from consumers for fixing stoves, fittings, &c., exclusive of the cost of the lighting, heating, or cooking apparatus fixed. The total output of gas undertakings was thus £31,607,000.

Under the limitations imposed by the Census of Production Act, it was not possible to require the quantity of gas made to be stated in the compulsory part of the schedule. A voluntary question was accordingly included in the schedule, requesting companies and public authorities to state the quantity of gas made by them. The great majority furnished this information. But some supplied particulars only of the gas sold; and companies and authorities that sold gas valued at £369,000 gave no particulars. After due allowance has been made for these deficiencies, it may be estimated that the total make of gas in the United Kingdom in the year of the return was as follows:

	Thousand Cubic Feet
Statutory undertakings—	
Companies	118,650,000
Local authorities	69,845,000
Total	188,495,000
Non-statutory undertakings—	
Companies	7,090,000
Public authorities	690,000
Total	7,780,000
Grand total	196,275,000

The annual Returns of Gas Undertakings cover only those operating under statutory powers, and relate, as do the returns made to the Census of Production Office generally, to the year 1907 in the case of companies and to the twelve months ended March 31, 1908, in the case of the local authorities. The output shown in these returns was 118,699,705,000 cubic feet in the case of companies, and 69,786,988,000 cubic feet in that of local authorities. The very small differences between these figures and those given above are due to the fact that in some cases the returns made to the Census Office were not for the periods covered by the annual returns. According to these, the quantity of gas sold by authorized undertakings was 172,889,147,000 cubic feet; and, on the assumption that the relation between gas sold and gas made is similar for statutory and non-statutory undertakings, the total quantity sold and consumed in the United Kingdom in the censal year would be about 180,000 million cubic feet—the difference between make and sales being accounted for by gas used in works and leakages from mains. In addition to the gas made at public gas undertakings, railway companies stated in their returns that they made for their own purposes 1,411,496,000 cubic feet of coal gas at the cost of £146,000, and 441,933,000 cubic feet of oil gas valued at £140,000.

With regard to the other products of the distillation of coal, information was also received from the owners of coke-works at mines and iron-works, from the owners of tar distillation and sulphate of ammonia works, and from sundry other factory occupiers.

Combining the particulars thus furnished with those contained in the preceding statement, the following table shows the quantities and

values of the several products returned to the Census Office as made in the United Kingdom in the censal year :—

	Quantity.	Value.
Coke and breeze	19,762,000 tons	£14,607,000
Crude tar	846,000 „	833,000
Ammoniacal liquor	(a)	361,000
Ammoniacal liquor and crude tar, not separately distinguished.	(a)	179,000
Ammonia, sulphate of	260,000 „	2,823,000
Anthracene	3,126,000 lbs.	9,000
Benzol and toluol.	6,212,000 galls.	182,000
Carbolic acid	{ 688,000 „ } 160,000 cwt. }	208,000
Naphtha	4,188,000 galls.	141,000
Naphthalene	283,000 cwt.	42,000
Pitch	647,000 tons	795,000
Tar (refined) and tar varnishes	6,251,000 galls.	64,000
Tar oil, creosote, &c.	65,613,000 „	672,000
Other coal tar bye-products (not dyes)	(a)	565,000

As indicated above the crude tar and ammoniacal liquor included in the foregoing statement only represent the quantities of these products which were sold or retained in stock as crude tar and ammoniacal liquor and not the total quantities made.

With regard to the output of sulphate of ammonia, the Chief Inspector of Alkali Works, in his forty-fifth annual report, estimated that in 1907 “the recovery and production of ammonia in the United Kingdom, expressed in terms of sulphate,” was the equivalent of 313,000 tons of sulphate of ammonia—adding that these figures “do not represent the produce of sulphate of ammonia.” His estimate of the theoretical produce of sulphate of ammonia showed 165,000 tons from gas-works and 148,000 tons from other works, as compared with actual quantities of 105,000 tons returned to the Census Office as produced at gas-works, and 155,000 tons as produced at other works. There is thus a difference of 53,000 tons between the actual and the theoretical quantities of sulphate of ammonia. With regard to this difference, two points have to be noted. First, it appears from the report quoted that in 1908 it was discovered that there had been certain errors in the method of calculating the quantities for previous years, and that consequently the theoretical total for 1907 is somewhat over-estimated. Secondly, the principal difference between the two figures occurs in the produce of gas-works ; and in addition to the 105,000 tons of sulphate returned to the Census Office as produced at such works, there was also produced ammoniacal liquor valued at £322,000 (and, including liquor produced at other works, £361,000), and ammoniacal liquor and crude tar, not separately distinguished, valued at £179,000. This liquor is sold partly to alkali works for use in the production of alkali by the ammonia-soda process, and partly to other firms making ammonia, and carbonate, chloride, and other compounds of ammonia. Particulars as to large quantities of ammonia and ammonia compounds were returned to the Census Office ; but, in order to avoid the possibility of disclosing particulars relating to individual firms, they have not been shown separately, but are included in the group of “Unenumerated Chemicals” in the group of “Other Bye-Products,” in the tabular statement already given. All such ammonia and ammonia compounds, as well as the liquor sold to alkali works, are included by the Chief Inspector of Alkali Works in his estimate of their equivalent in sulphate of ammonia. Further, some sulphate of ammonia was probably worked up by the makers into compound manures, and included as such in the returns made to the Census Office. Thus there appears to be no inconsistency between the figures of actual output of sulphate of ammonia as returned to the Census Office, and the estimate of the production of ammonia and ammonia compounds made by the Chief Inspector in terms of sulphate of ammonia.

The exports of coke in 1907 amounted to 981,000 tons, or 5 per cent. of the total output in the United Kingdom ; but the net imports (*i.e.*, the imports less re-exports) were only 18,000 tons. The exports of sulphate of ammonia amounted to 231,000 tons, or 89 per cent. of the total output ; the imports are not separately specified. The exports of carbolic acid amounted to 126,000 cwt., valued at £154,000, free on board ; those of anthracene and naphthalene to 100,000 cwt., valued at £28,000, free on board ; and the exports of all other coal-tar products (not dyes) were valued at £1,064,000, free on board. The net imports of coal-tar products (not dyes) were valued at £87,000 at the port of landing.

The net output of all the gas undertakings covered by the report is £17,278,000 ; this sum representing the total amount by which the value of the output exceeded the cost of the materials used. The actual cost of materials was £14,329,000.

The average number of persons employed on the four dates for which the numbers were returned was 83,531—viz., 74,967 wage earners and 8564 salaried persons. Of the total number, 81,888 (including 8514 salaried persons) were employed at gas-works, and 1643 (including 50 salaried persons) at tar-distilling and ammonia works. The total number of persons ordinarily employed at gas-works, according to the Home Office return of persons employed in 1907 in non-textile factories, was 62,234. Gas fitters and chemical workers were separately distinguished—not being included in this total. Moreover, these figures refer to persons employed “wholly or partially in the factory,” while the returns to the Census Office include members of the outdoor staff. But the whole of this staff (collectors, repairers, &c.), does not appear to have been included in some cases ; and allowance should be made for this fact in comparing the net output with the number employed.

DETAILS AS TO COMPANIES.

The next statement shows the particulars furnished by gas companies respecting the output of their works, and is free from duplication. The total value of the above products amounts to £19,889,000, and is exclusive of the value of any gas and coke used in the gas-works where they were made. As already noted, the crude tar and ammoniacal liquor included in the statement do not represent the total quantities made in companies' gas-works, but only the quantities not subjected to further treatment at the works where they were made. In

	Quantity.	Value.
Coal gas and water gas	(a)	£15,324,000
Coke and breeze	4,706,000 tons	2,968,000
Crude tar	366,000 „	363,000
Ammoniacal liquor	(a)	140,000
Ammoniacal liquor and crude tar not separately distinguished.	(a)	18,000
Bye-products—		
Ammonia, sulphate of	73,000 tons	729,000
Anthracene	280,000 lbs.	2,000
Benzol and toluol	38,000 galls.	2,000
Carbolic acid	14,000 cwt.	21,000
Naphtha	57,000 galls.	3,000
Naphthalene	29,000 cwt.	11,000
Pitch	64,000 tons	88,000
Tar (refined) and tar varnishes	154,000 galls.	2,000
Tar oil, creosote, &c.	6,247,000 „	67,000
Other sorts	(a)	142,000
Other products	(a)	9,000

(a) Recorded by value only.

addition, the sum of £949,000 was received from consumers for fixing stoves and other fittings, &c., exclusive of the cost of the lighting, heating, or cooking apparatus fixed. The total output of gas undertakings conducted by companies was thus £20,838,000.

The working staff of gas companies is not employed solely in the operation of the gas-generating plant, but also in works of construction, alteration, and repair in connection with the buildings, plant, mains, &c. The cost of such work, whether immediately met out of capital or out of revenue, forms eventually a charge on the value of the gas and other products sold ; consequently, it has not been taken as an addition to the “output” of gas undertakings, in the sense in which this term has been used for the purposes of the census. A summary of the particulars furnished in respect of the cost of such work done in the censal year (covering wages, materials, and establishment charges attributable to the work) is shown below ; the work given out to contractors not being included :

	Construction.	Alteration and Repair.	Total.
Work done by employees of companies—			
Buildings and plant	£172,000	£1,307,000	£1,479,000
Street mains	324,000	378,000	702,000
Work not separately distinguished.	—	—	172,000
Total cost of work done			£2,353,000

The net output of gas undertakings conducted by companies was £11,546,000 ; this sum representing the total amount by which the value of the output of these undertakings exceeded the cost of the materials used. The actual cost of materials was £9,292,000.

The average number of persons employed on the last pay-days in January, April, July, and October, in connection with gas undertakings conducted by companies, was 54,946—viz. :

	Wage-Earners.	Salaried Persons.	Total.
At gas-works	48,253	5426	53,679
At tar-distilling and ammonia works.	1,232	35	1,267
Total	49,485	5461	54,946

The following statement affords some indication of the seasonal variation in the employment of wage-earners ; the figures showing the number of persons employed on last pay-days in the months named :

	January.	April.	July.	October.
At gas-works	51,705	46,838	45,340	49,129
At tar-distilling and ammonia works	1,281	1,258	1,157	1,229
Total	52,986	48,096	46,497	50,358

The total number returned was distributed by age and sex as follows : Males under 18, 1813 ; over 18, 52,909. Females under 18, 8 ; over 18, 216.

As already stated, it is probable that in some cases the whole of the outdoor staff of the companies (collectors, repairers, &c.) has not been included in these figures ; and allowance should be made for this in considering the net output per head.

DETAILS AS TO PUBLIC AUTHORITIES.

The following statement shows the particulars furnished by public authorities respecting the output of their gas-works, and is free from duplication :—

	Quantity.	Value.
Coal gas and water gas	(a)	£7,833,000
Coke and breeze	2,884,000 tons	1,466,000
Crude tar	287,000 „	304,000
Ammoniacal liquor	(a)	182,000
Ammoniacal liquor and crude tar, not separately distinguished.	(a)	161,000
Bye-products—		
Ammonia, sulphate of	32,000 tons	349,000
Anthracene	16,000 lbs.	(b)
Benzol and toluol	8,000 galls.	(b)
Carbolic acid	{ 18,000 „ } 4,000 cwt. }	4,000
Naphtha	224,000 galls.	5,000
Naphthalene	15,000 cwt.	1,000
Pitch	21,000 tons	22,000
Tar (refined) and tar varnishes	488,000 galls.	4,000
Tar oil, creosote, &c.	1,630,000 „	17,000
Other sorts	(a)	24,000
Other products	(a)	24,000

The total value of the above-mentioned products amounts to £10,396,000, and is exclusive of the value of any gas and coke used in the gas-works where they were made. As already noted, the crude tar and ammoniacal liquor included in the statement do not represent the total quantities made in public authorities' gas-works, but only the

quantities not subjected to further treatment at the works where they were made. In addition, the sum of £373,000 was received from consumers for fixing stoves and other fittings, exclusive of the cost of the lighting, heating, or cooking apparatus fixed. The total output of the gas undertakings conducted by public authorities was thus £10,769,000.

As already explained in the case of companies, the working staff of the gas undertakings of public authorities is engaged not only in operating the generating plant, but also in works of construction, alteration, and repair in connection with the buildings, plant, mains, &c. The cost of such work has not been taken as part of the output of the undertakings; but a summary of the particulars furnished in respect of the cost of such work (covering wages, materials, and establishment charges attributable to the work) is given below; the work given out to contractors not being included:

	Construction.	Alteration and Repair.	Total.
Work done by employees of public authorities—			
Buildings and plant . . .	£38,000	£610,000	£648,000
Street mains	164,000	227,000	391,000
Work not separately distinguished	—	—	142,000
Total cost of work done			£1,181,000

The net output of gas undertakings conducted by public authorities was £5,732,000; this sum representing the total amount by which the value of the output exceeded the cost of the materials used. The actual cost of materials was £5,037,000.

The average number of persons employed on the last pay-days in April (c), July, and October, 1907, and January, 1908, in connection with gas undertakings conducted by public authorities, is returned as 28,585—viz.:

	Wage-Earners.	Salaried Persons.	Total.
At gas-works	25,121	3,088	28,209
At tar-distilling and ammonia works	361	15	376
Total	25,482	3,103	28,585

The following statement affords some indication of the seasonal variation in the employment of wage-earners, the figures, as in the case of the companies, showing the number of persons employed on the last pay-days in the months named:

	April.	July.	October.	January.
At gas-works	23,734	23,171	25,779	27,801
At tar-distilling and ammonia works	346	282	407	410
Total	24,080	23,453	26,186	28,211

The total number returned was distributed by age and sex as follows: Males under 18, 557; over 18, 27,927. Females under 18, 3; over 18, 98.

As in the case of the companies, allowance has to be made for the whole of the outdoor staff (collectors, repairers, &c.) not being included in these figures.

The statistics given in the foregoing extracts will be found in much greater detail in the tables following the general report by the Director of the Census.

METROPOLITAN (OF MELBOURNE) GAS COMPANY.

The Half-Yearly Meeting.

This Meeting was held on Thursday, July 27—Mr. JOHN GRICE in the chair.

The balance-sheet and detailed financial statement showed that the net profits for the half year to June 30, including a balance of £2646 brought forward from the previous half year, amounted to £99,901. From this sum the Directors recommended the transferences of £25,000 to the reserve fund account; £5000 to the meter renewal fund; £20,000 to the works reconstruction account; and £2000 to the gas-stoves, &c., account. A dividend at the rate of 5s. a share (amounting to £42,860) was recommended; leaving £5040 to be carried forward.

The CHAIRMAN, in moving the adoption of the report and balance-sheet, said that the results of the six months' operations indicated continued prosperity in the community and a satisfactory response to the Company's sustained efforts to take advantage of conditions arising therefrom. Proceeding, he remarked: The number of meters standing fixed at June 30 and at the same date in 1910 shows considerable expansion, as follows:—

	1911.	1910.	Increase.
Ordinary	87,273	80,330	6,943
Slots	19,397	16,826	2,571
	106,670	97,156	9,514

The total sales of gas during the half year amounted to 998,193,000 cubic feet, compared with 881,468,000 cubic feet in the corresponding half of 1910—representing an increase of 13½ per cent.; and though a part of this increase is attributable to the exceptionally cold and wet season we have experienced, much of it is doubtless in consequence of the more extended use and popularity of the gas-stove, which is in these times a practical necessity. The ever-increasing problem of domestic help, and the growing practice of adopting all possible labour-saving appliances, have made it so. I need not recapitulate the methods we employ to bring the advantages of cooking by gas before the public. I will content myself by assuring you that our efforts are unabated, and have not been fruitless, since we placed no fewer than 3718 new stove consumers on our books in the past six months—a very large number for that period of the year.

The effect of the continued activity in the building trade and the

(a) Recorded by value only. (b) Under £500. (c) April, 1908, in the case of local authorities in Scotland.

expansion of the various suburbs around Melbourne are reflected in our outgoings for new mains, services, and meters. Under these three headings, our accounts show a total expenditure of £25,969. New mains represent an extension to our reticulation service of 15,926 yards, or just over 9 miles.

Referring to the different items in the balance-sheet, I may point out that as the figures for the half year ended June 30, 1910, were very largely affected by the disturbing influences of the Newcastle strike during the early months of that year, a satisfactory comparison with the half year immediately past is not possible. As an example of this, the cost of coal carbonized in June, 1910, worked out for the half year at £88,048 for 94,711 tons, while during the corresponding period of this year the outlay amounted to the smaller sum of £80,057 for the larger quantity of 102,024 tons.

Together with other large employers of labour, we have met the demands for all-round increases in the rates of pay to employees; and the various items on the expenditure side of the balance-sheet, such as wages at works, repairs at works, expenses of distribution, which include the cost of labour, have expanded in an upward direction owing to this factor. The cost of manufacture and distribution and the handling of residuals, &c., has thus been increased by the large sum of £25,000 per annum, which is being paid to the employees of the Company in the form of increased rates of wages, &c., and which of course affects our yearly balance to this extent.

The receipts from sales of gas consumed by meter and for public lighting amounted to £240,450, and residuals realized £60,052.

The only transfer calling for remark is that to "works reconstruction account," £20,000. This appropriation appeared for the first time in the balance-sheet for the half year to December last, and an explanation for its inclusion was then given, as well as an intimation that similar provision would be necessary in the next few half years. The new Dessau vertical retort-house, which is an imperative requirement to meet the increased output of gas, is now in course of construction at West Melbourne; and that manufacturing station is being practically remodelled and largely reconstructed to ensure more economical and effective results. These transfers to works reconstruction account are to provide the funds for reconstruction, and a similar value of buildings and plant now being demolished, but which are to be erected in another form, in accordance with our plans.

Referring still to my forecast, made last January, of the probable financial requirements of the Company in the then near future, I would remind you that I explained that, in addition to the provisions necessary to be made from revenue account for reconstruction and renewals at the West and South Melbourne works, some capital would have to be forthcoming for new and additional plant and buildings about to be erected. As the time has arrived when the capital expenditure above alluded to has to be incurred, we have given notice that we intend to-day to ask the authority of shareholders to re-issue debentures to the sum of £59,000 towards the funds required for the work in hand. The amount in question is made up of separate lots, respectively of £9000 and £50,000 debentures, paid off during recent years, and allowed to remain unissued until the demands upon the Company's capital account rendered this course necessary.

My remarks at our last meeting were concluded by a short reference to the adoption after careful inquiry by the Society of Medical Officers of Health (London), of a system of gas lighting and heating for their offices and demonstration and exhibition rooms, which clearly showed that body considered gas a healthy illuminant. Since that date further valuable testimony has been adduced, which I do not think should remain unnoticed, concerning the results of scientific investigation into the hygienic conditions arising out of the use of gas for purposes of lighting and heating. On this occasion I refer to the results given in a recent issue of the "Medical Magazine" of an inquiry on this important subject, made under the supervision of the Medical Superintendent of the Lewisham (England) Infirmary, Dr. F. S. Toogood. After quoting the report (which appeared in the "JOURNAL" at the time of its issue), the Chairman concluded: I do not think in these days that the public is quite so ready to accept without proper inquiry the statements made by our competitors, that the use of gas for lighting and heating gives rise to unhealthy conditions; but in any case it is both interesting and instructive to learn the conclusions arrived at by modern scientific investigators who have applied themselves with an open mind to testing the truth or otherwise of such statements.

Mr. EDWIN PHILLIPS, in seconding the motion, said it might be thought that the Company were spending too much on machinery; but the present was an age of machinery—it never went out on strike, was always willing to work, and it was a great advantage.

The resolution was passed; as was also the following: That the Directors of the Metropolitan Gas Company be and are hereby authorized to borrow the sum of £59,000, for extensions and improvements to the Company's works at West Melbourne, and for that purpose to issue debentures to the said amount—such debentures to be charged and secured upon the undertaking, rates, and other revenues of the Company.

A resolution declaring the dividend concluded the business.

Limerick Gas-Works Extensions.—It has been decided by the Limerick Corporation to carry out a scheme of enlargement of the gas-works, at a cost of £3300.

Melton Mowbray Gas Company, Limited.—At the annual meeting of this Company on the 25th ult., the accounts presented showed that the balance of profit and loss amounted to £2099; being an advance of £57 as compared with the previous year. The usual dividend of 7½ per cent. was declared. There was an increased revenue from the sale of gas by slot-meters of £145; but the ordinary meter consumption was £43 lower. The sales of residual products were extremely good during the year; and the Directors hoped this account would go still higher, as coke was advancing in price. Altogether it was one of the most satisfactory year's working the Company had ever had. After expressions of satisfaction and votes of thanks to the Managing-Directors, the Manager (Mr. G. R. Casterton), the Secretary (Mr. G. Rose), and the staff generally, the meeting closed.

TICEHURST AND DISTRICT WATER AND GAS COMPANY.

The Past and the Present.

An Ordinary General Meeting of Shareholders of this Company was held last Wednesday afternoon, at the Institute of Chartered Accountants, Moorgate Place, E.C., to receive the Directors' report and statement of accounts covering the period from Oct. 23, 1909, to April 30, 1911. Some points from the report were given in last week's "JOURNAL" (p. 554). Mr. C. S. GLOVER, the Chairman of the Company, presided over a numerous gathering.

In moving the adoption of the report and accounts, the Chairman entered into a lengthy explanation of the past history and the present position of the Company. In the course of his remarks, he said that on the last occasion he had the pleasure of meeting the proprietors, it was not in the position of Chairman of the Company, but as a large shareholder. In December, 1909, he and his colleague Mr. W. H. Collier, who was also largely interested in the Company, were unanimously elected to the Board, instead of Mr. W. B. Martin and Dr. W. R. White, who were requested to resign. Since then, Mr. Alfred Evans had joined the Board, and represented a large number of cash share and debenture holders. He thought it would be agreed that the shareholders had cause for congratulation on the marked progress shown by the accounts, and the satisfactory position, under the circumstances the Directors had had to contend against. Proceeding to detail the facts elicited during the examination which had been made of the affairs of the undertaking, he said that it was found in the course of the investigation that both Mr. Martin and Dr. White, the late Directors, were only acting as nominees of the original promoter of the Company, Mr. E. O. Preston; and that Mr. Preston really controlled the Company, received the revenue, and paid what expenses he considered necessary. Having unloaded shares and debentures upon the public, it was to his interest to just keep the Company alive, and pay a little debenture interest to those whom he could get to take a further financial interest in the undertaking and in other flotations for which he was responsible, and about which those present had probably all read in the Press. In 1903, Mr. Preston promoted two Statutory Companies—one the Wadhurst, Ticehurst, and District Gaslight and Coke Company, and the other the Ticehurst and Robertsbridge Water Company. Under the original purchase agreements, Mr. Preston was to pay the costs of obtaining the two Acts of Parliament, and in the case of the Gas Company transfer the benefit of his rights in a gas-works at Wadhurst which he had obtained from a Mr. Whitty for £500 in shares, and a gas-works at Ticehurst which he had secured for a small consideration from a private concern. For this he was to receive £16,500—a preposterous figure, and one that allowed a large surplus for profits. In the case of the Water Company, he was to construct a pumping-station at Burwash, and lay certain mains (in addition to paying for the Act) for a consideration of £18,500—which, again, left a large margin for profit, particulars of which were not given in the prospectus. It would thus be seen that a sum of some £35,000 was paid by the shareholders to Preston in cash, shares, and debentures. The shares and debentures transferred to him he disposed of through his share-pushing agency. He controlled the affairs until December, 1904, when the two Companies were amalgamated by a further Act of Parliament, and continued from Jan. 1, 1905, as the Ticehurst and District Water and Gas Company. The concern not having been a success, and being in want of funds, Preston sought the aid of Mr. Edmund Eaton—well known, unfortunately, he thought, among them all; and the Company was transferred to the notorious No. 99, Cannon Street address, and nominees of Eaton appointed as Directors in place of those of Preston. The capital of the Company having been increased by £10,000 in preference shares, the first thing that Eaton attempted was the issuing of a prospectus inviting subscriptions for these shares. In addition, Eaton and his nominee Directors sought to make further profits from the Ticehurst Company by giving, for no consideration, to themselves as controllers and directors of the Gas and Water Works Supplies and Construction Company, Limited, certain parts of its statutory area and rights in the form of two agreements to take water from the Company at the ridiculous figure of 6d. per 1000 gallons. Having obtained these agreements, Eaton, White, and Co. immediately formed the East Sussex Gaslight and Coke and Water Company, Limited, and the Robertsbridge, Salehurst, and Hurst Green Water and Gas Company, Limited, and sold the benefit under the agreements for enormous purchase considerations. Messrs. Eaton and Co. acted on the Boards of these Companies; and as soon as the water-mains were laid, the Ticehurst Company had to supply water under the agreements, every 1000 gallons of which resulted in a loss to the Company. Yet no steps were taken to remedy this state of affairs until the present Board took office, when, under the advice of Counsel, proceedings were begun to have the agreements annulled, and heavy damages were claimed against those responsible. The action against the Robertsbridge Company was settled on terms whereby the Ticehurst Company obtained their statutory area and the water-mains for a very small payment. As regarded the East Sussex Company, the action went to trial, with the result that in future the water supply must be paid for by that Company at the rate of 1s. 6d. per 1000 gallons, instead of 6d. In addition, judgment for damages and costs was given against Eaton and White. In the course of the investigations of the present Board, it was found that the bill of costs for obtaining the Water Act had been paid, with other costs, by the then Directors. Proceedings were therefore commenced against Preston to obtain the return of over £800. As a defence, he lodged a counter-claim for some £2000, which he stated that he had lent to the Company. They also claimed from him a large sum of money for various things which they contended he was liable for. Unfortunately, these proceedings were abortive, as a receiving order in bankruptcy had been made against Preston. The Directors had lodged a claim for some £18,000 against the estate. The Directors found that debentures had been created and issued by Eaton and Co. over and above the authorized number allowed by the Act. To preserve the goodwill and assets, a Receiver and Manager of the Company

was appointed. It was found that the liabilities of the Company were enormous; there being large bills outstanding for coals and goods supplied. In many instances, coal had been purchased locally in small quantities at high prices, instead of being obtained by contract on favourable terms. There were complaints about the gas supply; in fact, the works were in a state of collapse. To remedy this state of affairs, and ensure a good supply of gas, and to connect up people who were wanting water, the Receiver obtained sanction to borrow £1500. With this sum, the work detailed in the report had been carried out. A large number of water agreements had been effected, whereby the consumers agreed to lay the mains and the Company to furnish water. When the Company had worked-off the cost of the mains by water supplied, the mains became the property of the Company together with the revenue, which alone should provide a further £200 to £300 per annum. Since the present Directors took office, they had added 85 water consumers and laid mains to connect up others; and it would be appreciated that this department was the most remunerative, as the expenses were not heavy. They had also added 35 gas consumers. Satisfactory arrangements had just been completed to supply gas to the Wadhurst Parish Council by meter, which should result in an increase of revenue over the previous arrangement; while the Company would also save the expense of lighting, cleaning, and extinguishing the lamps. Many more prospective gas and water consumers were waiting to be connected up. In consequence of the efforts made, a previous loss of £600 or £700 a year had been turned into a gross profit for the period under review of over £1000, with a net profit of £854. In addition, the works had been thoroughly overhauled and repaired, and many additions made, and the value of the goodwill and property accordingly enhanced. The Directors and officers took over the management of the concern determined, as far as they could, to place the Company in a satisfactory position. It was the present intention to pay 3 per cent. as a half-year's interest on such debentures as were properly issued; but they aimed at placing the concern in such a condition that they might be able to declare a dividend on the shares.

Innumerable questions having been replied to, the report was adopted. Acknowledgment was made of the great services rendered to the Company by the Solicitor (Mr. Jarvis), the Receiver and Manager (Mr. C. R. Beeby), the Managing-Director (Mr. A. W. Lunt), and the Secretary (Mr. T. W. Carter).

BARNET DISTRICT GAS AND WATER COMPANY.

Increased Make of Gas per Ton.—Unrestricted Supply of Water.

The Half-Yearly Meeting of this Company was held last Tuesday, at the Holborn Restaurant, W.C.—Mr. ALFRED H. BAYNES, J.P., in the chair.

The SECRETARY (Mr. Ernest W. Drew, F.C.A.) read the notice convening the meeting; and the Directors' report and the accounts were taken as read.

The CHAIRMAN said his first words that day must be expressive of deep and sincere grief at the sudden death of their highly esteemed colleague on the Board, Mr. Frederick Lennard, who passed away on the evening of Monday, Aug. 21. Mr. Lennard always took very special interest in the Company, to which he rendered most valuable service. For 28 years, he was an Auditor of the Company. Gifted with sound judgment, together with a wide experience of business, he was able to take a really active part in the deliberations of his fellow Directors. The Board felt sure that the shareholders would desire to join with them in sending to Mrs. Lennard and the sorrow-stricken family a respectful assurance of deep and sincere sympathy with them in their bereavement; and a communication would be sent to Mrs. Lennard in the joint names of the Directors and the proprietors.

Those present signified their agreement with this suggestion by rising silently in their places.

The CHAIRMAN then proceeded to move the adoption of the report and accounts; and in doing so, he dealt with some of the more prominent results obtained in the working for the six months to June 30. Referring first to the gas department of the undertaking, he said that the total expenditure in the half year on gas capital account had been £949; and this sum had been spent entirely on new mains, services, and meters. As to the revenue account, the increase in the receipts from the sale of gas for private and public lighting had been £268; and having regard to the fact that during the whole of the past half year the price had been 2d. per 1000 cubic feet less than it was in the corresponding period of the previous year, this increase might be looked upon as highly satisfactory—the sales having gone up by 4½ million cubic feet, or 6·58 per cent. The receipts from meters and stoves were £86 more; this being due to the added consumers, which at the end of the half year numbered 5797. The returns from residuals showed an increase of £372; the total receipts being equivalent to 69·3 per cent. of the cost of the coal. The gas revenue account income exhibited a total increase of £728. With regard to the expenditure side of the account, the charge for manufactory was £8870, which was an increase of £394; this being due principally to the additional quantity of coal carbonized. The carbonizing result was extremely satisfactory; the gas made having been 13,041 cubic feet per ton, as against 12,558 cubic feet the previous year. The distribution charges were £2911, or £556 less than in the corresponding half year. This was due to the decreased amount which it had been necessary to spend on renewing mains and services. The total expenditure was £14,366; and the balance carried to net revenue was £4439—an increase of £780 over the same half of the previous year, though, as he had already mentioned, the price of gas had been reduced 2d. per 1000 cubic feet throughout the six months. He would point out that every attention was being given to consumers. During the last half year, the Company had cleaned free of charge for labour over 10,500 burners; and the fittings sold from the show-room exhibited a satisfactory increase. The number of new services laid was 251, though very few new houses were being erected in the Company's gas district. He had just one other comment to make on this side of the business, and that was with reference to the excessive amount which the Company paid

for rates. In the past half year it had been £933, or 3d. per 1000 cubic feet of gas sold. This was nearly the highest sum paid by any company, and was about 73 per cent. more than was paid by neighbouring companies; and it militated greatly against the fulfilment of the desire of the Board to supply gas at a lower price.

Turning to the water department, it would be seen that the expenditure on the water capital account during the past half year had been £14,339, of which £12,517 had been in connection with the new works at Tyttenhanger, and £1822 for new mains and meters. It was pleasing to be able to point to an increase of £1047 in the revenue. This was due principally to the larger number of consumers in the Company's water area; 315 new services having been connected during the half year. Before dealing with the expenditure side of the revenue account, he would refer to the extraordinarily dry and hot weather that had characterized the past half year. It had resulted in an abnormal demand for water—far greater than the Company had ever before experienced. They had, however, as a result of the new works at Tyttenhanger, and of other arrangements made, been able to meet all demands for water; and he thought they could congratulate themselves and their consumers on the fact that they had been in a position to give a full and unrestricted supply. It was certainly a vindication of the policy of the Board in connection with the heavy outlay incurred to obtain water. This great demand, however, had resulted in the cost of maintenance, and particularly pumping and engine charges, being considerably increased; the total maintenance charges being £1425 more than in the corresponding half of the preceding year. He would like just to refer to a communication their Engineer (Mr. F. J. Bancroft) had received with regard to the great drought. It was from one of the consumers, and was in the following terms: "The great drought we hope is over; and I would like to send these few lines to gratefully acknowledge the splendid service of water that has daily filled our tanks and saved us from the slightest inconvenience during this very trying summer." He thought it most gratifying to receive such testimony from a consumer. The increase in rates and taxes amounted to £267; the amount paid during the past half year having been £2111, or over 10 per cent. of the gross receipts. Surely, the rating authorities of the district hardly realized that they had come to the point when it would be necessary for the Directors to take a decided stand against the continual increase in the assessments, and that they would, at great expense both to them and to the Company, be compelled to appeal against what had become a great injustice. Under the heading of management, there was a decreased charge of £331, due to a reduction in the item of law charges—the other items showing a slight increase. It would be seen that the total expenditure on water revenue account had been £10,191, which was an increase of £1093. But as the income was £1047 more than in the corresponding half year, the amount carried to net revenue showed only a slight decrease of £46.

The profit on fittings had amounted to £145; and this, together with the credit balances from the gas and water revenue accounts, enabled £14,840 to be carried to net revenue account. The charges for income-tax and interest showed an increase of £157; a sum of £1000 had been transferred to the contingency fund; and after providing for the same rates of dividend as were declared for the previous half year, the balance to be carried forward was £19,529, which was a slight increase on the balance brought forward at the commencement of the six months just closed. It was only right to mention that the past half year had been a time of special anxiety and responsibility for their able Engineer—particularly in connection with the new source of supply at Tyttenhanger, and the long drought. As mentioned in the report, by means of temporary plant sufficient water had been obtained from Tyttenhanger to maintain a full supply to meet all the increasing demands of the growing district. The Directors felt sure that the proprietors would join with them in recording their high appreciation of the valuable services rendered by the Engineer and the members of his efficient staff.

Mr. J. L. CHAPMAN, in seconding the motion, remarked that the report and accounts were excellent in every way, and reflected great credit on those who had managed the affairs of the Company.

The resolution was at once carried unanimously.

On the proposition of the CHAIRMAN, seconded by Mr. CHAPMAN, dividends were thereafter declared, less income-tax, for the half year, at the rates per annum of 8 per cent. on the "A" and "C" stocks, 7 per cent. on the "B" stock, and £5 12s. per cent. on the "D" capital gas and water stocks.

Mr. A. F. PHILLIPS said it afforded him much pleasure to propose a vote of thanks to the Secretary, the Engineer, the Rental Clerk, and all the other officers of the Company, who had during the past half year rendered such able and such loyal service. In Mr. Drew, they possessed a most capable Secretary; and in Mr. Wright they had a Rental Clerk to whose energy they owed much. But what was he to say about Mr. Bancroft? He could only assure the shareholders that the last six months their Engineer had passed through a most trying time. The Directors realized that it was practically impossible to afford a proper supply of water through their district unless they obtained it from another source. The Metropolitan Water Board told them that they could give no further assistance. The unfortunate action taken to get an injunction to prevent the Company utilizing the site at Tyttenhanger delayed the completion of these works for two years. Immediately, however, the House of Lords gave their decision, and confirmed the Company in their rights, Mr. Bancroft set to work with an energy for which he deserved the very highest credit. He left no stone unturned, and never wasted a single hour until he had completed his plans and got the pumping-station at Tyttenhanger at work; and fortunately he was able to do this by the end of June. Now, had they not had this pumping-station to supply the district during the month of July and the present month [August], they would have been short of water, and a large number of their customers—especially those living on the higher levels about Finchley—would have been much inconvenienced. Consequently, it was not only the shareholders in the Company, but the public also, who were deeply indebted to Mr. Bancroft for the energy he had displayed and the way in which he had saved the situation. He (Mr. Phillips) had twice recently visited the pumping-station; and he could bear testimony to the excellent manner in which the work had been carried out. Not only was it most efficient

in working, but its cost had been very economical. The Company had there a plant which was capable of adding to their water supply some 2 million gallons a day.

The resolution was seconded by Mr. ALFRED LASS, and carried unanimously.

Mr. DREW, Mr. BANCROFT, and Mr. WRIGHT returned thanks. Mr. Bancroft added that they had had two very trying years. Last year their difficulties were of a legal character, and delayed operations greatly; but directly this obstacle was overcome, they lost no time in getting on with the work. He could not possibly have secured the results that had been obtained in the gas department, or have been able to complete the Tyttenhanger works in time for the present summer, without very loyal assistance from the staff at Barnet.

The proceedings terminated with a vote of thanks to the Chairman and Directors, on the proposition of Mr. C. P. CROOKENDEN, seconded by Mr. WILLING TIBBS. The former gentleman remarked that it was most satisfactory to find the water supply had been maintained without any cessation whatever. The figures both in regard to gas and water were excellent.

SOUTHEND GAS COMPANY.

Continued Development of the Supply.

The Half-Yearly Meeting of the Southend Gas Company was held last Tuesday—Mr. C. F. WOOSNAM (the Chairman) presiding.

The SECRETARY (Mr. J. T. Randall) having read the notice convening the meeting, the report of the Directors for the six months ended the 30th of June was presented. It was stated therein that, as compared with the corresponding period of last year, 9.11 per cent. more gas had been sold. The number of consumers was 14,428, of which number 9809 were on the prepayment system. There were in the district 9899 cooking-stoves and 598 fires. The balance available for distribution was £10,504; and the Directors recommended the payment of dividends on the original and new ordinary stocks at the rate of 5½ per cent. per annum, and on the new ordinary "B" stock at the rate of 5½ per cent. per annum (all less income-tax). This would absorb £7466; leaving £3038 to be carried forward.

The CHAIRMAN, in moving the adoption of the report, referred to the increase in the consumption of gas. He said extensions of mains were still going on; the usual 1½ miles having been laid in the past half year. Turning to the accounts, the revenue account showed that the Company had sold 15 million cubic feet more gas; making 176 millions, equal to £29,765, against £28,166 last year, or £1600 more. This figure would have been half as much again but for the reduction in price. The rentals of cooking-stoves, meters, and stove fittings showed an improvement of £300. Residual products were excellent, and were bringing in a sum of £5657—an increase of £1234. This was very largely due to the improved methods of carbonizing. The Company now turned out larger quantities of coke of the finest quality, for which there had been a very ready sale. The total receipts were £42,092. Deducting the expenditure of £33,000, there was a balance of £9092. This was not quite sufficient to pay the dividend without drawing to a small extent on the undivided balance.

The DEPUTY-CHAIRMAN (Mr. James Randall), in seconding the motion, referred to the increase in the amount received for fires and fittings—viz., £300 in the half year. He said this was very favourable indeed, because when they reduced the price of gas, they anticipated a profit from the use of the different appliances in regard to supply, and the sale of these appliances; and he looked forward to the no distant time when this branch would prove very beneficial.

Mr. J. TYSOE said the Directors were to be congratulated on the successful result of the half-year's working. The increase in the percentage of gas sold was a very important matter. They had the same result pretty generally throughout the country, though their friends who supported the electric light were fond of pointing out that gas was dying out. It was not so, however. It was holding its own, and would continue to do so for many years. Referring to the accounts, he said he noticed that coke had yielded an excellent return; but he thought the make of tar and liquor should be improved. He did not know what difficulties the Engineer (Mr. F. Clark) had to contend with; but he considered that the production for the half year was somewhat small.

The CHAIRMAN remarked that they were very glad to see Mr. Tysoe at the meeting, because he held a high position in the gas industry. With regard to his comment, the Directors knew that the make of tar and liquor was low; and personally he would like to see Mr. Tysoe have a chat with Mr. Clark to see if anything could be done to improve the position. He had been told, however, that they squeezed such a lot out of a ton of coal in the shape of coke, that they could not expect to get so much tar; and at present they were working at very high heats.

The motion was then put and carried unanimously.

Mr. J. H. BURROWS moved the payment of dividends as set forth in the Directors' report.

Mr. A. TALBOT, in seconding the motion, gave a series of interesting figures to show how the gas undertaking had developed in the town in spite of the introduction of the electric light, and said the demand for gas was increasing rapidly in the percentage both of consumers and population. In 1901, the population was 28,793 and the consumers numbered 4226, or 14.7 per cent., with no electric light opposition. In 1908, the population was estimated at 56,834, and the consumers numbered 11,700, or 20 per cent.; while this year the figures were 62,763 and 14,428 respectively, or 23 per cent. In 1901, the quantity of gas sold was 149,671,000 cubic feet; and in 1911, 371,857,000 cubic feet—an increase over 1901 of no less than 222,186,000 cubic feet. He thought they could look forward to a successful future.

The motion was carried.

A vote of thanks to the Chairman and staff having been passed,

Mr. CLARK, replying for the staff, alluded to Mr. Tysoe's comment in regard to the quantity of liquor produced, and said if that gentleman would take out the weight per ton he would see the Company were not far behind.

EASTBOURNE GAS COMPANY.

The Half-Yearly Meeting of this Company was held on Monday last week—Dr. G. A. JEFFERY, J.P. (the Chairman) presiding.

The SECRETARY (Mr. J. S. Garrard) having read the notice convening the meeting, the report and accounts for the six months ended the 30th of June were presented. The revenue account showed a profit of £9904 : and there was a balance of £17,377 at the credit of profit and loss account, after payment of the half-yearly dividend in February and other charges. The Directors therefore recommended that a dividend for the past six months should be declared at the rate of 7½ per cent. per annum upon the "A" stock, of 6½ per cent. per annum upon the "B" stock, and of 5 per cent. per annum upon the preference stock. These payments would absorb £8785, and leave a balance of £8592 to be carried forward.

The CHAIRMAN, in moving the adoption of the report, said the story he had to tell would be a short, but he hoped a pleasant, one. How had the Company reached the prosperity shown in the report? Every first-class business had something to sell; and the Company's was one of this class. They had to sell gaslight, which was a brilliant light, but one less trying to the eyes than any other artificial light. It was reliable and cheap, and was to a great extent superseding coal for heating and motive power. When compressed, and used with an incandescent mantle, it was the most brilliant light of the day. If he might coin a term, it was "the ratepayer's light." During the past half year, the Company had made 249 million cubic feet of gas—an increase of more than 7 million cubic feet compared with the first half of last year. This, he thought, spoke volumes. The consumers at the present time numbered no less than 10,202—a gain of 468 during the half year. The number of public lamps was 1525, and of stoves on hire 7573. With regard to the residual products, they had realized from them no less than £9710, against £7875—a gain of £1835. If the proprietors deducted the sum required to pay the dividend (£8785), and looked at what the residuals produced, they would find a surplus of £925. He would not weary them with further figures, but simply say that all along the line they had been successful, with one exception, and that was sulphate of ammonia, from which they had not received what they expected. When, however, the new plant which the Directors had that day decided to put up was built, they hoped to have a better return. The success of the past half year had been due largely to the indefatigable work of their Engineer (Mr. John Hammond), the Secretary, and staff—managers and men. Then there were his colleagues on the Board. He desired to convey to all a hearty expression of his thanks; and he was quite sure all present would, as shareholders, cordially endorse it.

Mr. A. W. OKE, in seconding the motion, remarked that when the public found doctors "coming round," and admitting that gas was the best and the most healthy light—the best for the eyes and also from the point of view of the ventilation of rooms used for large public assemblies—he thought they might say they had all they required. It only remained for them to go on using the wonderful burners and the economical stoves now on the market to an even greater extent than hitherto. With gas at 2s. 6d. and a population of 52,000 in the county borough, it was very refreshing to find that there were no less than 10,202 consumers in Eastbourne. He considered this spoke well, not only for the policy of the Board, but for the very capable management under which the Company had been working for years past.

The report was adopted, and the dividends recommended were declared.

The retiring Directors and Auditor having been re-elected, a proposal was submitted to increase the Directors' remuneration by £200—to £1200 per annum.

The CHAIRMAN, however, expressed a wish that the figure should remain £1000, free of income-tax, in accordance with a resolution on the agenda; and this was agreed to.

A vote of thanks was then accorded to the Directors, officers, and workmen, for the care with which they had conducted the affairs of the Company, as shown in the accounts, and also by the growth and progress made.

The CHAIRMAN having acknowledged the vote,

Mr. H. E. JONES (the Company's Consulting Engineer), responding on behalf of the staff, said he did not work so hard as the officials on the spot, who were heartily deserving of the thanks accorded them. The Company had a very far-seeing, liberal-minded, and broad-minded Board of Directors; and the work of the clerical department was done in a marvellous manner. The results of the past half year were better than they had been for some time. There was, however, room for improvement, and good ground to expect it.

A vote of thanks was passed to the Chairman for presiding; and with his acknowledgment the proceedings closed.

HARTLEPOOL GAS AND WATER COMPANY.

The Annual Meeting of this Company was held last Thursday—Mr. O. K. TRECHMANN (the Chairman) presiding.

The SECRETARY (Mr. W. Scott) having read the notice convening the meeting, the report of the Directors, with the accounts for the year ended the 30th of June, was presented. It was stated therein that the total revenue was £88,945, and the expenditure (including interest on loans, &c.) £57,060; leaving a balance of £31,885. An interim dividend was paid in March, and the Directors recommended the declaration of a like dividend for the past half year at the rate of 5 per cent. per annum, less income-tax.

The CHAIRMAN, in moving the adoption of the report, congratulated the Directors and shareholders alike upon the satisfactory results of the year's operations. There was a profit of £31,845, which enabled the Directors to recommend the payment of the maximum dividend of 5 per cent. The trade of the district, which had for so long been in a stagnant condition, had, he was glad to say, much improved. Most of the local industries were in full work; and the amount of wages now distributed very much increased the spending capacity of the

artisan classes—which, in turn, benefited the town generally. What was really wanted in the town, however, was more industrial concerns, and, if possible, a greater variety of them, so that they might not be dependent upon shipbuilding alone. The Company's works, both gas and water, had been maintained in a satisfactory condition. It was most gratifying to be able to report that, notwithstanding the recent hot weather and the almost unprecedented drought, there had been an abundant supply of water for both domestic and commercial purposes—even much in excess of all demands. The present outlook in the coal trade was anything but bright; and should the North Country miners be successful in their call for a national strike on the eight hours question, the consequences would be most disastrous and far-reaching, and might lead to famine prices, not only for coal but most other commodities. Even if a strike were averted, the cost of working coal, which had been increased by the passing of the Mines (Eight Hours) Bill, would remain as a cause of permanent increased charge. If, further, they took into consideration the additional charges that all employers of labour would be called upon to pay on the passing of the State Insurance Bill, it would seem that in the near future their obligations and their costs would be considerably increased. Dealing with the revenue account, the Chairman said all the markets for residual products improved during last year, and were at present in a healthy state. Coke realized £600 more; the increase being largely due to the great demand for shipment. Sulphate of ammonia, which had accounted for an additional income of £668, had been in a most buoyant condition; the average selling price having been nearly £2 per ton above last year's prices, and higher than it had been for many years. This was to a great extent due to an increased demand from Japan, Java, and America; and, as far as it was possible to judge, there should be equally good results from next year's operations. Tar, which yielded an increase of £261, still maintained its value, and appeared likely to do so. Then, if the Road Board, as well as the various local authorities having control of the highways throughout the country, fully realized its value, and continued to extend its use as a dust preventer, it should become of still greater value, even if it did not reach the higher prices of former times. The general outlook on the whole of the residual products markets was decidedly bright; and he ventured to predict for the coming year prices as good as those obtained over the period under review. The Chairman next dealt with the subject of the competition of electricity with gas, and caused some laughter by referring to statements contained in a pamphlet he had received from the Borough Electrical Engineer, drawing attention to the alleged dangers of gas as an illuminant. Singularly enough, however, shortly after receiving the pamphlet, he had from Mr. Bower (the Engineer) a reprint of an article from the "Medical Magazine," giving an account of some experiments made last November at the Lewisham Infirmary.* Having given some particulars of the tests, the Chairman pointed out that the experiments were made by a medical authority, and not at the instigation of any gas company. The conclusion, he drew from them was that, both for lighting and heating, gas was, from a hygienic point of view, better than any other system.

The DEPUTY-CHAIRMAN (Mr. Robertson Murray, J.P.) seconded the motion; and it was carried unanimously.

The retiring Director and Auditor were re-elected; and the salary of the Secretary was increased by £100 per annum, from July, 1910.

A vote of thanks was accorded to the Chairman for his services; the mover of the resolution expressing the thanks of the shareholders to the officials, who, he said, had worked so loyally in the interests of the Company.

ROCHDALE CORPORATION GAS UNDERTAKING.

Thirty Years' Progress.

Reference has already been made in the "JOURNAL" to the fact that Mr. T. Banbury Ball, the Gas Engineer of the Rochdale Corporation, has completed thirty years' service. He took up his duties in 1881, in succession to Mr. William Romans; and since his appointment the progress of the undertaking has been remarkable. This is shown by some figures recently given in the "Rochdale Observer." At the end of March, 1881, the amount of capital employed was £164,956, or at the rate of £620 per million cubic feet of gas produced; whereas at the corresponding date this year it was £225,256, or at the rate of £360 per million. Details of the general progress can be best shown in tabular form as follows:—

	Year 1880-1.	Year 1910-11.
Gas made	265,736,000 c. ft.	625,320,000 c. ft.
Gas sold	235,148,000 „	582,232,200 „
Value of gas sold	£44,319 5s. 3d.	£64,624 12s. 3d.
Value of residual products sold	£6,091 13s. 7d.	£25,292 18s. 8d.
Number of meters in use	19,210	32,030

The price of gas in 1881 was 3s. 8d. per 1000 cubic feet within the borough, and 4s. 4d. outside. In 1911, the figures are 2s. 8d. within and 2s. 11d. outside the borough.

In the course of an interview with a representative of the above-named paper, Mr. Ball furnished the following particulars in regard to the principal developments which have taken place at the gas-works during his occupancy of the engineership. When he went to Rochdale, only horizontal retorts were used, and a scheme of extensions, involving an outlay of £65,000, and including the erection of inclined retorts, was approved. An additional gasholder, with a capacity of 2½ million cubic feet, was constructed. The next development was the installation of plant for the production of water gas; Rochdale being among the early authorities to adopt this system. The plant, together with the buildings, cost about £15,000; and the money was taken from the gas-works reserve fund. The latest development has been the installation of vertical retorts, which are now nearly ready for use. In connection with these extensions, manual labour in the handling of coal has been practically superseded. In 1881, nearly all the gas produced was used for

* See "JOURNAL," Vol. CXIII., p. 512.

lighting purposes ; now about 30 per cent. is otherwise employed. Coming to the financial position of the undertaking, the figures presented show that in the past thirty years the net profits have reached the large total of £326,741.

At a meeting of the Gas Committee last Wednesday, on reference being made to the fact that Mr. T. Banbury Ball had completed 30 years' service with the undertaking, several members spoke in terms of high praise of the valuable services rendered by that gentleman to the town and the Corporation, as Manager of the Gas Department. A resolution was unanimously passed expressing the Gas Committee's appreciation of his services to the Corporation, and the hope that he would long be spared to hold the position he has filled with such success for so many years. Mr. Ball, in responding, referred to the good feeling which had always existed between the Gas Committee and himself.

IMPERIAL CONTINENTAL GAS ASSOCIATION.

Coming Sale of Property in Vienna.

[From the "Financial Times," Sept. 2.]

A matter of great interest to the shareholders of the Imperial Continental Gas Association is the forthcoming sale of the Company's building site and house property in Vienna. As readers will remember from our previous notes on this subject, the concession of this important British Gas Company for lighting the old suburbs of Vienna, now absorbed into the city, expires on the 1st of January next, from which date the municipal gas-works will conduct the supply ; the mains, gas-pipes, and street-lamps hitherto used by the Company becoming municipal property. The Company is left with its gas-works on its hands (the Municipality having meanwhile constructed gas-works of its own), and also with a certain quantity of adjoining land, as well as other property. We now see from the "Neue Freie Presse" that the Company intends to divide the land into building lots, and dispose of it to builders. The Company owns land besides at Baumgarten, Döbling, Floridsdorf, and Fünfhaus, and also a large building in the Schenkenstrasse, which is now to be converted to other uses. Negotiations are stated by our contemporary to have been carried on between the "Consortium for Barrack Transactions" and the Imperial Continental Gas Association for the purchase of this last-mentioned property, but to have come to a standstill owing to a disagreement as to price, which the latter fixes at 1,500,000 kr. for the house in the Schenkenstrasse and about 2,000,000 kr. for the remaining sites. It is now thought that the Municipality will make a bid for a portion of the suburban property with a view to the erection of artisans' dwellings. It is to be hoped that the price arranged will be a satisfactory one. The Municipality can well afford to treat the Gas Association well, as the latter has done most important work for Vienna for a long course of years, and seems to have been treated somewhat cavalierly in the matter of having its gas-works—a naturally unsaleable property—left as a dead-weight upon its hands. The value of house property in Vienna has been going up very much of late ; and the Gas Association may, of course, decide to hold for higher values. But if it sells at its own price, the 3,500,000 kr. (or £145,000) will be some solatium on the occasion of its discontinuing the business it has carried out so long and well.

ELECTRICITY v. GAS FOR STREET LIGHTING.

Local Government Board Inspector's Views.

An inquiry was recently held in the Town Hall, Rawtenstall, by Mr. T. C. Ekin, M.Inst.C.E., an Inspector of the Local Government Board, in regard to an application by the Corporation for sanction to borrow £2000 for the purposes of street lighting by electricity.

Mr. E. S. Ware, the Fire Brigade and Lighting Superintendent, made a statement to the effect that there would be a saving of about half the cost of street lighting if electricity were substituted for gas. He said that at present there were 150 incandescent and 350 flat-flame lights on the main roads, costing £645 per annum for gas ; and he estimated the cost of electric street lighting would be £322 10s. At the present time the gas-lamps had to be kept burning all night, to enable people to see their way in going to work in the mornings ; and it was considered that the Corporation could take off about five hours per night in the winter, which would mean a saving of 670 hours. But putting the amount saved at a very moderate figure, and calling it 400 hours, it meant an economy of £120. Asked by the Inspector if he was satisfied he could carry out the work for the amount applied for, Mr. Ware replied that he was perfectly satisfied. The Inspector said he appreciated the fact that incandescent mantles could not be put on the lamps on the hillsides, but he thought more mantles might have been tried. Mr. Ware said they had tried them on some of the lamps, and found the cost too heavy. Last year they used 1½ mantles per lamp per month. It had cost them 2s. 9½d. per lamp for mantles ; and new electric globes would only cost 2s.

Mr. Rothwell, the Chairman of the Lighting Committee, stated that they had gone jolly into the matter. They had tried to get the price of gas reduced from time to time, and had decided to adopt electric lighting for the streets, even if it cost as much as lighting by gas. Seeing that the Corporation were generating their own electricity, it had been their idea from the first to have electric lighting in the streets. The Inspector asked Mr. Rothwell if they would be satisfied even if there was no saving ; and he replied that they would, because they would get a better light. The Inspector said he was doubtful about the saving. Mr. Rothwell said that even if there was none, the Corporation were desirous of going on. The Inspector said this simplified matters very much. He took it that the Corporation wished to have the electric light on two grounds—because the lighting would be better, and because they would be able to supply their own illumination from their own works. Mr. Rothwell said these were the two principal points ; and, of course, the Corporation would have direct control,

PUBLIC LIGHTING QUESTION AT HYDE.

Town Council Decide on Gas as against Electricity.

For considerably more than a year, the question of improved street lighting has been before the Hyde Town Council ; and a determined effort has been made on behalf of the Stalybridge, Hyde, Mossley, and Dukinfield Tramway and Electricity Board to bring about the introduction of electricity for the purpose. A Sub-Committee was appointed to carry out tests with the two illuminants, and prepare a statement showing the cost of lighting the main thoroughfares of the town with gas and electricity. The Directors of the Hyde Gas Company, who have hitherto supplied gas for street lighting purposes at 3s. per 1000 cubic feet, less 25 per cent. discount, making the net cost about 2s. 3d., were invited to fix up four lamps in the centre of the town ; and the same privilege was given the Joint Electricity Board—the understanding being, of course, that the lamps should be of equal candle power. At a meeting of the Town Council on Monday of last week, the rival claims of electricity and gas came forward for consideration, on a report presented by the Special Committee appointed to deal with the matter.

In order to assist the members of the Council, Mr. James Diggle, the Borough Surveyor, had drawn up a statement showing the comparative cost of street lighting with gas and electricity. It was as follows :—

<i>Electric Lighting.</i>	
Cost of 200-watt lamps in Market Street—	
Wiring and fixing	£1 10 0
Two 100-watt lamps (Osram), at 4s. each	0 8 0
Cost of installation	£1 18 0
Maintenance—	
Cost of electricity per 1000 hours at 220 watts per hour at 0.825d. per unit.	£0 15 0
Renewing lamps every 1000 hours, at 4s. each	0 8 0
Time fixing lamps	0 0 6
Lighting and cleaning	0 3 0
Cost of maintenance per 1000 hours	£1 6 6
<i>Gas.</i>	
Cost of two-light gas-lamps in Market Street—	
Cost of inverted fittings per lamp	£0 15 0
Connecting gas-service	0 10 0
Cost of installation	£1 5 3
Maintenance—	
Cost of gas per 1000 hours, 3½ cubic feet per burner, or 7 cubic feet per lamp	13s. 6d.
Renewing fittings every four years, cost per 1000 hours	0 7½
Renewing mantles per 1000 hours	1 4
Time refitting mantles	1 5
Lighting and cleaning 12 weeks—1s. 9d. lighting, 1s. 3d. cleaning	3 0
Cost of maintenance per 1000 hours	19s. 10½d.

After a heated discussion, the Town Council decided, by eleven votes to six, in favour of gas for street lighting. The first installation of the new gas-lamps will be in the two main thoroughfares of the town—that is, from Tower Street to Newton Street, and from the Town Hall to Mottram New Road. Next year, when the estimates are being prepared, provision will be made for an extension of the system.

Referring to this matter, our local correspondent says : Considering the great influence brought to bear in support of the claim of the Joint Board to supply electricity from their own generating station for the lighting of the streets of Hyde, and the fact that the gas supply of the district is in the hands of a private Company, the decision of the Town Council is all the more notable. The competition of the Joint Board has not always been conducted on exactly fair lines ; and yet the Hyde Gas Company, of which Mr. Charles Potts is the Manager, have not only held their own, but have increased their output and the number of their consumers. The first half of this year, for instance, showed an increased make of more than 4 million cubic feet compared with the corresponding half of 1910.

Since its inception, the undertaking of the Joint Board has never made a profit. In fact, there has been a total loss on it of upwards of £83,000, of which each constituent authority has had to bear an equal share. So that from the very start the undertaking has been a burden to the ratepayers. The Hyde Gas Company are large ratepayers (in the borough of Hyde their property has a rateable value of nearly £4000) ; and it has seemed to the Directors of the concern a little hard that they should be compelled to contribute, through the medium of the rates, to financing what is undoubtedly a rival undertaking, which, if it had not been supported out of the rates, would have been wound up long ago. When the Joint Board last made application for sanction to borrow more money for the electricity installation, it was shown at the inquiry held by a Local Government Board Inspector that the Board, in order to get a footing with large consumers of gas, had offered to supply, and were supplying, current at less than cost. This is, of course, not the first time that there has been a test competition in Hyde between the Gas Company and the Joint Board. Two years ago this autumn there was a five weeks' competition at the Hyde Philanthropic Burial Society's Hall in Hammett Street ; and in this competition the cheapness of gas for artificial lighting, domestic, and other purposes was clearly demonstrated to the parties most concerned, who are now customers of the Gas Company. The competition extended from Oct. 20 to Nov. 25, 1909 ; the number of hours' burning being 42½, and the consumption of both gas and electricity registered by meters. One 250-candle power Graetzin inverted gas-lamp consumed 350 cubic feet of gas at 3s., less 7½ per cent. discount, equal to 11½d. The 100-candle Osram electric lamp consumed 6 units of electric current at 3½d. per unit, less 10 per cent. discount, equal to 1s. 7d.

Therefore, to obtain 250-candle power, it would cost the consumer for electricity 3s. 11½d., or more than four times the cost of gas. In the test for street lighting, when prices were admittedly cut to the very lowest possible point, there is roughly a difference of about 50 per cent. on the cost of installation and 25 per cent. on maintenance between electricity and gas, and in favour of the latter.

The Discussion in the Council Chamber.

Mr. ROBINSON, who moved the adoption of the Highways Committee's minutes, including the one relating to improved street lighting by gas instead of electricity, said the members of the Committee had been occupied for a considerable time considering this question, and the fullest inquiry had been made, in regard to the relative merits and cost of the two illuminants for street lighting. From the statement prepared by the Borough Surveyor (Mr. Diggle), members of the Council would see that the cost of electric installation was 50 per cent. more than gas; and maintenance, taking the price of current at 0.825d. per unit, as first quoted by the Joint Board, was 33 per cent. more. Subsequently, however, the Borough Surveyor was informed by the Engineer to the Joint Board that the lamps would be charged at the rate of 13s. 9d. each for current; and this reduced the price of current to 0.75d. per unit, in which case the maintenance was reduced from 33 to 25 per cent. dearer than gas. He also pointed out that a man employed at the rate of 6d. per hour could fit up and repair the gas-lamps; whereas for electricity they would require an electrician. He added: "After very carefully going into the figures and examining the lights in the streets, the Committee can see no reason for fitting up electric light; and they have decided to carry out the street lighting improvement with gas. I would further point out that, in my opinion—and I think it is the opinion of the Committee generally—the electric light cannot be compared with gas-light in its diffusive power."

Mr. FOWDEN, in moving an amendment that the whole matter as to street lighting be referred back, said that, as a great deal of time had been spent by the Committee in the consideration of this matter, a postponement for a month would not make any difference. He suggested this, so that further experiments might be carried out. The Joint Board had made an offer which he thought ought to be considered; and this was to light a complete street in a permanent manner with electricity, such street to be at right angles to a street lit with incandescent gas, so as to get a fair comparison. He desired also to call attention to the fact that the Borough Surveyor, in his statement, had made no allowance for cracked glasses in the incandescent lighting figures; and everybody knew that the glasses did crack now and then. Next, he understood that the Council were charged 2s. 3d. per 1000 cubic feet for the gas used for street lighting; but according to the Borough Surveyor's statement the price worked out at 1s. 11½d. per 1000 cubic feet. If the Gas Company had reduced the price, he would like to know when and how it happened, and if this price was to obtain all over the town.

The TOWN CLERK read the letter received from the Hyde Gas Company, which gave the quotation. It was as follows: "In reply to your letter of Aug. 5, 1911, asking this Company for a quotation for supply of gas for street-lamps by an improved type of incandescent lighting, which it is proposed to erect through the main thoroughfares of the borough, my Directors have given the matter their fullest consideration; and they are now prepared to supply gas in the area in question at the reduced rate of 13s. 6d. per lamp, each lamp containing two burners having a consumption of 3½ cubic feet per burner per hour, for 1000 hours' lighting. It is limited to the area in question."

Dr. BEECROFT, who took part in the discussion, submitted for the consideration of the members of the Council a tabulated statement showing that it was untrue for the advocates of electric lighting to say that gas had been losing ground in recent years so far as street lighting is concerned, and also told the Council that, after an exhaustive inquiry in this country and on the Continent, a deputation from the Corporation of the City of London reported that "high-pressure incandescent gas-lamps with inverted burners should be adopted as the illuminant;" and that after a complete series of experiments and consideration of competitive tenders, the Westminster City Council selected high-pressure gas for the lighting of the most important West-end thoroughfares, purely because gas was found to give the best light for the least money. Dr. Beecroft quoted the experiences of other large centres, and gave figures to support his contention that gas was by far the best and cheapest illuminant for street lighting purposes. Coming to deal with Hyde, he said the local Gas Company had met them in a business-like manner, and had fitted up at their own expense eight lamps with different types of burner. On the other hand, the Joint Tramway and Electricity Board brought "a few fancy things," but did nothing which was likely to convince the Committee of the alleged superiority of electricity over gas.

After further discussion, the Committee's recommendation that gas be adopted in the scheme for improved street lighting in the main streets of the borough, in preference to electricity, was approved, as stated.

Price of Gas at Croydon: A Correction.—In the "Editorial Note" last week entitled on "A Statistical Examination," it was stated that at Michaelmas the price of gas at Croydon would be reduced by 1d., making it 2s. 6d. The latter figure should have been 2s. 5d.; a reduction to 2s. 6d.—the lowest price reached in the history of the Company—having been made at Lady Day last. They have now gone one better.

Gas Purchase Question at Bedwellty.—The Bedwellty Urban District Council have discussed at length the question of purchasing the Blackwood Gas-Works. The Company objected to the purchase of the works until some arrangement was made regarding the parliamentary costs involved in connection with the opposition to the Council's last Bill. It was decided that the negotiations should be continued with a view to an amicable settlement being arrived at, so that the purchase of the Blackwood works should be embodied with that of the New Tredegar Gas-Works in a Bill to be promoted in the next session of Parliament.

MUNICIPAL WORKERS AND NON-UNIONISTS.

Decision of Manchester Men Not to Strike.

A mass meeting of municipal employees in Manchester, Salford, and neighbouring towns was held on Saturday afternoon at Manchester, to decide whether or not they should carry out a resolution that members of the Municipal Employees' Union should refuse to continue to work with non-unionists. At half-past twelve in the morning a meeting of the Salford municipal workers was held outside the Corporation tramway sheds in Frederick Road, and the proceedings were characterized by some rowdy scenes. Councillor Jones, Secretary to the Municipal Employees' Union, was repeatedly interrupted in the course of a speech advocating that the municipal workers should act together in refusing to work with non-unionists; and there were several "scraps" among sections of the audience requiring the intervention of the police. The tramway workers who had refused to join in the movement were denounced by Councillor Jones amidst loud hooting; and he also criticized a recent appeal made by Alderman Jackson, Secretary of the Tramway and Vehicle Workers' Union, who had said the tramwaymen held the key to the position. "Let me tell Alderman Jackson," declared Councillor Jones, "that he does not hold the key to the position. The whole of the workers in the electricity generating station are in our Association, and if we decide at our mass meeting this afternoon to come out on strike, it will be without consulting Alderman Jackson. We are going to have the support of the gas workers, cleansing department employees, and other classes of municipal workers, in such numbers as will ensure our success; and if we can cut off the electricity supply, Alderman Jackson and his men can go fishing."

At Sunday's meeting, Councillor Jones said he had reason to believe they would get their grievances remedied without having recourse to a strike. After a number of speeches had been made on the need for men in the various departments having better wages and conditions of employment, a resolution was adopted to the effect that the members of the Union continue at work, and that the leaders approach the Committees of the Corporations affected, with a view to obtaining a redress of the men's grievances.

NELSON CORPORATION WATER-WORKS.

Increased Storage.

There is now in course of construction for the Nelson Corporation a reservoir which is expected to cost something like £40,000. It is the largest and the most important undertaking of its kind the Corporation have ever entered upon; and it will place the town in a position to meet the water requirements of the inhabitants for many years. At present, Nelson serves a population of 60,000; including in its area the borough and several outside places. The source of supply is two drainage areas, one of which, 400 acres in extent, is situated four miles east of the town on the borders of Yorkshire; and the other, 1100 acres, four miles west of the town on the Pendle Hill. In both cases surface springs exist.

During the year 1910, the town experienced a severe drought. At the beginning of the summer, there was only 112 days' supply in store; and it was felt that this was certainly below requirements. The position, however, became so serious that it was found necessary to curtail the consumption for a time to four hours per day; there being at that period considerably less than a 50 days' supply in the reservoirs. The same year, therefore, tenders for the work of constructing the Lower Ogden Reservoir were obtained; but, after full consideration, the scheme was allowed to drop—a strong feeling being expressed that the expense was not warranted in the then state of the area's growth. At the same time, during the last twenty years the population which Nelson serves has grown enormously. In 1881, it was 19,223; in 1891, 33,476; in 1901, 47,326; while to-day it is computed, as already stated, at 60,000.

It was originally intended to construct three reservoirs in the Ogden Valley. One of them—known as the Upper Ogden Reservoir—with a capacity of 54 million gallons, was completed in 1903 at a cost of £22,000, exclusive of land; but the second had to be abandoned owing to the costly work of construction. The one now in progress is the third. The present storage is 134½ million gallons, contained in the Coldwell reservoir, which has a capacity of 80 million gallons, and the Upper Ogden Reservoir, with 54½ millions. The estimated consumption in 1901 was 1½ million gallons per day, or 26½ gallons per head. In 1907, the population having reached about 55,000, the consumption had increased to 28.8 gallons per head; and whereas in 1901 it was estimated that there was 137 days' supply, this fell year after year until in 1907 there was only 96 days' supply. The whole question being one which vitally affects the health of a town, the construction of an additional reservoir could not be indefinitely postponed. The water supplied by meter for trade purposes was also increasing enormously; and therefore, on Feb. 20, 1908, it was finally decided to proceed with the construction of the reservoir under notice. The following June, the preliminary task of building the culvert and cutting the trench was commenced; and, few difficulties having been experienced, the work has progressed in a perfectly satisfactory manner. In the case of the trench, it was necessary to go down 100 feet for a water-tight bottom. This has now been filled up, and the banking at present reaches a height of 39 feet above the old stream level. This, however, has yet to be raised an additional 41 feet; and some ten to sixteen months must elapse before the work is completed.

When finished, the reservoir will have a holding capacity of 160 million gallons; so that the storage will be more than doubled. The Corporation will then be in a position to supply a population of 80,000, with 30 gallons per head per day for 195 days.

The Brighouse Town Council have been notified that the Hipperholme District Council have decided to take over the undertaking of the Bailiffe Bridge Gas Company, and are prepared to take the gas in bulk from the Brighouse Corporation.

NOTES FROM SCOTLAND.

From Our Own Correspondent.

Saturday.

I have been present this afternoon at the proceedings at Helensburgh in connection with the official opening of the installation of Glover-West vertical retorts. The installation is of more than usual interest, on account of its being the first one which has been added to the work-a-day plant of a gas-works in Scotland; also because—and this is of more importance than the other point—it brings into the field of actual fact the feasibility of working the Glover-West system of retorts in an installation which serves a works producing less than 100 million cubic feet a year. The success which has attended the introduction of the vertical-retort system in Helensburgh is undoubted. This will inspire others, whose works are not regarded as large, to look into the possibilities of vertical-retort carbonization. Nothing, in this respect, can be more instructive than to learn of the success; and as Mr. Blair is to give the results of his working at the North British Association meeting in Glasgow on Thursday next, this condition will be then met. It is, therefore, unnecessary to say more here at the present time; and I may only add that, having seen the works, I thoroughly endorse all that was said at Helensburgh regarding the quality of the work which has been put into the construction of the installation by West's Gas Improvement Company. Mr. Blair is certainly to be congratulated upon his courage. He has his reward, so far, in the heartiness of the proceedings on Saturday; and he will doubtless have more next week.

The accounts of the Aberdeen Gas Department for the year ending July 31 have been issued this week by the Gas Treasurer (Mr. J. T. Sorley). The revenue account for gas shows that, after charging £10,989 as sinking fund for the reduction of mortgages and gas annuities, and carrying £3000 to the renewal fund, and £300 to the fire insurance fund, there is a credit balance on the account for the year of £3728, which, added to the sum at the beginning of the year, makes £7776 to be carried forward to the credit of the current year's account. The net liabilities in connection with the gas undertaking at July 31 amounted to £132,921; being the amount of borrowed money, accounts due to tradesmen, &c., less gas accounts payable, value of stock in hand, &c., £16,870. Gas annuities held by the public were valued in 1897 at £156,557. At the present market price, the value of these is £116,051. The total of the capital account is £446,221, there having been added during the year £3265. The surplus of assets over liabilities is stated at £28,803. A decrease is shown in the value of meters of £1848, and of gas-stoves of £850. The revenue account sets forth a total revenue of £125,467, and shows that gas and meter rents of the ordinary consumers amounted to £75,396; receipts for gas for motive power, to £7001; and receipts through prepayment meters, to £13,696. From the residual products there was realized £26,596—from coke, £14,627; from tar and ammoniacal liquor, £11,967—and from gas-stoves, £1759. The manufacture of gas cost £78,442; distribution, £5112; rents, feu-duties, and taxes, £6728; management, £1919; general charges, £921; and discounts and bad debts, £4023. The total expenditure was £99,828. The balance carried to net revenue account has been £25,639. The arrears of gas-rents at July 31 amounted to £1347; and the stock on hand, to £8731. The cost of coal, including freight, harbour dues and wages, was £53,564; and gas oil to the amount of £3593 was used. The quantity of gas made was 817,734,000 cubic feet, compared with 794,775,000 cubic feet in the preceding year. The Gas Committee on Wednesday considered the accounts, and resolved to recommend the Town Council to reduce the prices for gas to ordinary consumers from 2s. 6d. to 2s. 3d., and to users of gas for motive power from 2s. 3d. to 1s. 11d.; and to retain the price to prepayment consumers at 1d. per 29 cubic feet. The Committee also, on a report by the Gas Engineer (Mr. S. Milne), resolved to recommend that, as from Whitsunday last, rental be not charged upon cooking appliances. It is proposed to hold an exhibition of gas appliances in Aberdeen early in October.

Having before me copies of the annual accounts of the Corporations of both Glasgow and Edinburgh, there may be some interest if I cull from them a few figures with reference to the cost of gas produced per 1000 cubic feet sold. In Glasgow, the cost of coal last year was 12'93d., and there was received for residual products 9'65d., leaving the net cost of coal 3'28d. Other manufacturing charges amounted to 9'67d.; distribution charges, to 2'87d.; management, to 0'73d.; and rents, feu-duties, taxes and assessments, law and parliamentary charges, retiring allowances, depreciation charged to capital, sinking fund, and interest paid on capital, to 9'73d. The total cost was 23d. In Edinburgh, the cost of coal was 1s. 0'04d.; and other manufacturing charges raised the cost to 1s. 6'50d. Distribution charges amounted to 3'51d.; gas stoves and appliances, to 0'97d.; management, to 1'44d.; rents and feu-duties, rates and taxes, to 2'98d.; and allowances to ex-employees, contributions to superannuation fund, compensations, law expenses, and bad debts, to 0'74d. The total cost was 2s. 4'14d. From this there was deducted, for residuals sold, 8'51d.; for rental of stoves, prepayment meters, &c., 0'95d.; for stair lights, 0'76d.; for gas appliances, &c., 0'47d.; and for sundry revenue, 0'13d.; making a total deduction of 10'28d., and leaving the net cost of gas per 1000 cubic feet of gas sold at 1s. 5'32d. The revenue from gas, less discounts, amounted to 2s. 7'99d.; and the balance of 1s. 2'67d. was gross profit. If any attempt were made to institute comparison between these sets of figures, it would lead to a useless result, as the analyses are not made on the same basis. For instance, in the Glasgow accounts the items of depreciation, sinking fund, and interest paid on capital are included. These items amount to 7'55d.; and with this sum deducted from 23d., it would leave the cost of gas at 15'45d. In Edinburgh, there is no depreciation; but the charges for sinking and reserve funds, interest, and annuities are stated as charges upon the gross profit of 1s. 2'67d. The sums amount to 1s. 1'94d.

A return has been prepared by Mr. Jas. Nicol, the City Chamberlain of Glasgow, of the revenue, expenditure, and interest for the year to May 31, 1911, and of the assets, liabilities, and sinking funds of the Corporation departments. It is shown that the revenue of all the departments amounted to £3,946,823—an increase over the preceding year of £139,911. The total expenditure, including interest, year's

sinking fund, and depreciation and reserve funds, was £3,874,344—an increase of £92,216. Net interest amounted to £526,687—a decrease of £33,240. The total assets are stated at £24,910,703—an increase of £314,658. Liabilities, exclusive of sinking funds, are stated at £16,398,441—a decrease of £202,746. Sinking funds, reserve funds, and other bookkeeping liabilities, are shown at £8,761,681—an increase of £610,507. The Gas Department used to be the largest trading department of the Corporation, and I doubt not is so still; but in this return, by linking the Common Good and Tramways Department together, the Gas Department is considerably eclipsed. The revenue of the Common Good and Tramways is stated at £1,099,958. That of the Gas Department is given as £896,046; the expenditure, including interest, &c., at the same figure; net interest, at £72,943; assets, at £2,684,700; liabilities, excluding sinking funds, at £1,805,746; and sinking and reserve funds, &c., at £981,549. A comparison with the Electricity Department may be interesting. The revenue in that department is stated at £260,526; the expenditure, including interest, &c., at the same; net interest, at £58,605; assets, at £1,996,360; liabilities, exclusive of sinking funds, at £1,672,744; sinking and reserve funds, &c., at £323,616. The Water Department is one of the greatest of the Corporation undertakings. The revenue is stated at £260,141; the expenditure, including interest, sinking fund, &c., at £250,234; net interest, at £95,397; assets, at £4,429,544; liabilities, excluding sinking funds, at £2,716,503; sinking and reserve funds, &c., at £1,713,041.

While I write [at Dunoon] the rain is falling mercilessly, as it has done nearly all day. The conditions are the opposite of pleasurable; but there is consolation to be had in the fact that a long-continued dry period has manifestly come to an end, and there is now no danger of water famine, the fear of which had begun to trouble the minds of local authorities. It may be said that in Scotland the water supplies to all the larger places are quite ample for any contingency regarded as possible, with the exception, perhaps, of Aberdeen, where an augmentation has been under consideration for some years. It is among smaller places that scarcity of water has been felt this season; and even among them the drought has been quite sectional. North of the Tay there does not seem to have been anything unusual experienced; but in Fifeshire and Linlithgowshire there were considerable straits. In the case of Fifeshire, the situation was aggravated by the fact that around the coast there is an annual influx of people on holiday, sometimes to the extent of double the population; and to provide water for these summer visitors, is a severe tax upon the conditions of supply, which are at all other seasons found to be quite sufficient. The inland towns of Cowdenbeath and Lochgelly, neither of which is, however, much sought after by the summer visitor, have been under the necessity of obtaining supplies from the Dunfermline Corporation Water-Works; the former to the extent of 700,000 and the latter of 100,000 gallons daily. In other places, temporary expedients have been resorted to—such as pumping water from limestone quarries at Leven and Lundin Links, and the utilization of the surplus supply from the private well of a distillery in another instance. There was difficulty in obtaining water for railway engines; but going farther afield for supplies got over this. So far, I have not heard of the stoppage of mills or factories through want of water, except to a very trifling extent; but warning notices as to impending enforced cessation were common. All this risk is at an end now for a season, as the rainfall (which began on Thursday, the 24th ult., and has been experienced about every alternate day since) has been sufficiently copious to replenish depleted reservoirs. One outcome of the situation has been the resolution, already taken in more places than one, to call in the aid of consulting engineers to advise as to the best means for augmenting existing supplies. I would have liked to have been able to give figures as to the rainfall; but these are not yet forthcoming.

Mention is made in the preceding "Note" of the water supply of Aberdeen. It will be within the recollection of some that the Corporation promoted a Bill in the last session of Parliament for the taking of a new water supply from the River Avon, which rises among the Cairngorm Mountains, and flows into the River Spey, and that the measure was defeated. The measure was the pet scheme of Lord Provost Wilson. His party did not take the defeat with good grace; and while they have not given much indication of a desire to renew the Avon scheme, those in the Corporation who opposed them, and who favoured the continuance of the taking of the water supply from the River Dee, have gone in for a policy of giving their own pet scheme all the airing they possibly can. The water accounts of the Corporation for the past year have been published, and show a handsome balance. The situation is so favourable that the Water Committee have fixed the rates for water at the same figures as for the past year—5d. per £1 for domestic supply, and 1½d. per £1 for public supplies. It has been resolved to add £8771 to the sinking fund; and the interesting information is given that this clears off the entire debt due on the existing water-works, and leaves a balance of £7761. What to do with this sum was discussed by the Water Committee on Tuesday, when it was revealed that the cost of promoting the abortive Avon scheme was £15,521. The proposal was made that the surplus should be applied in paying off half this sum. A decision was not come to; but the subject was sent forward to the Town Council, to be disposed of there.

Sidmouth Gas Company and Electricity Supply.—As already announced in the "JOURNAL," the Sidmouth Gas and Electricity Bill, promoted by the Sidmouth Gas Company, has received the Royal Assent; and under the Act, the Company are possessed of powers to supply Sidmouth with electricity. It is stated, however, that nothing will be done for twelve months or so, pending the decision of the District Council as to whether or not they will acquire and carry on the Company's undertaking.

Altrincham Gas Company's Increased Profits.—At the half-yearly meeting of the Altrincham Gas Company the report of the Directors showed that the profit for the six months ended June 30 was £5693, compared with £5272 in the corresponding period of 1910. It was stated that the sales of gas had increased by 2,498,000 cubic feet. The balance-sheet showed a sum of £9232 available for distribution. After payment of the full statutory dividends (10 and 7½ per cent. respectively on the original and new ordinary shares), there was left a balance of £5579 to be carried forward. The report was adopted.

CURRENT SALES OF GAS PRODUCTS.

[For Table of "Tar Products Prices," see p. 613.]

Sulphate of Ammonia.

LIVERPOOL, Sept. 2.

Notwithstanding the settlement of the difficulties in the way of transport, with the turn of the month there has been a distinct falling off in the demand for sulphate of ammonia, and values have receded to a small extent from the highest point reached. At the close the tone of the market is quiet, and the quotations are £14 per ton f.o.b. Hull, £14 1s. 3d. per ton f.o.b. Liverpool, and £14 3s. 9d. per ton f.o.b. Leith. With the easier position for near delivery, there has been little inclination to operate for future shipment. Manufacturers continue to quote £14 7s. 6d. per ton f.o.b. at the principal ports for delivery in equal monthly quantities up to the end of this year or over the first half of 1912, but no business has been reported thereat.

Nitrate of Soda.

This article is a quietly steady market at 9s. 10½d. per cwt. for 95 per cent. quality and 10s. 1½d. for 96 per cent. on spot.

LONDON, Sept. 4.

Tar Products.

There is little or no alteration in the markets for tar products; but prices on the whole remain firm. In pitch, the inquiry is steady, and prices have been well maintained. Benzols are firm, especially for prompt delivery. Solvent naphtha still remains quiet. There is a fair demand in heavy naphtha. Creosote appears to be a good market, and prices are firm for both prompt and forward delivery. Crude carbolic continues in about the same position.

The average values during the week were: Tar, 21s. to 25s. *ex works*. Pitch, London, 40s. 6d. to 41s. 6d.; east coast, 40s. to 41s.; west coast, Manchester, 39s. 6d. to 40s. 6d., f.a.s.; Liverpool, 40s. 6d. to 41s. 6d., f.a.s.; Clyde, 40s. to 41s., f.a.s. Benzol, 90 per cent., casks included, London, 9½d. to 10½d.; North, 9½d. to 10d.; 50-90 per cent., casks included, London and North, 9½d. to 9½d. Toluol, casks included, London, 10d.; North, 9½d. to 9½d. Crude naphtha, in bulk, London, 4d. to 4½d.; North, 3½d. to 3½d.; solvent naphtha, casks included, London, 11½d. to 11½d.; North, 10d. to 10½d.; heavy naphtha, casks included, London, 11½d. to 1s. 0½d.; North, 10d. to 11½d. Creosote, in bulk, London, 2½d. to 2½d.; North, 2½d. to 2½d. Heavy oils, in bulk, 2½d. Carbolic acid, 60 per cent., casks included, east coast, 2s. to 2s. 3d.; west coast, 1s. 11d. to 2s. 2d. Naphthalene, £4 10s. to £9; salts, 42s. 6d. to 45s., bags included. Anthracene, "A" quality, 1½d. to 1½d. per unit, packages included and delivered.

Sulphate of Ammonia.

This article remains firm, although there is practically no alteration in price. Actual Beckton is quoted £13 15s.; outside London makes, £13 12s. 6d.; Hull, £14 2s. 6d.; Liverpool, £14 5s.; Leith, £14 7s. 6d.; and Middlesbrough, £14 2s. 6d.

COAL TRADE REPORTS.

Northern Coal Trade.

There has been a heavy shipment of coal during the last few days, and thus the stocks of consumers will be added to, after the depletion in some instances in the strike period. Steam coals are a little quieter. Best Northumbrians are from 11s. to 11s. 3d. per ton f.o.b., second-class steams from 9s. 6d. to 10s., and steam smalls from 5s. to 6s. Except for lack of ready steamers, the output is well taken up generally. In the gas coal trade, the demand is very good for this season; and the price is firm. Durham gas coals are quoted at 11s. to 11s. 1½d. per ton f.o.b. for best kinds; second-class gas coals are 9s. 9d. to 10s.; and for "Wear specials," the quotation is about 11s. 6d. to 11s. 9d. Very few contracts were reported in the last few days; but one, for some 11,000 tons, for Magona, shipped this autumn, is said to have been concluded at about 18s. per ton for best Durhams, delivered. Some sales are also reported of cargoes of good gas coal at 17s. 6d. per ton delivered at Genoa. There is, however, rather less disposition to sell coal for forward, unless at higher prices, owing to the unrest at the collieries, and the agitation for a higher minimum wage. Coke is a little more plentiful in supply. Good gas coke is quoted from 14s. 3d. to 14s. 9d. per ton f.o.b. in Tyne or Wear.

Scotch Coal Trade.

Trade has been more active; the advance in prices for shipping being fully maintained. From the coalowners' point of view, there is a better outlook. Prices may now be quoted at: Ell, 9s. 3d. to 10s. 3d. per ton, f.o.b. Glasgow; splint, 9s. 9d. to 10s.; steam, 9s. 3d. to 9s. 6d. The shipments for the week amounted to 338,575 tons—an increase on the previous week of 9345 tons, and on the corresponding week of 5502 tons. For the year to date, the total shipments have been 10,553,134 tons—an increase upon the corresponding period of 128,837 tons.

Watford Gas Company.—At the recent half-yearly meeting of this Company, the accounts presented showed a profit of £4593 for the six months ended the 30th of June, and a sum of £7403 available for distribution. The Directors recommended a dividend at the rate of £7 7s. 6d. per cent. per annum on the "A" stock, and £5 17s. 6d. per cent. per annum on the "B" stock, both less income-tax. The make of gas in the half year amounted to 120,353,350 cubic feet, of which 114,334,100 cubic feet were sold and 115,652,000 cubic feet in all were accounted for.

Testing Gas-Meters at Hyde.

The minutes of the Watch Committee of the Hyde Corporation, read and confirmed at a meeting of the Council last week, contained the following: Read letter from Mr. Walter Gee with respect to the testing of gas-meters. The Town Clerk reported upon the statutory provisions as to testing of gas-meters; and, after consideration, the Committee decided not to take any action. It was explained by the Town Clerk at the Council meeting that Mr. Gee had recently seen a report in the newspapers of the proceedings of the Manchester City Justices, who acted as the gas-meter testing authority under the Sale of Gas Act; and he (Mr. Gee) wanted to know whether the Sale of Gas Act might be made use of by the Hyde Corporation. The answer to this was in the affirmative. The Corporation could adopt the Act if they thought fit; but it would mean, said the Town Clerk, setting up rather elaborate machinery for gas-testing, and they would have to appoint an inspector—probably a qualified man. The suggestion of Mr. Gee that this duty might be entrusted to the Inspector of Weights and Measures was not feasible, unless such Inspector had had some prior training. The Town Clerk added that it was doubtful even then if it would be of much use in Hyde, because there was an arrangement in force now with the Gas Company by which a consumer could have his meter tested, under certain conditions, if he had reason to doubt its accuracy. Under the circumstances, the Committee decided not to take action in the matter; and this was endorsed by the Council.

Sale of Shares.—At the Church Inn, Tintwistle, last week, Mr. J. T. Goddard, of Glossop, offered for sale by auction a number of shares in the Hollingworth Gas Company, Limited. Ten "A" £1 shares were sold at £1 6s. 6d. each, and 29 "B" shares, of the same nominal value, changed hands at £1 2s. 6d. apiece.

Waltham Abbey and Cheshunt Gas Company.—At the recent half-yearly general meeting of this Company, the Directors reported a balance of £3379 available for distribution; and they recommended dividends at the rates of 8½ per cent. per annum on the "A" shares, and 6½ per cent. per annum on the "B," "C," and "D" shares. The payment of these and the debenture interest required £2442; leaving £937 to be carried forward. The quantity of gas sold in the half year was 39,360,200 cubic feet; and out of a make of 42,307,000 cubic feet, 40,276,000 cubic feet were accounted for.

More Burst Water-Mains.—Owing to the bursting of a 2-inch water-main in High Holborn shortly before ten o'clock on the night of the 27th ult., a portion of the roadway from Fetter Lane to Holborn Circus and another portion in Farringdon Street, 200 yards distant, were rendered unsafe for traffic. The Gosport Water Company sustained a considerable loss of water last Tuesday by the bursting of their chief main at Fareham, between headquarters and the reservoirs at Soberton. Much damage was caused last Wednesday by the bursting of a 36-inch water-main at Milngavie, near Glasgow. Water rushed down into the village, flooding houses, shops, and the Town Hall. Eventually the supply was cut off, and in consequence several factories and public works in Glasgow were temporarily closed, while the domestic supply was also seriously affected in the north-western district.

Swansea Water Scheme.—On Thursday afternoon, the Chairman of the Swansea Water Committee (Alderman T. T. Corker) formally opened the Morrision service reservoirs, which complete the present water-works system of the town, and have been constructed, at a cost of about £20,000, for the purpose of distributing water over a large area of the borough. They are twin reservoirs, covered in below ground, and are constructed of steel and concrete, to hold 2 million gallons each. They are at such an elevation as to be able to supply nine-tenths of the population of Swansea. The reservoirs were built from the plans of Mr. R. H. Wyrill, the Swansea Water-Works Engineer; and the contract was carried out by Messrs. Aird and Sons, under the superintendence of their agent, Mr. Avant, and his assistant, Mr. Wilkinson. A gold key was presented by the Contractors to Alderman Corker, with which he unlocked the doors of the valve-house.

Cork Gas Consumers' Company.—The accounts of this Company for the six months ended June 30 last, which were presented at the half-yearly meeting last Thursday, showed a balance of £5507 on the profit and loss account; and the Directors proposed to pay a dividend at the rate of 8 per cent. per annum. In moving the adoption of the report, the Chairman (Mr. George Lynch) said the demand for gas for lighting, cooking, &c., continued to increase. The quantity sold during the past half year showed an increase of nearly 3 million cubic feet, chiefly in the slot meters and cookers, indicating that the convenience and economy of gas were being more extensively appreciated by a class of smaller consumers. The slot meters now slightly exceeded the others in number; both together being upwards of 9500. The Directors had done better with the residuals, owing principally to a larger production of coke, and having a ready sale for it at fairly good prices. The report was adopted.

Gas v. Electricity for Pumping Water.—The Norton (Malton) Urban District Council were informed at their meeting on Monday last week, that the Water Committee had advertised for tenders in connection with the pumping of the water at the reservoir. The Northern Counties Electricity Supply Company offered to do the work for five years on the same terms and conditions as those existing, with the exception that the charge was to be a flat-rate of 1½d. per unit net. If the contract was to be for one year only, the charge would be 1½d. per unit. The number of units used during the year ended June 30 last was 32,832; and this at 1½d. per unit would amount to £171 per annum. The Malton Gas Company offered to pump the water for £96 a year. At the meeting of the Committee on the 21st ult., the Clerk stated that he had written to the Gas Company for further particulars with respect to their tender, and they had stated that it did not include the renewal of any of the principal parts, or the repair or renewal of the pumps or gearing. The Electricity Supply Company wrote saying that they could not reduce their tender. It was proposed that the Electricity Company be offered £150 per annum. An amendment was submitted to the effect that the Gas Company's tender should be accepted; and it was carried.

Messrs. W. Sugg and Co.'s New Lamp Catalogue.

We have received from Messrs. W. Sugg and Co., Limited, their latest catalogue of lamps and fittings. It contains particulars of their "Regent," "Littleton," and other lamps, fitted with inverted incandescent burners, in great variety. The lamps are shown suspended and with upright and horizontal fixings, and fitted with reflecting shades and advertising screens. The "Regent" lamp is made for gas consumptions ranging from 4 cubic feet, with a single burner, giving 160-candle power, up to 36 cubic feet, with nine burners and 1440-candle power. These lamps are usually fitted with lever cock and pilot-light; but they can be arranged for lighting with a flashing spirit torch. On p. 10 of the catalogue is shown a lamp with upright fixing illustrating the method of doing this. The cover is fitted with a trumpet-shaped entry, which passes to the inside of the lamp. The torch has a permanent oil flame and a supply of spirit. When it is desired to light the lamp, the end of the torch is inserted in the entry already referred to, and by lightly pressing a rubber ball attached to the torch by a tube, a portion of the spirit is atomized and blown across the oil flame, by which it is ignited, and a flame of ample volume to light the gas is sent into the lamp. Messrs. Sugg have patented this method of applying a spirit flame to the lighting of lamps, thus superseding the flash-light; and they claim for it the advantage over the latter and more general plan that it does not discolour the inside of the lamp. The system of lighting described can be employed for column, bracket, or suspension lamps; and spirit torches of various sizes, suitable for outdoor or indoor use, are shown. Another feature of the catalogue to which attention may be directed is the "Regent" lamp shown mounted with horizontal fixing for a wrought-iron bracket for street lighting. The cover of the lamps is so arranged as to be easily removable for cleaning purposes. Lamps of smaller size, with inverted incandescent burners and fitted with steel and opal glass reflecting shades and anti-vibrators (some specially adapted for general office lighting), are shown in numerous types and powers.

Rugby Gas Company.—The report adopted at the half-yearly meeting of the Rugby Gas Company stated that receipts on revenue account for the half year ended June 30 amounted to £13,323, and the expenditure to £8831, leaving a balance of £4492 to be carried to profit and loss account. This balance, added to £10,960 brought forward, with £84 interest on moneys deposited, less £169 interest on mortgage, £166 depreciation of Birmingham Corporation stock (reserve fund), and £344 depreciation of Consols (insurance fund), gave a net balance of £14,856. The Directors recommended a dividend for the half year on the original share capital at the rate of 14½ per cent. per annum (less income-tax), amounting to £2560; and a dividend on the additional capital issued at the rate of 11½ per cent. per annum (less income-tax), amounting to £303. The Directors stated that they hoped to be able to recommend a further reduction of 2d. per 1000 cubic feet in the price of gas as from Jan. 1 next. The report was adopted.

Chichester Gas Company.

In the report presented at the half-yearly general meeting of this Company last Tuesday, the Directors called attention to the loss they had sustained by the change in the public lighting from gas to electricity; but the hope was expressed that the loss was only of a temporary character, and that the sale of gas would be restored by extensions in the private and prepayment consumptions. The accounts accompanying the report showed a balance of £1861; and the Directors recommended the declaration of a dividend at the rate of 7 per cent. per annum upon the "A" capital, and £4 18s. per cent. upon the "B" and "C" capital, all less income-tax. The Manager (Mr. T. E. Pye) reported that the works and mains were in good repair and condition. In moving the adoption of the report, the Chairman (Mr. W. A. Walker) congratulated the Company on the passing of the Chichester Gas Bill, which, among other important powers, extended the Company's limits of supply to include Bosham, Chidham, Funtington, Boygrove, Lavant, Merston, and West Stoke. He said the past half year was the first that the Company had experienced the full brunt of the loss of the public lighting of the city, which came to £568. But to set against this there was a welcome increase of £149 in the income from private lighting; thus reducing the actual loss to £419. He regarded this increase with the liveliest satisfaction, as indicating that the Company might fairly look for further expansion. It was the opinion of the Board that the Company had passed over the worst. They had, moreover, concluded more favourable contracts for coal. They were laying down plant for making tar paving, and hoped to do well with it. The dividends recommended were declared.

Maryborough (Queensland) Gas Company, Limited.—In the report presented by the Directors of this Company at the last half-yearly meeting, they stated that the profits, after making provision for bad and doubtful debts, repairs and renewals, depreciation, working expenses, wear and tear, and all other charges, including the balance brought forward, amounted to £1036, from which they recommended the usual dividend of 6 per cent. per annum (free of income-tax). This came to £773; leaving £262 to be carried forward.

Bridlington Water Supply.—An inquiry has been held at Bridlington by Major J. Stewart, on behalf of the Local Government Board, concerning the application of the Council for sanction to borrow £2000 for the purpose of laying a large water-main in connection with recently completed improvements and extensions, which cost £12,000. It was stated that the new main was required in view of the extension of the town and improved sanitary conditions. The Town Clerk said that, while the normal winter population was about 15,000, the August population was 50,000. The works were purchased in 1909 from the Bridlington Water Company, Limited, for £70,000; and £8000 had been repaid, and the works and mains maintained out of revenue. There was no opposition.

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Contaminated Water Supply.—It was lately discovered at Porthcawl that the public water supply was not fit for domestic use. The reservoir is eight miles from the town, and there were many conjectures as to the cause of the trouble until it was ascertained that the contamination was due to the water of a stream, which by special permission had been turned into the reservoir to increase the town supply temporarily. This stream, it was found, had been poisoned with carbolic acid, and hundreds of fish were floating about dead.

Douglas Gas Company and their Employees.—The statement of accounts submitted at the half-yearly meeting of the Douglas Gas Company showed a net profit for the six months of £4145, which was an improvement on the corresponding period of the previous year. There was available for distribution £7600; and a dividend of 22s. 6d. per share was declared. The report was adopted, and complimentary references were made to the satisfactory manner in which the Directors had prevented the recent threatened strike of employees. The Chairman alluded to the increased revenue from the sale of sulphate of ammonia, through the growing demand for agricultural purposes.

South Lincolnshire Water-Works Purchase Question.—A special meeting of the Spalding Rural District Council has been held to consider the desirability of purchasing the undertaking of the South Lincolnshire Water Company, including the bore at Pinchbeck West and the unfinished work in connection with it. The Company was formed to supply water to a district extending from Spalding to Sutton Bridge. Some 15 miles of pipes have been laid, and an artesian well sunk; but the works have not been completed, and the affairs of the Company are in the hands of a Receiver. An offer of the works has been made to the Council; and the price was stated to be £12,000. It was eventually decided to consult a Water Engineer, with a view to ascertaining the value of the property, and the cost of completing the works. On receipt of his report, a further meeting of the Council will be held, and possibly other local authorities will be consulted.

Road Tarring and Alleged River Pollution.—The question of river pollution in consequence of tarring the roads has been reported upon by the Main Roads Committee of the Hants County Council. They stated that they had arranged that the tar used on main roads should accord with a stringent specification eliminating all deleterious products which might be injurious or destructive to fish or vegetable life; and any delivery of tar found not to accord with the specification has been condemned. The precaution has also been taken of obtaining a considerable number of samples of washings from the roads in various parts of the county. These washings have been submitted to Mr. W. J. A. Butterfield, who prepared the specification, for analysis, and in every case he has reported that the sample was free from contamination by tar or tarry matters. A similar report was received of a sample which was taken from the River Lyde, from a part of the river where the tarry matter was stated to have been seen; and, having regard to these reports, the Roads Committee feel justified in thinking that the risk of contamination which is apprehended does not in reality exist.

Increased Consumption at Newark.—At the annual meeting of the Newark Gas Company, held Thursday week, the balance available for disposal was £2766. The statutory dividends were declared, at the rate of £11 5s. per cent. per annum on the "A," 5 per cent. on the "B," and £8 5s. per cent. on the new ordinary shares. The number of consumers by prepayment meters has largely increased. The quantity of coal carbonized in the past year amounted to 9009 tons; and it produced 95,539,400 cubic feet of gas—being an increase of 1,611,700 cubic feet.

Romford Gas Company.—The half-yearly meeting of this Company was held on the 26th ult.—Mr. J. Smith (the Chairman) presiding. The amount available for distribution was £7002; and the Directors recommended the payment of dividends at the rate of 13 per cent. per annum on the original shares, and of 10 per cent. per annum on the "B" shares, both less income-tax, for the six months ended June 30. These dividends would amount to £2595; leaving £4407 to be carried forward. The sale of gas showed an increase of 5½ per cent. over the corresponding half of last year.

Montreal Water Supply.—Particulars are given in the "Monetary Times" as to the present condition of the water supply at Montreal. In the city itself, there is some shortage of water. The lower level reservoir is being repaired; and the water is down to a depth of 17 feet, which is 6 feet under normal. The contents are just now only 20 million gallons, or about 45 per cent. of what it should contain. There is not much danger from any of these sources at the present time, it is thought. The contract has been given out for a new 12-inch pump at the water-works, which will have a daily capacity of 12 million gallons. This will increase the city's total pumping capacity to 55 million gallons a day. The average consumption of water this year has been 42 million gallons a day; but the hot spell has caused these figures to mount. On the 6th ult., there were 47 million gallons used; on Aug. 5, a total of 48 millions flowed through the city taps; and the day previous, Aug. 4, saw a consumption of 46½ million gallons.

South Staffordshire Water-Works Company.—The report adopted at the half-yearly meeting of the South Staffordshire Water-Works Company stated that the number of houses laid on in the six months to June 30 was 642, making the total supplied 140,583. The gross amount of water-rates for the half year was £75,745, against £72,618 in the corresponding period of the previous year. The amount remaining for division was £30,254; and the Directors recommended the declaration of a dividend for the six months on the ordinary stock at the rate of 6½ per cent. per annum, less income-tax. After this, there would remain £9155 to be carried forward. The Chairman (Alderman G. C. Beale) pointed out that the water-rates had increased by over £3000. This was much more than the average rate of growth, and was due to a large extent to the exceptional drought. Their engineering staff had coped with the extraordinary demands without the slightest hitch; and in no district was there any serious complaint of shortage of water, though on the extremely high levels it was not possible to keep up a 24-hours' supply.

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83, Old Market St., BRISTOL; 13, Whitworth St. West, MANCHESTER; 8, Exchange Place, Donegall St., BELFAST;
333, Queen St., MELBOURNE; and 12, Cunningham Lane, Pitt Street, SYDNEY.

Sale of the Silvertown Gas-Works Site.—The "Co-Partners' Magazine" of the Gaslight and Coke Company for the current month reports that the site of the disused Silvertown station of the Company has been disposed of. On this site originally stood the works of the Victoria Docks Gas Company, long since acquired. For some years it was used as a coal-testing station, until the modern advance and variety in carbonizing practice rendered the once standard plant out of keeping with the equipment of the working stations. It was managed by Mr. J. Wilton, in conjunction with Bow Common. Work there was finally stopped in September, 1909.

The Berlin-Anhaltische Maschinenbau-Actien-Gesellschaft, referring to the article published last week (pp. 539-41) respecting mantles for incandescent gas-lamps made of artificial silk, ask us to mention that they are represented in England by Messrs. A. Hurst and Co.

At the next half-yearly meeting of the British Gaslight Company, Limited, the Directors propose to recommend, subject to audit, a dividend at the rate of 10 per cent. per annum, with a bonus of 5s. per share, for the six months ended the 30th of June, less income-tax, and payable in October.

The annual abstract of accounts for the Borough of Blackpool, prepared by the Treasurer, and issued to members of the Council last week, shows that the profit on the gas undertaking for the past financial year amounted to £13,923; while the electric lighting department had a profit of £5270.

Messrs. Silcock and Tongue, of Birmingham, have sent a copy of their eighteenth catalogue of lamps—containing many new designs in advertising and sign lamps, also for street, hotel, and shop-window lighting. The lamps for gas-lighting are shown provided with fittings and connections complete, ready for fixing; and most of the lamps listed can be adapted for acetylene or electric lights.

A few evenings ago, a singular occurrence attracted a large crowd in Broad Street, Teddington. A dense column of black smoke was seen to be issuing from a gully of the surface-water drain. The Chief Officer of the Fire Brigade was soon on the spot; but as it was found that the cause of the smoke was the fusing of the electric light cable, the brigade were not called out. The smoke continued to pour from the gully for upwards of half-an-hour, and then gradually subsided. The following morning, a gang of men belonging to the Electric Light Company effected the necessary repairs.

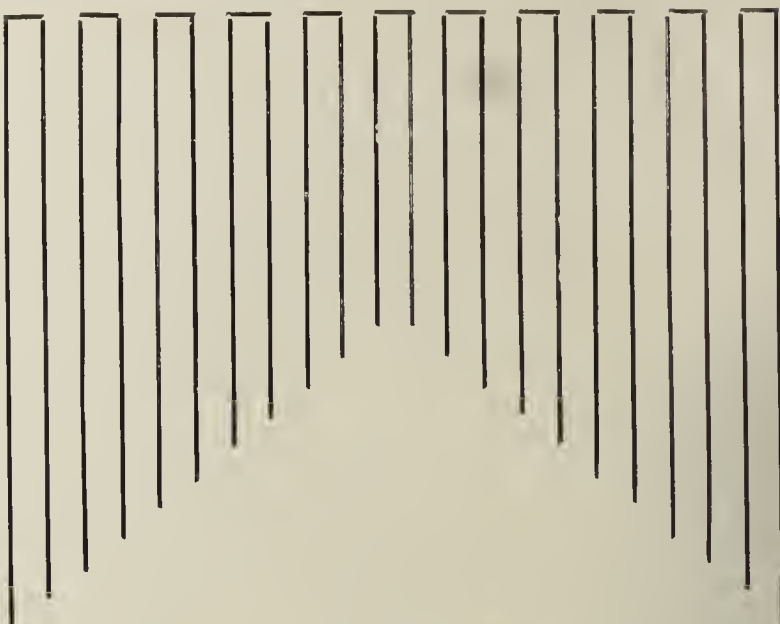
In the industrial section of the Burton-upon-Trent Flower Show, the Corporation Gas Department exhibited a number of cooking-stoves of the pattern supplied to prepayment meter consumers, and a selection of artistic and up-to-date gas fires and radiators. There were also gas irons, a "Sun" boiler, a "Garajo" boiler (for heating greenhouses, garages, &c.), and a Sugg's anti-vibrator burner fitting. Most of the goods displayed were supplied by Messrs. John Wright and Co. The Richmond Gas Stove and Meter Company also furnished one of their "Daisy" boilers fitted up for heating greenhouses, &c.

A supply of gas has been afforded by the Gas Committee of the Burton-on-Trent Corporation to Stretton—a neighbouring village containing about 150 houses; and with the view of directing attention to the matter, Miss Edith M. Smith, who has recently been engaged by the Committee to give demonstrations in cookery, attended at the Church Schools on Monday afternoon and evening last week, and showed to a numerous audience how to use a gas cooking-stove to the best advantage. Her methods of saving gas in culinary operations were followed with much interest. It was arranged that dainty and simple meals would be prepared next day.

A flower and vegetable show and a garden fête were held on the Metrogas Sports Ground in the Old Kent Road on Saturday, the 26th ult. The arrangements were carried out by a Committee, of which Mr. A. G. Manley was the Chairman and Mr. G. H. Peedle the Hon. Secretary. The exhibition was opened by Mr. F. M'Leod, the Secretary of the South Metropolitan Gas Company, who said that though it was the first attempt to hold such a show, he hoped it would not be the last, because he regarded it as the means of bringing the men more closely together; and it was this spirit which encouraged co-partnership. Rivalry of this sort brought out the best in a man. He was accorded a hearty vote of thanks. The prizes were distributed by Mrs. Gibson, wife of the Works Superintendent. During the afternoon, sports were held under the direction of Mr. A. C. Griesbach; and in the evening there was dancing to the music of the Company's band.

APPLICATIONS FOR LETTERS PATENT.

- 18,740.—MOORE, G., "Ornamentation devices for gas-fittings." Aug. 21.
 18,744.—ROLLASON, A., "Manufacture of gas from coal." Aug. 21.
 18,748.—CARMICHAEL, D., and WINNING, J. F. F., "Leak-finder." Aug. 21.
 18,753.—GOODYEAR, G. W. & E. F., "Metallic tubes." Aug. 21.
 18,801.—CREMER, H., and HEINRICH, P., "Determining and measuring leakages in conduits." Aug. 21.
 18,840.—COVENTRY, W., "Inverted burners." Aug. 22.
 18,844.—BOYD, A., "Operating valves." Aug. 22.
 18,851.—LUCAS, H., and EDWARDS, W. H., "Flexible pipes." Aug. 22.
 18,905.—KENNEDY, R., "Water-meters." Aug. 23.
 18,910.—COOK, T., "Gas-taps." Aug. 23.
 18,917.—VALENTINE, H. S., "Gas-fires." Aug. 23.
 18,936.—BLAUGAS PATENT G. M. B. H., "Manufacture of liquid illuminating gas." Aug. 23.
 18,973.—TITTERTON, F., "Compressors and exhausters." Aug. 24.
 18,976.—HACKING, R., "Igniting gas-lamps." Aug. 24.
 18,995.—MILNE, J., "Meters for gas, &c." Aug. 24.
 19,049.—LOW, A. M., "Ignition of gas." Aug. 25.
 19,051.—MACKLOW-SMITH, A., and PULLEN, W. W. F., "Gas-calorimeters." Aug. 25.
 19,063.—ALLIN, H. P. & J. M., "Heating water by gas." Aug. 25.
 19,074.—ALLAN, H., "Incandescent gas-fittings." Aug. 25.



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Appointments Vacant.

SECOND ASSISTANT (Gas Department), Singapore Municipal Commissioners.
Applications by Sept. 15.
JUNIOR ASSISTANT, East Hull Gas Company.
WORKING MANAGER. Hawkhurst Gas Company.

Appointment Wanted.

CLERK. "Z." c/o Streets.

Patent Licenses, &c.

"COKING, OR DISTILLING, COAL FOR THE MANUFACTURE OF COKE AND PRODUCTION OF GAS." Marks and Clerk, Lincoln's Inn Fields, W.C.
"IMPROVEMENTS IN METERS." Haseltine, Lake, and Co., Southampton Buildings, Chancery Lane, W.C.

TENDERS FOR

Coke.
WANDSWORTH AND PUTNEY GAS COMPANY. Tenders by Sept. 18.

Glass Panes for Street Lanterns.
CALCUTTA CORPORATION. Tenders by Oct. 9.

Jena Glass Cylinders.
CALCUTTA CORPORATION. Tenders by Oct. 9.

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Their DESIGN, CONSTRUCTION, and EQUIPMENT,

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TAR PRODUCTS PRICES.

Representative manufacturers give the following as fair current values for the week ending Sept. 2. Prices are net, and they include the usual packages and delivery f.o.b., f.a.s., or f.o.r., as customary.

Article.	Basis.	London.	North-East Coast.	East Coast, Yorks.	West Coast.		Glasgow.
					Liverpool.	Manchester.	
Tar, crude	per ton	—	20/- 25/-	21/- 25/-	—	21/- 24/-	—
Pitch	"	42/6	40/-	40/-	40/-	39/- 39/6	40/-
Benzol, 90%	per gallon	—	-/9½ -/10	-/9½	-/9½	-/9½ -/9½	-/10
Benzol, 50-90%	"	—	-/10	-/9	—	-/9	—
Toluol, 90%	"	—	-/10	-/9	-/10	-/10	-/10
Crude naphtha, 30%	"	—	-/4½	-/3¾	-/3¾	-/3¾	—
Light oil, 50%	"	—	-/3½	-/3½	-/3½	-/3½	—
Solvent naphtha, 90-160	"	—	-/10 -/10½	-/10	-/10	-/10	-/11
Heavy naphtha, 90-190	"	—	-/11	-/11	-/11½	-/11½	-/11
Creosote in bulk	"	-/2¾	-/2 1/16	-/2 1/8	-/2½	-/2 3/16	-/2
Heavy oils.	"	—	-/2½ -/2 5/8	-/2½	-/2½	-/2½	-/2 3/4
Carbolic acid, 60's.	"	—	2/1	2/3	—	—	2/3
Naphthalene, crude drained salts	per ton	—	43/9	42/6	47/6	47/6 50/-	—
" pressed	"	—	60/-	63/-	60/-	60/- 72/6	—
" whizzed.	"	—	—	—	70/- 72/6	65/- 75/-	62/6
Anthracene	per unit	-/2	-/1½	-/1½	-/1½	-/1½	—

GAS COMPANIES' STOCK AND SHARE LIST.

Referred to on p. 585.

Issue.	Share.	When ex-Dividend.	Dividend or Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Invest-ment.	Issue.	Share.	When ex-Dividend.	Dividend or Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Invest-ment.
£	Stk.	Apl. 12	p.c.	Alliance & Dublin Ord.	81-84	..	£ s. d.	£	Stk.	Aug. 31	p.e.	Lea Bridge Ord. 5 p.e..	118-120½	+1	£ s. d.
1,551,868	Stk.	July 14	4	Do. 4 p.c. Deb.	93-95	..	4 4 3	200,242	Stk.	Aug. 16	10	Liverpool United A. .	210-212	..	5 0 0
374,000	5	May 12	7	Bombay, Ltd.	64-6½	..	5 3 8	561,000	"	"	7	Do. B.	161½-163½	+1½	4 5 8
250,000	10	Aug. 31	15	Bourne-) 10 p.c..	28½-29¼	..	5 1 8	718,100	"	June 30	4	Do. Deb. Stk.	102-104	..	3 16 11
50,000	"	"	7	mouth Gas- B 7 p.c..	16½-16¾	..	4 3 7	306,083	"	June 15	5	Malta & Mediterranean	4½-5	..	6 0 0
311,810	10	"	6	and Water) Pref. 6 p.c.	14½-14¾	..	4 1 4	75,000	100	"	6	Mct. of 15 p.c. Deb.	101-103	+1	4 17 1
75,000	10	"	13	Brentford Consolidated	256-261	..	4 19 7	560,000	"	"	4½	Melbourne 4½ p.c. Deb.	101-103	+1	4 7 5
380,000	Stk.	Aug. 16	10	Do. New	198-203	..	4 18 6	250,000	100	"	3¾	Monte Video, Ltd.	12½-13½	..	5 5 8
330,000	"	"	5	Do. 5 p.c. Pref.	120-122	..	4 2 0	541,920	20	May 31	3¾	Newcastle & Gateshead Con.	103-105	..	4 3 4
50,000	"	"	4	Do. 4 p.c. Deb.	97-99	..	4 0 10	1,775,892	Stk.	July 28	4½	Do. 3½ p.c. Deb.	87-89	..	3 18 8
206,250	Stk.	June 15	11	Brighton & Hove Orig.	216-221½	+2½	4 19 7	529,705	Stk.	June 30	3¾	North Middlesex 7 p.c.	14½-15½	..	4 10 4
220,000	Stk.	Aug. 31	8	Do. A Ord. Stk.	156-159½	+1	5 0 8	55,940	10	Aug. 31	7	Oriental, Ltd.	138-140	..	5 14 4
246,320	"	"	12½	British	45-46	..	5 8 8	300,000	Stk.	Apl. 27	8	Ottoman, Ltd.	6¾-7½	..	5 10 4
490,000	"	Apl. 12	4	Do. 4 p.c. Deb. Stk.	94-96	..	4 3 4	60,000	5	Apl. 12	8	Portsea Island A	132-136	..	5 1 0
120,000	Stk.	June 30	6	Bromley, A 5 p.c.	115-120	+2	5 0 0	31,800	53	Aug. 16	13	Do. B	122-125	..	5 4 0
109,000	"	Aug. 16	4½	Do. B 3½ p.c.	85-90	+1½	5 0 0	60,000	50	"	12	Do. C	117-122	..	4 18 4
165,700	"	"	5½	Do. C 5 p.c.	105-110	+3½	5 0 0	100,000	50	"	12	Primitiva Ord.	7½-7½	..	5 6 8
82,278	"	"	3½	Do. 3½ p.c. Deb.	82-84	..	4 3 4	398,490	5	May 31	8	Do. 5 p.c. Pref.	54-5½	..	4 10 11
55,000	"	June 30	4	Buenos Ayres 4 p.c. Deb.	95-97	..	4 2 6	796,980	5	June 30	5	Do. 4 p.c. Deb.	97-99	..	4 0 10
250,000	Stk.	"	—	Cape Town & Dis., Ltd.	2-3	..	—	488,900	100	June 1	4	River Plate 4 p.c. Deb.	95-97	..	4 2 6
100,000	10	"	—	Do. 4½ p.c. Pref.	4-5	..	—	312,650	Stk.	June 30	9	San Paulo, Ltd.	21½-22½	..	4 0 0
100,000	10	"	—	Do. 4½ p.c. Deb. Stk.	80-83	..	5 8 5	250,000	10	Mar. 24	9	Do. 6 p.c. Pref.	12-12½	..	4 16 0
100,000	Stk.	June 30	4½	Chester 5 p.c. Ord.	107-109	..	4 11 9	115,000	10	"	6	Do. 5 p.c. Deb.	49½-50½	..	4 19 0
157,150	Stk.	Aug. 16	5	Commercial 4 p.c. Stk.	111½-113½	..	4 16 1	125,000	50	July 1	5	Sheffield A	239-241	..	4 3 0
1,513,280	Stk.	"	5/9/4	Do. 3½ p.c. do.	105½-107½	..	4 19 3	135,000	Stk.	Mar. 24	10	Do. B	238-240	..	4 3 4
560,000	"	"	5½	Do. 3 p.c. Deb. Stk.	76-78	..	3 16 11	209,984	"	"	10	Do. C	238-240	..	4 3 4
475,000	"	June 15	3	Continental Union, Ltd.	88-92	..	4 7 0	523,500	"	"	10	South African	8½-9½	..	7 7 4
800,000	Stk.	May 31	4	Do. 7 p.c. Pref.	135-137	..	5 2 2	70,000	10	June 15	7	South Met., 4 p.c. Ord.	116½-118½	..	4 12 2
200,000	"	"	7	Derby Con. Stk.	122-124	..	4 8 9	6,429,895	Stk.	Aug. 16	5/9/4	Do. 3 p.c. Deb.	78½-80½	..	3 14 6
492,270	Stk.	"	5½	Do. Deb. Stk.	104-105	..	3 16 2	1,895,445	"	July 14	3	South Shields Con. Stk.	150-152½	..	5 11 10
55,000	"	"	4	European, Ltd.	18½-19½	..	5 2 7	209,820	Stk.	Aug. 16	8½	S'th Suburb'n Ord. 5 p.e.	117½-119	..	4 14 9
840,150	10	July 28	10	Gas- 4 p.c. Ord.	106-107	..	4 8 5	605,000	Stk.	"	5½	Do. 5 p.c. Pref.	115½-117½	..	4 5 1
16,160,600	Stk.	Aug. 16	4/14/8	light 3½ p.c. max.	83-85	..	4 2 4	60,000	"	"	5	Do. 5 p.c. Deb. Stk.	121-123	..	4 1 4
2,600,000	"	"	3½	and 4 p.c. Con. Pref.	101-103	..	3 17 8	117,058	"	July 14	5	Southampton Ord.	108-110	..	4 10 11
4,062,235	"	"	4	Coke 3 p.c. Con. Deb.	79-81	+½	3 14 1	502,310	Stk.	May 12	5	Tottenham A 5 p.c.	144-147	..	4 17 0
4,531,705	"	June 15	3	Hastings & St. L. 3½ p.c.	96-98	+1	5 2 0	120,000	Stk.	Aug. 16	7½	and B 3½ p.c.	114-116	..	4 17 0
258,740	Stk.	Mar. 10	5	Do. do. 5 p.c.	—	..	—	483,940	"	June 15	5½	Edmonton 4 p.c. Deb.	96-98	..	4 1 8
82,500	"	"	6½	Hongkong & China, Ltd.	17½-18	..	6 2 2	149,470	"	"	5	Tusean, Ltd.	8½-9½	..	8 13 0
70,000	10	Apl. 27	11	Ilford A and C	148-152	+1½	4 18 8	182,380	10	June 15	8	Do. 5 p.c. Deb. Red.	96-98	..	5 2 0
131,000	Stk.	Mar. 10	7½	Do. B	121-124	+2	4 16 9	149,900	10	July 1	5	Tynemouth, 5 p.c. max.	113-115	..	4 6 11
65,780	"	"	6½	Do. 4 p.c. Deb.	94-96	..	4 3 4	236,476	Stk.	Aug. 16	5	Wands- B 3½ p.e.	112-145½	+1½	4 14 10
65,500	"	June 30	4	Imperial Continental	180-183	..	4 18 4	255,636	Stk.	Aug. 31	6½	worth 3 p.c. Deb. Stk.	71-73*	..	4 2 2
4,940,000	Stk.	May 12	9	Do. 3½ p.c. Deb. Red.	90-92	..	3 16 1	85,766	"	June 30	3				
1,235,000	Stk.	Aug. 16	3½												

Prices marked * are "Ex. div."

† Next dividend will be at this rate.

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Apply, by Sept. 14, for Particulars as to Duties and Salary, to GEORGE MORRIS, Secretary, Gas Company, HAWKHURST.

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WANTED, by the above Company, a
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(GAS ENGINEER'S DEPARTMENT.)

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SCRUBBER WASHER with 12-inch connections, Engine, &c., complete. Sold cheap before removal. Seen near London. Splendid bargain.
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THE Directors of the Wandsworth
and Putney Gaslight and Coke Company invite TENDERS for the Removal of about 18,000 Tons of Guaranteed "Wandsworth" COKE from their Works at Wandsworth, between Oct. 1 and March 31 next. The Coke to be removed by Van or by Barge (free Waterway on River Thames). Sealed Tenders, endorsed "Tender for Coke," to be delivered not later than the 18th of September, 1911. The Directors reserve to themselves the right to accept any Tender in part or in whole, and do not bind themselves to accept the highest or any Tender. Any further Information may be obtained from the Engineer, Mr. H. O. Carr.

CHAS. W. BRAINE,
Secretary.

Wandsworth and Putney Gaslight
and Coke Company, Fairfield Street,
Wandsworth, S.W., Aug. 24, 1911.

CORPORATION OF CALCUTTA.

TENDERS are invited in duplicate for 40,000 (forty-thousand) JENA GLASS CYLINDERS, for Mansfield patent Inverted Burners. Outside dimensions 2½" (two and one-eighth inch) at top, 2½" (two and three-quarter inch) at bottom; and 3" (three inches) long, with three lugs projecting ¼" (one-eighth) of an inch for the purpose of securing to holder. The whole lot must be delivered free at the Municipal Office, Calcutta, within Four months of receipt of order, and insured against breakages.

Tenderers must quote a Price at per gross. The Corporation do not bind themselves to accept the lowest or any Tender. Payment will be made on completion of delivery.

Tenders will be received by the Vice-Chairman of the Corporation up to 3 p.m. of the 9th of October, 1911, when they will be opened in the presence of such Tenderers as may be present.

No Tender will be considered unless accompanied by a remittance to the extent of 2½ per cent. on the value of such Tender.

Tenderers must abide by the rules in regard to Tenders in vogue in the Corporation.

P. N. MOOKERJEE,
Secretary to the Corporation.

Dated the 15th of August, 1911.

CORPORATION OF CALCUTTA.

TENDERS are invited in duplicate for the following GLASS PANES for Public Street Lanterns:

75 Gross 21 oz. English Glass Lamp Panes for Public Street Lanterns measuring 14½" deep by 13½" top by 5½" base.

23 Gross 21 oz. English Glass Lamp Panes for Public Street Lanterns measuring 13½" deep by 12½" top by 5½" base.

This Glass must be cut to exact measurements stated above, and Prices must include packing and free delivery into Corporation Stores, and insured against breakages. Delivery must be made in three equal consignments over a period of Six months from date of order.

Tenders should be addressed to the Vice-Chairman, and should reach him not later than 3 p.m. of the 9th of October, 1911, when they will be opened by him in presence of such Tenderers as may be present.

No Tender will be considered unless accompanied by a remittance to the extent of 2½ per cent. on the value of such Tender.

P. N. MOOKERJEE,
Secretary to the Corporation.

Dated the 15th of August, 1911.

THE Proprietors of Patent No. 19,479
of 1905, for "IMPROVEMENTS IN OR RELATING TO METERS" are desirous of entering into Arrangements, by way of LICENCE and otherwise, on Reasonable Terms, for the purpose of EXPLOITING the same and ensuring its Full Development and Practical Working in this Country.

All Communications should be addressed in the first instance to HASELTINE, LAKE, & Co., Chartered Patent Agents and Consulting Engineers, 7 & 8, Southampton Buildings, Chancery Lane, LONDON, W.C.

THE Owner of British Patent No.

21,808 of 1907, entitled "IMPROVEMENTS IN COKING, OR DISTILLING, COAL FOR THE MANUFACTURE OF COKE AND PRODUCTION OF GAS," granted to S. B. Sheldon is desirous of Disposing of the Patent or entering into a Working Arrangement under LICENSE with Firms likely to be interested in the same. In the alternative, the Owner would be open to consider Proposals to Manufacture Apparatus and to carry out the process to fill any Requirements of the market in Great Britain on Terms to be arranged.

The Patent covers an Invention interesting to Manufacturers of Gas and Coke and Gas Producers.

Detailed Information as to the Invention will be found in the Patent Specification, of which a Copy will be supplied to any interested party on request.

Full Particulars can be obtained from, and Offers made (for transmission to the owner) to, MARKS and CLERK, 57 and 58, Lincoln's Inn Fields, LONDON, W.C.

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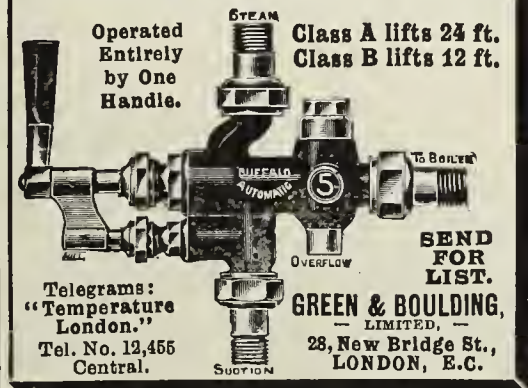
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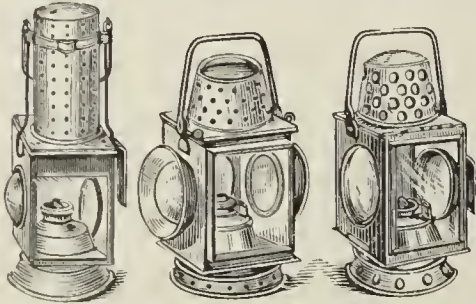
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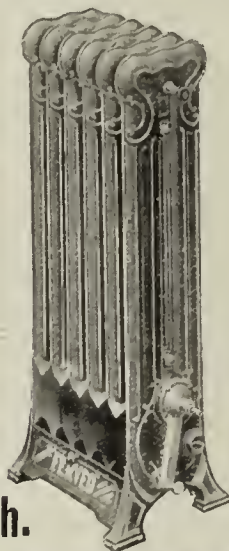
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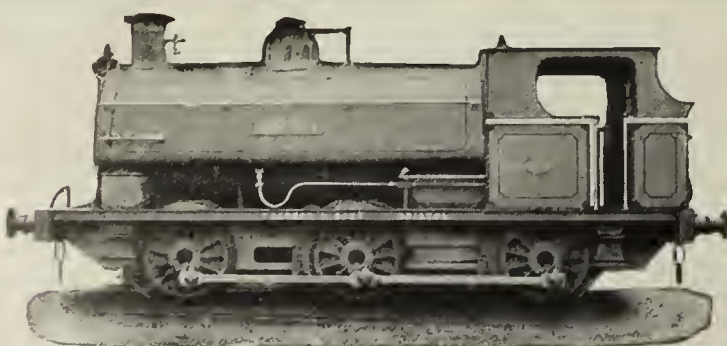
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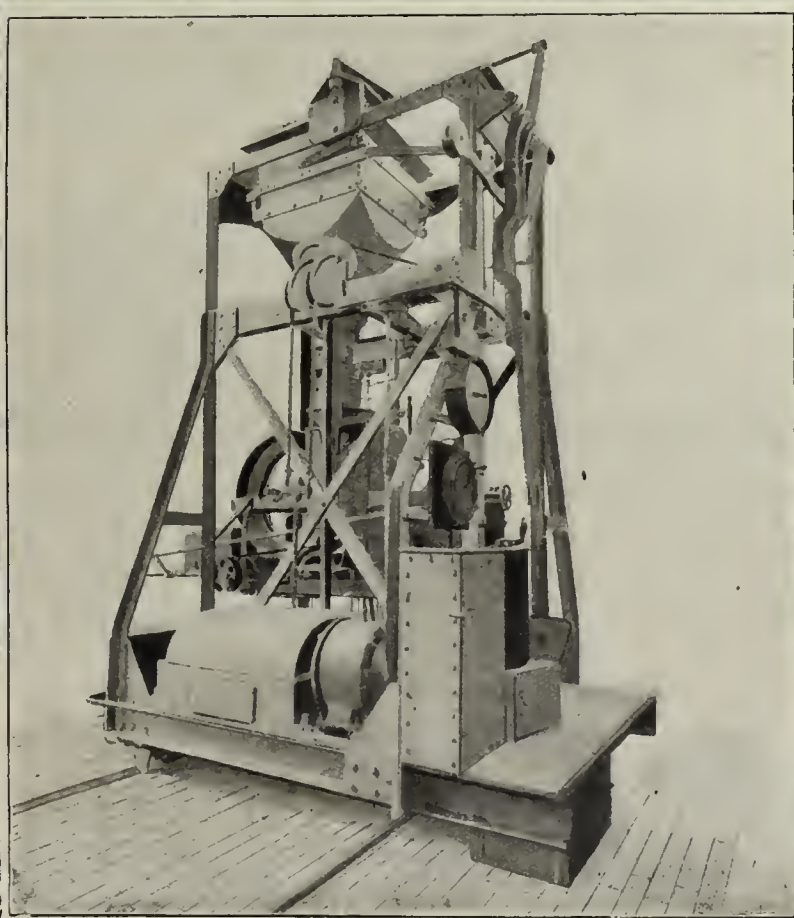
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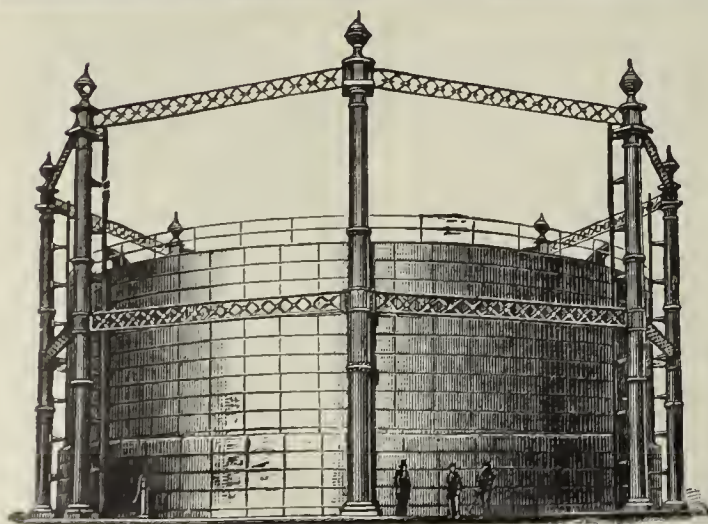
The Report of the Photometry Committee of the Association of Gas Managers of Holland presented at the Meeting on July 4, 1911, stated:

"They have also investigated a specimen of the Simmance and Abady apparatus for determining the specific gravity of gas. This apparatus depends in principle on the variation in the time of outflow of different gases from a fixed opening. Compared with Schilling's apparatus and the Lux gas-balance it gave very trustworthy results; and in regard to its construction, it is well adapted for technical use."

(See "GAS JOURNAL," Aug. 29, 1911, p. 543.)

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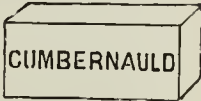
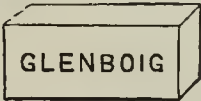
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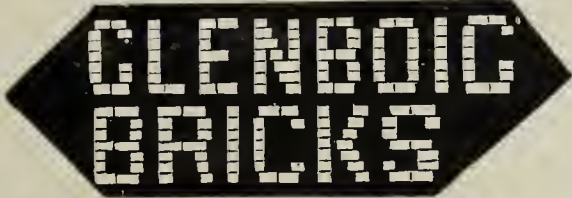
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Undenoted we give a Table of Analysis and Physical Characteristics of a sample of Glenboig Fire-Clay by J. T. Norman, London; and, in submitting a report from a responsible and reliable public analyst, we would here draw attention to the unreliable character of some recently published analyses where a manufacturer selects not only his own samples, but also those of his competitor, and has them treated by a private analyst. SUCH STATEMENTS ARE ALTOGETHER UNTRUSTWORTHY.



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CHEMICAL ANALYSIS.

	Raw.	Fired.
Silica, free	3.03	3.49
Silica, combined	43.20	49.77
Alumina	36.55	42.10
Ferric oxide	1.80	2.08
Titanic oxide	1.30	1.50
Lime	trace	trace
Magnesia	trace	trace
Alkaline oxides	trace	trace
Sulphates as trioxides	0.92	1.06
Loss on Ignition	13.20	—
	100.00	100.00

PHYSICAL RESULTS.

Density	2.66
Volume weight	1.90
Porosity	15.4 %
Linear shrinkage at 100° C.	3.70 %
" " " 1050° C.	4.76 %
" " " Total	8.46 %
Volume shrinkage at 100° C.	10.7 %
" " " 1050° C.	12.6 %
" " " Total	23.3 %
Plasticity	20.0 %
Fire Stability	1850° C. equiv. 3362° F.

(SEGER CONE 36.) (New Scale CONE 38.)
(Signed) J. T. NORMAN.

This Clay is remarkable for its high percentage of Alumina and for the almost complete absence of ingredients tending to lower the refractory properties; its fire stability is extremely high. For some years past I have been urging clients who are working the Clays of the Coal Measures to search for such a material, but you are the first to discover a supply. The possession of this Clay places you in a unique position amongst the manufacturers of refractory goods throughout the world, and I have no doubt will, if duly exploited, enable you to drive out of the market the large quantities of foreign fire-bricks which are being poured into this country for use in the construction of bye-product ovens and for other purposes.—I am, yours faithfully,
JOHN T. NORMAN.

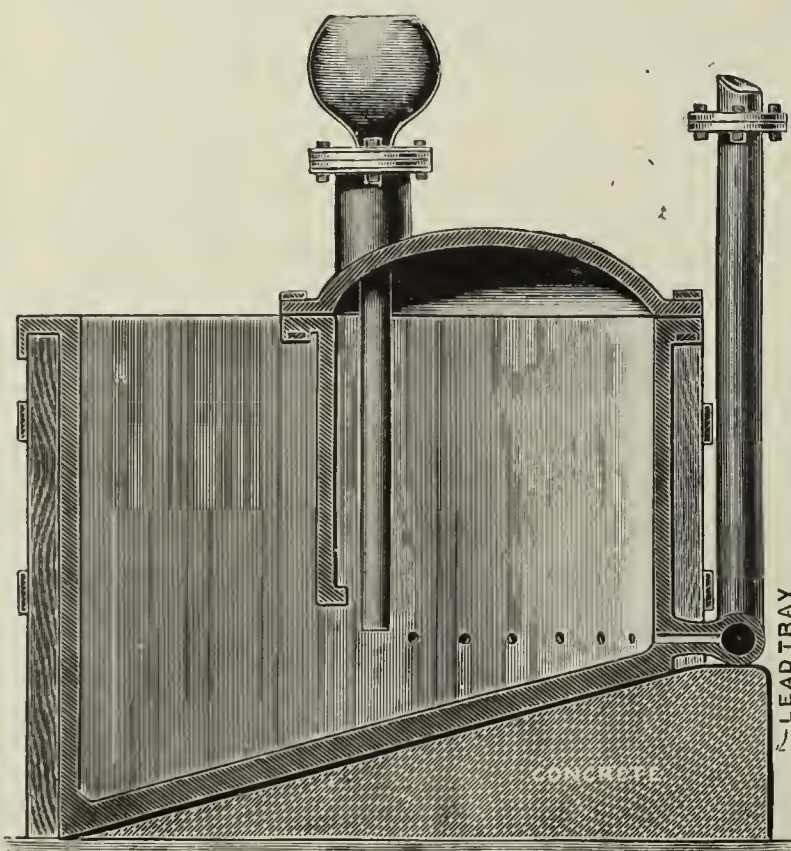
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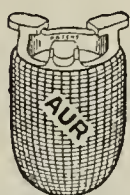
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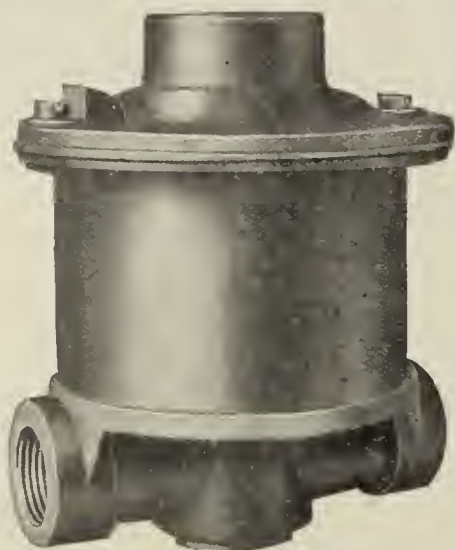
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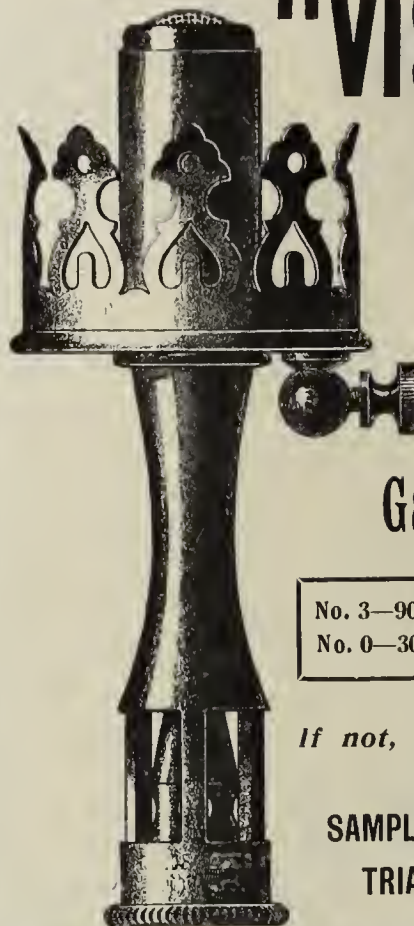
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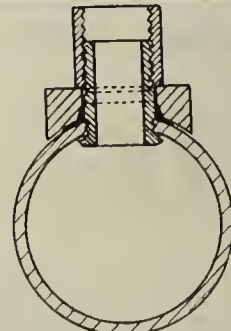
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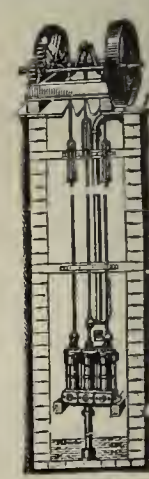
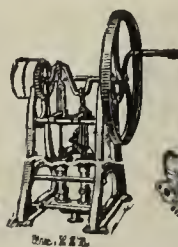
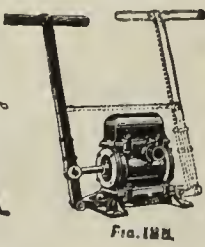
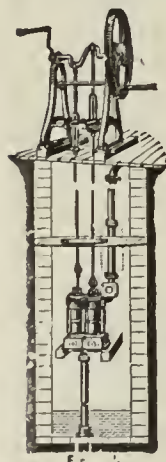
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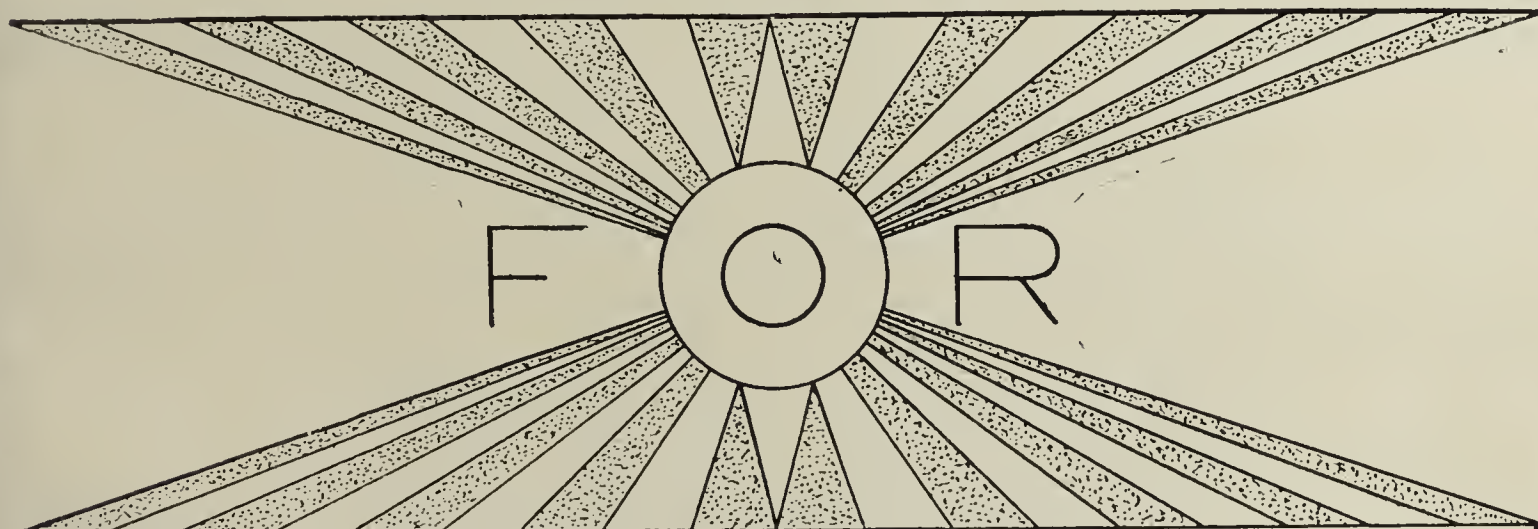
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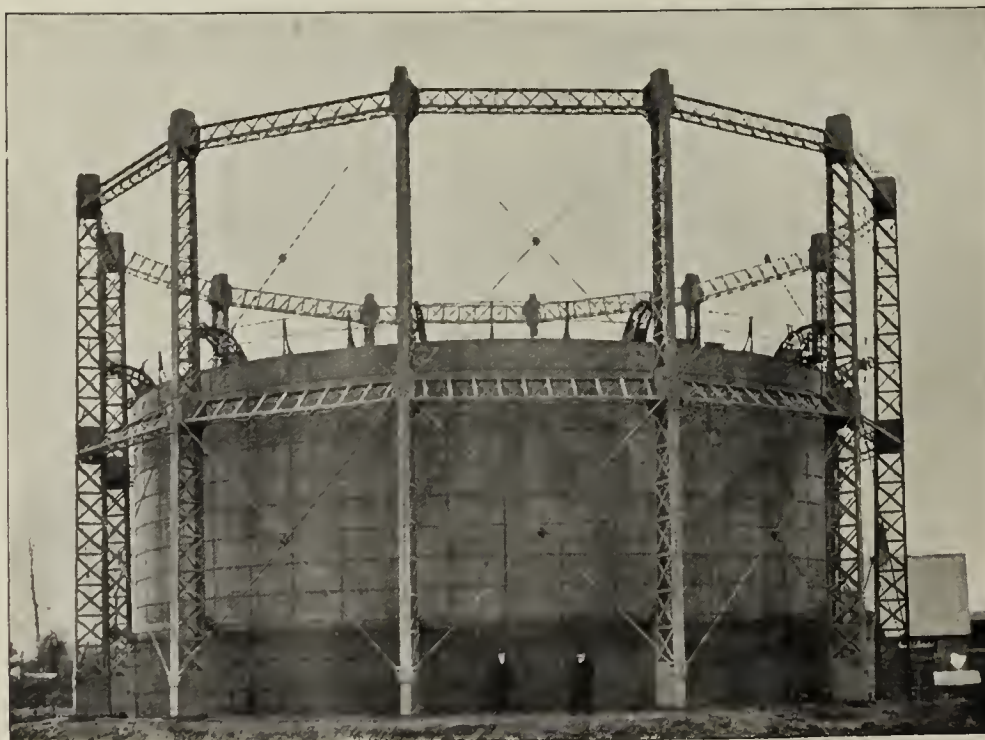
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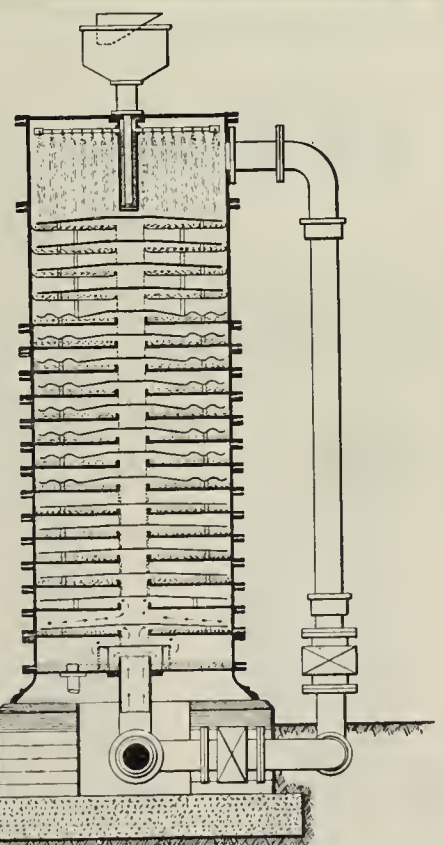
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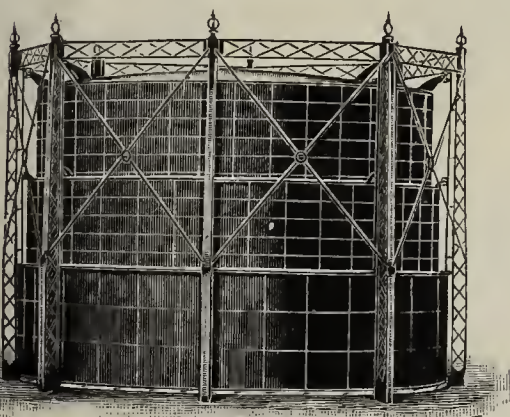
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December 2nd, 1908.

"In reply to yours of the 1st inst., we have had Two 'Cockey's' Washers erected here, and if another was required, I should certainly put it down in preference to any other make.

It is absolutely certain in action, easy to control, and visible in working. I am sure you could not put down a better Machine. By paying proper attention to the Water supply not a particle of Ammonia passes the last Chamber.

I shall be pleased to answer any further questions on the matter, and if you like to run over and see the Apparatus in work, I shall be pleased to show you our results."

December 2nd, 1908.

"In reply to yours of the 28th ult., just to hand, I may say that the 'Cockey's' Washer was erected for the purpose of removing the last trace of Tar, and dealing with CO₂ and H₂S in the two Bottom Chambers by means of Ammoniacal Liquor, the three Upper Chambers being used for removing NH₃, intending at a later date to erect a supplementary Scrubber. At the present time the 'Cockey's' Washer is doing the whole of the work, and we have not found any difficulty in removing the last trace of NH₃. We have passed equal to 300,000 cubic feet per diem.

The only trouble we find in working, is a stopping up of the teeth of the Washing Hoods with Naphthalene, but these are easily cleaned by removing a Hand Cover and applying a stiff Brush. The Overflows work well, and a little attention occasionally is all that is required."

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"Replying to your Letter of yesterday's date, I have very much pleasure in giving you my opinion of Messrs. E. Cockey and Sons' Vertical Washer, one of which I have here (to pass 500,000 cubic feet per day).

I consider the apparatus a most valuable one, very efficient and does all the work that one can wish, leaving very little Ammonia for the Tower Scrubber to deal with.

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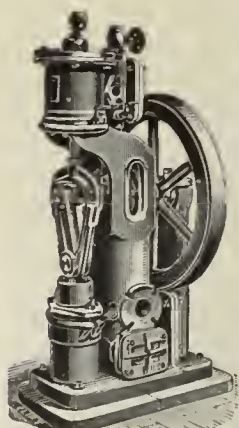


Fig. 703. "SINGLE RAM" STEAM-PUMP.

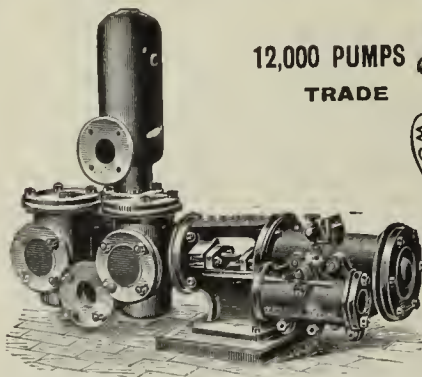


Fig. 598. "CORNISH" STEAM-PUMP FOR BOILER FEEDING, &c.

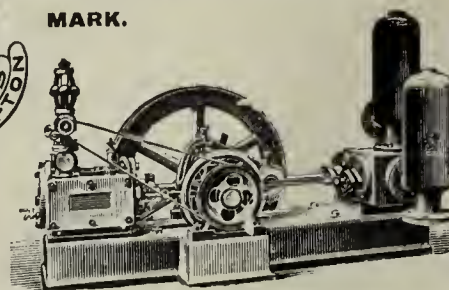


Fig. 688. "RELIABLE" STEAM PUMP FOR TAR AND THICK FLUIDS.



Fig. 712. "DOUBLE-RAM" STEAM-PUMP.

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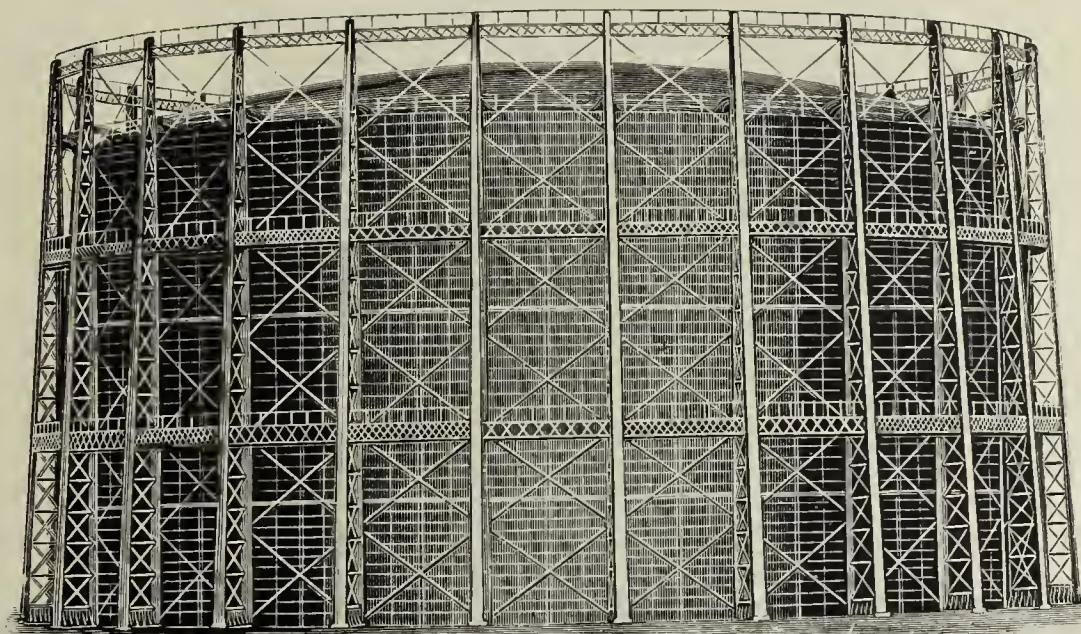
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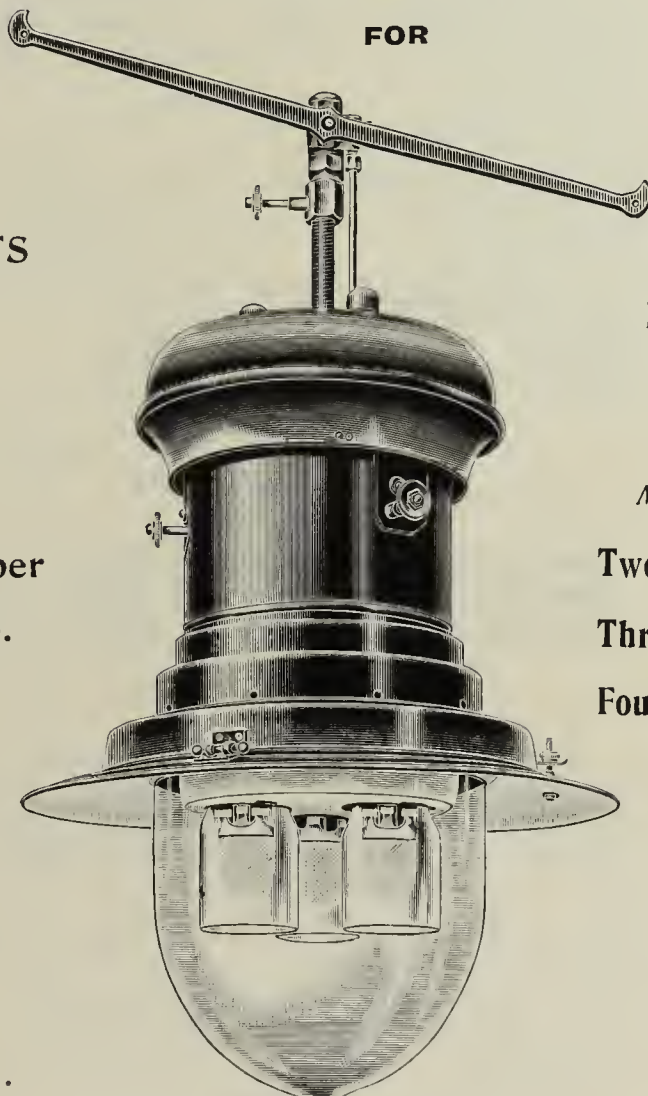
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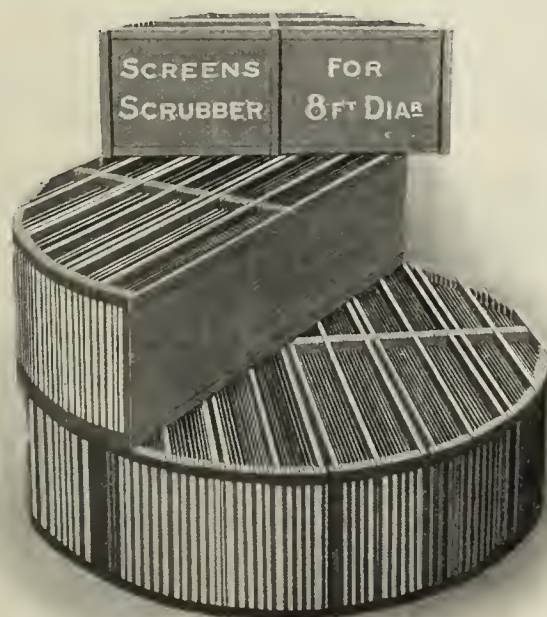
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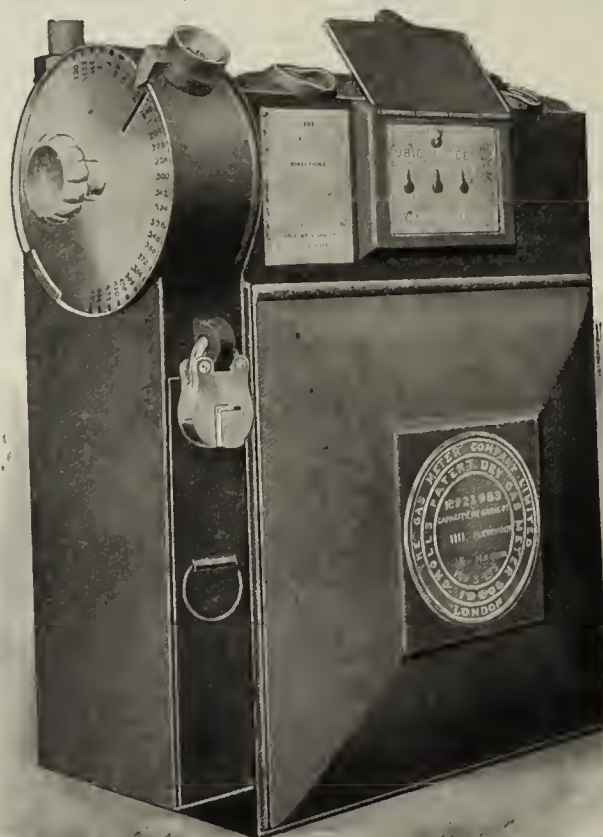
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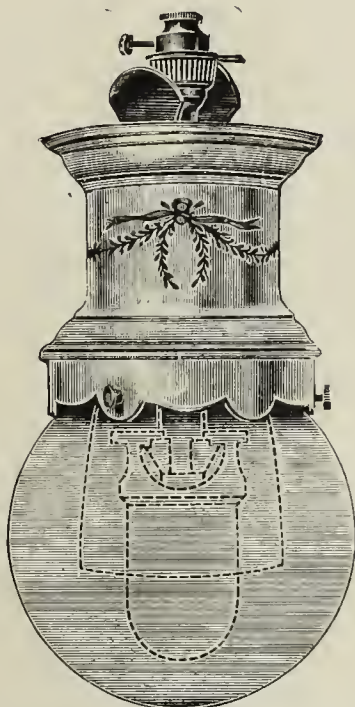
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JOURNAL OF GAS LIGHTING, WATER SUPPLY, &c.

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VOL. CXV., No. 2522.—TUESDAY, SEPTEMBER 12, 1911.

EDITORIAL NOTES—GAS, &c.

Bearing of the Present Position on the Future.

THE gas industry to-day occupies a phenomenal position. The accounts that have been reaching us lately from gas undertakings—both company and municipal—show it. Gas prices were never lower than they are to-day, gas consumers never greater in number, the uses of gas never so diversified, gas stocks as a whole never higher in price, dividends never so good. Yet competition was never so rife nor keener, nor has it ever assailed the industry on so many sides as it does at present. It is for the gas industry to make the most of this current phenomenal position; for what is characterized as phenomenal to-day may be looked upon as normal or very ordinary before much time has passed over our heads. It does not take long for even the novelty of a brilliant success to wear off. The industry cannot hope to always continue to add success to success at the same rate as in the immediate past; but we can use the conditions of the present to assist in pushing forward, if not at the same rate of speed, into further success.

Before considering this point, let us remark upon one important aspect of the present conditions which offers an invincible denial to the claims of the electricians that the lower priced gas of to-day is practically entirely due to the competition of their own commodity. The hypothesis can be quickly dissipated. Had competition been the factor that had forced reductions of gas prices, these reductions would only have been made in the cause of preservation of existing conditions; whereas the reductions in price wherever they have been effected during late years—the experience has been so general that it may be taken as the rule—have invariably been followed by an increase in the girth of the business and in an enhancement of financial strength, in which both consumers and stockholders have increasingly participated. By this we do not claim the whole advancement in condition as an effect of reductions. There are likewise the internal working causes that have contributed, and contributed handsomely, to the ability to make reductions. It would be quite logical to argue that, if the electricity industry's claim were true—that it had forced reductions, and that the increasing ability of the gas industry to make them had nothing to do with the matter—then, forsooth, the present position of the latter to-day would accuse the electrical industry of having been its own worst enemy. There is no running away from the fact. Never has the gas industry been more impregnable than to-day, nor stronger. Its progress certainly makes the position of every one of its competitors worse.

Generally speaking, the gas industry does not require any advice as to how to make use of the present phenomenal or unprecedented conditions. The lowering of the cost of the prime commodity to users is the best form of adding to the armour of the industry. Let us see. The more cubic feet of gas that can be purchased for a given sum, the more difficult will it be for electricity to cut into the gas industry's lighting custom to supplement their own; the more heat units that can be purchased for a given sum, the greater the chance has the gas industry of supplementing its own business in domestic and industrial heating of all kinds, and the greater the resistance that can be offered to the various competitors in the heating field; the cheaper gas can be supplied for power purposes, the better will it stand in the competition with suction and pressure gas plants, oil engines, and electric motors. Gas has many advantages of intrinsic value that cannot be offered by its competitors; but these advantages must be accompanied by a price that can alone compete in order to occupy a firm stand among the competitors. We must think of relative values in competition. The commercial value of gas for lighting in competition, may not be the commercial value of gas in competition for fuel or for power. We have therefore now to aim to work

prices down to a level that will constitute a line of commercial value having application to all markets, or to a figure that can be supplemented by discounts to meet what is necessary in each line of business. This is what is being done, but perhaps not so universally as is consistent with the future welfare of gas undertakings the administrations of which are neglecting opportunity.

The gas industry is in a phenomenal position because internal conditions and expansion of business have combined to largely produce new circumstances that may be said to establish a new era for the industry. It is remarkable that benefit should have been showered upon the industry from so many directions, and yet in an extraordinary degree many of the benefits, though from different directions, are inter-linked in the production of advantage. These conditions will not—we cannot expect them to—always remain unimpaired. More gas is now being obtained per ton of coal than ever before, of a calorific quality and constitution that are best for use in the appliances of the times, and which appliances in themselves have yielded to their users a wealth of efficiency, which, in its turn, has had a most important bearing upon the fabric of the industry as it at present stands. The increase in the production of gas per ton of coal has caused carbonizing wages, dividend and interest, management, and other charges per 1000 cubic feet to descend. The new carbonizing methods have brought about improvement in the qualities of coke and tar, and in the quantity of sulphate of ammonia for sale. Synchronizing with these conditions, the markets for these secondary products have all been in a flourishing position, and have shown sensible firmness. The demand for tar has grown exceedingly well for road purposes. From all over the country, good reports come regarding the vigour of the demand in this direction. One undertaking reports that the demand for tar for road purposes in the summer nearly absorbs the whole year's make. Higher prices are being asked for the tar required for these purposes than can be obtained in most cases for it from the distillers; and road authorities are now so satisfied with the economic advantages attaching to its use for road surfacing and construction, that they are willing to pay somewhat more for it. But we are with those who describe as folly the exaction of the last fraction of a penny per gallon from the road authorities, and, by so doing, are probably contributing to prejudice a growing and profitable trade. Such a course is to be condemned, especially in view of the fact that the sources of tar are not receding either in number or in capacity of output. However, these conditions in the residuals markets have had part in the building-up of the phenomenal circumstances of the gas industry at the present time, by having brought about a net cost for coal—coal that, under the new carbonizing methods, has a higher productive value than heretofore—that, in more recent years, is without parallel. This, again, has had a considerable effect on the ability of the industry to lower the price of gas.

These various tributaries to the stability of the gas industry are marked by their reciprocal tendencies; and here we almost feel tempted to enlarge upon the points how the expansion of the use of gas makes the gas industry a larger employer of labour, and a larger wage-payer than ever, and how the rates of wages and the general circumstances of labour in the industry are considerably better than in times past. The growth of the stability of the industry is the best security that its workers can have for their own future employment. This, however, only incidentally bears upon the main question. As we look round at what is being done (we cannot, of course, peer into the future sufficiently to gauge the markets), there is satisfaction with the prospect and with the opportunities that present themselves—all, if properly tended, representing the elements of increased prosperity. There is a big field, with a valuable economic bearing, in the utilization of gas as fuel in the daytime—both in summer and in winter, through cooking, water heating, room warming, and industrial uses. High-pressure gas-lamps are, where special high-pressure mains are laid in arterial

thoroughfares, playing havoc with electric arc lamps; and various gas companies are going farther in the competition with electricity by increasing their power load by supplying private installations of gas-driven generating plant for users of large quantities of electricity. But amid all this opportunity for expansion, the private consumer for lighting must not be neglected.

Taking stock of the conditions of the present, which we have termed phenomenal, and rightly so, the protection of the industry's interests, and the encouraging of its future development, it is clear, lies very largely in the direction of cheapening gas by every and any means possible within the limits of prudence. This is the best possible use—as many managements by their action (action that throughout the country has benefited consumers in recent times by hundreds of thousands of pounds) have already indicated to be their profound belief—that can be made part of the fruits of the present harvest time. “Insure the future by your present policy” might be a useful inscription for the walls of many Board and Committee rooms to-day.

Jubilee Meeting of the North British Association— The Reform of the Institution.

JUBILEES and celebrations of past events always bid us to indulge in retrospection; and it is good occasionally, but only occasionally, to comply with the bidding. The spirit of the times, the whole atmosphere in which we live, naturally induce us to devote our main thoughts and activities to pressing forward. But if we read well into the history of the past, and have a solid understanding of the work of those who have trodden the paths before us, we find inspiration and encouragement in it all, and are better able to comprehend the needs of the present, and to move onward. In the gas industry to-day, nothing but inertia can prevent progress being made anywhere and in all directions; and by the most simple exercise in comparing the past with the present can this be proved to any mind possessing a modicum of intelligence. We will not stay to make any such comparison here. The suggestion should be sufficient for anyone who has not already done so to obtain for himself, of his own knowledge, the stimulating interest of such comparison. Thoughts run in another channel for the moment. They are directed by the fact that last week the North British Association of Gas Engineers and Managers were celebrating the Jubilee of their existence, and at the same time commencing to perpetually commemorate the work of that builder of knowledge, William Young. The latter is a matter that is dealt with in a separate article; the former—the celebration of fifty years' existence—permeated the whole proceedings. The meeting was held at Broughty Ferry. That was appropriate. Fifty years ago, in the same streets of the town, walked to its first technical meeting the men who founded the Association. Appropriate also to the occasion was the occupancy of the presidential chair by Mr. George Keillor, in whose care reposes to-day the executive responsibility for the gas supply of the town. The arrangements for the occasion were all in keeping with the spirit and idea of a jubilee; and Mr. Keillor, deftly, in his address gave just the finishing touch that forced thoughts back to the distant past, made one consider the present, and give thought to the future. The address was full of purpose; we hope the purpose will be fulfilled.

The objects of the North British Association, as of all similar organizations, have been two—to advance by united effort and conference, and the circulation of knowledge and experiences, the interests of the gas industry; and to promote the bonds of fellowship and sympathy among those pursuing similar walks in life. In both objects the Association have succeeded; in both, there is a good record. Whether the members have taken full advantage of the opportunities of their organized state, is not a matter upon which we need pass judgment here. Few Associations have done so; and no one knows it better than those constituting their membership. A jubilee is not the time for stricture for any bygone lapses, but rather a time for congratulation, jubilation, and excellent resolution. But a few reflections should have a potent influence. Mentally picture the conditions that existed in the gas industry fifty years ago. They were, looked at from the standpoint of to-day, crude and of comparatively minor importance compared with those of the present. The proportions of the industry were then relatively lean. But the conditions and the proportions were of anything but negative importance to the gas men

of the time. Picture, again, those few men who were the founders of the North British Association, and who felt the need of organization some fifty years ago, and then deliberate over the question, What would those founders have thought regarding the need of organization under the conditions of to-day? If organization was then necessary, how much more so is it necessary in these times? If the objects that the Association was intended to serve fifty years ago were, by profound and mature thought, considered of such a nature as to call for organization, then surely the objects to be served to-day are comparatively manifold, and of vastly greater gravity and weight.

We trace remonstrance in the words that fell from the President last Thursday as to the apathy of the individual members in the work that lies before and around. If there is any “easy-going belief and reliance in the industry's end—less power of self-development and improvement” without the aid of organized effort, then let that belief be dissipated. It is distinctly more dangerous to indulge in apathy and inertia when development is in unparalleled swing, and when the very fact incites the opponents, through motives of self-interest, to seriously try to arrest that development, than would be the case if other conditions prevailed. The work of our Associations must (we shall never tire of insisting upon this while the need exists) develop with the times and their circumstances. “We are sick of unreality and weary of shadows,” said the President; and the words have application here. The President discussed the question of reform, and the putting of more endeavour and substance into the work of organization. We hope that his words have not fallen into deaf ears, but into those channels of communication with robust and intelligent minds. The industry and its conditions command that organized work shall be broadened for a fuller protection and for a continued expansion. Let the spirit and appreciation that animated and dominated the founders of the North British Association half a century since inspire the members of to-day, and interest and enthusiasm will be quickened to the common advantage. Therein will Mr. Keillor find abundant reward for the part he has taken in the jubilee year of the Association, and for the counsel running through the first part of his address.

The jubilee and reform of the Association, however, did not monopolize the attention of the President. Far from it. We have our interest sustained to the very end by the piquant and thought-arousing comment of Mr. Keillor on topics of momentous import to the present and the future of the gas industry. Many who read the address, and who have not hitherto been alive to the need of reorganizing the industry's forces, and impelling to greater activity in the causes of reform, will feel that they have been chastized by a skilled hand, and summoned in no uncertain voice to arouse themselves. The President does not in any way mince matters. He speaks courteously, and yet firmly and plainly; and there is in his remarks a warning that, if the Institution of Gas Engineers desires to regard itself as the central organization of the industry, it must mend its ways, rearrange its house, and broaden its basis. Plenty of work is at hand for such an organization to do in raising the status of the profession, and in looking after the common interests of the industry. In this connection, there is much discussable matter in the address—more than can be dealt with within the limits of an editorial article. But we urge that the deliverance be read; and the result will be many adherents to the side of those who are pressing for reformation in the constitution of the Institution, and larger and more persistent work in place of the lethargy, or little better, that now obtains.

The Committee who are considering this matter, as the result of the address that Mr. James W. Helps delivered in 1910, must see that a considerable amount of dissatisfaction abounds. And we take it that Mr. Keillor, as a municipal gas engineer, knows well the feeling that exists in this connection in municipal circles. He thrusts into broad daylight what those who have followed up this matter closely have had knowledge of for some time—that among municipal authorities, the Institution is not regarded as a representative organization for the industry. It is looked upon by them as more company than municipal. We are not with Mr. Keillor and those who think with him that the charge (if so it can be called) is warranted. The Institution knows no distinction between the one and the other. Its list of Presidents and the constitution of the Council show this. But there is no question whatever when we come to look at

the results of the appeals that have been made through the Institution, that it has not the fullest confidence of the municipalities owning gas undertakings. The same applies to a less extent among the companies. But in regard to municipalities, the Publicity Scheme has brought several important ones into closer contact with the Institution than hitherto. Here, parenthetically, it may be said we are not in agreement with the President, that the Publicity Scheme should have been postponed until the Institution had set its house in order. That event is such a problematical thing in point of time that the industry would by indefinite deferment have suffered loss of opportunity. "Procrastination is the thief of time." Concerning, too, the question of the legality of municipal subscriptions to this and other objects, certain local authorities have shown that "where there is a will, there is a way." But that want of confidence of which the President speaks is one of the things that has to be removed. It brooks of no delay.

We do not want to see any more schisms in the gas industry in the matter of its organization. It would be, to say the least, highly regrettable—indeed, little less than disastrous—if a Municipal Gas Association were to spring up in our midst, such as that at which Mr. Keillor hints. An organization of the kind exists in connection with the electrical industry. If such an organization came into being in the gas industry, it would further weaken the Institution as the central organization. We see much more that may be stimulating and effective in gaining the end in the suggestion of the President that, if the Institution are slow to move in reconstructing itself, and in broadening its objects in conformity with the progress and necessities of the times, the District Associations should move in forcing the Institution to get out of the old ruts, and to make itself worthy of the position that it is its ambition to occupy in the gas industry of to-day, while taking no action to qualify itself for bringing about the fulfilment of its aspirations. If in each of the District Associations some leading spirit took up the matter, we believe it would be seen that greater dissatisfaction exists with the Institution at present than some people imagine who have not the opportunity of testing the feeling on this matter throughout the length and breadth of the land. An organization is wanted that will do more than hitherto in moulding the policy of the future, and that will take part in working persistently, when occasion needs, for the reform of gas legislation, for the redressing of grievances (such as the absurd position of the question of depreciation allowance for income-tax), and for necessary changes conforming with development and progress. The President deals with some of these matters. In short, a central organization is wanted that will assist in building for the future, in ways in which undertakings are operating individually while in some of those ways a larger effect could be produced by acting collectively. It is a remarkably thoughtful address that is before us; and if the gas undertaking at Broughty Ferry cannot show "extraordinary results," we are satisfied that its Engineer is animated by the best of progressive policies.

In Memory.

ONE of the finest pieces of the large and useful work that the North British Association have accomplished during an existence of half-a-century has been the setting up of a memorial—not in wood or stone, but in a manner more in keeping with the life-work and characteristics of the genius whose name the members desire to keep green and in revered recollection—to William Young, one of the greatest sons of Scotland, and a great benefactor of the industrial life of that country. His benefactions (they were many) were scientific and economic, with a large final contribution to the substance of commercial prosperity. The memorial that the Association have set up has its base in the fund that was accumulated for the purpose; the pedestal has been furnished in the masterly appreciation that the old friend of Mr. Young—Dr. Alfred Daniell, M.A., L.L.B., D.Sc., Barrister-at-Law—has written, and which will stand for all time as the portrayal, by one who knew him intimately, and was cognizant of the thoughts and aspirations that animated him, of a man of giant intellect, who used his talents—he was incapable of resisting their use—to the material benefit of his times and generation, and of all succeeding times and their people. The lectures that will be delivered in connection with the Association from time to time, as the result of this foundation of the William Young Memorial

Lectureship, will cause the successors of the present members of the Association, and many besides, to ask what manner of man was this, what was the peculiar nature of his gifts, and what was the character of his work—work that is monumental among us to-day—that the Association should have instituted this memorial to him. They will find their answer in Dr. Daniell's appreciation, which will be preserved in the "Transactions" of the organization.

We read in this work of Dr. Daniell more than is expressed. The care, the thought, the patient research that are transparent throughout are the unspoken and unwritten attestations of the honour and deep feelings of regard that the writer bears for his departed friend. It was a work of love, but a work that had always pressing on it the feeling of the impossibility of doing justice to the subject and his fruitful labours. No one can adequately penetrate and portray in words the subtle workings of such a mind as that of William Young. The psychologist might attempt, but he would inevitably fail, however close his knowledge of the man in life. There were no empty spaces in the life of William Young. The reviewer in his sketch shows it. To within a few hours of the time when his gifted and active brain ceased its questioning, its fathoming, and its working, he was thinking and analyzing the problems of the day, and presenting his thoughts and deductions to the world that they interested. Science and practice and practice and science were with him inseparable. He made the one bear upon the other. From boyhood to the end, the trifles in his work that presented problems and difficulties were never passed by until he had found the solution. That was the secret of the place which he made for himself. Science and his great mental capacity were brought to bear upon the smallest nut that seemed to defy having its shell cracked, and the kernel yielded. There was no passive surrender by him to any difficulty.

From comparatively small things, Dr. Daniell reminds us by his appreciation, the largest issues and developments of knowledge sprang into being through the dissecting hands and penetrative brain of William Young. He would not leave those problems. His alert, restless, inquiring, and inventive spirit was always hungry for new information, and continuously striving to improve the ways of doing things. His endeavour was ever to get beyond the present; to drag something fresh from the infinite unknown. Take, for example, the chapter of his work that commenced by the discovery, nearly half-a-century ago, that, in an experimental use of an intermediate paraffin oil in a meter, the gas that passed through it was robbed of some of its illuminating properties. This fact opened up to him quite "a successive range of new ideas." Most men would have simply discarded the use of the intermediate paraffin oil in a meter as unsuitable, and there left the matter. But that was not sufficient for William Young. There was the wherefore to be investigated; and we find him inquiring into the absorptive powers of various grades of oil in relation to the illuminating constituents of gas, and into the nature of the illuminating constituents of gas themselves by separating them out of the gas. To cut a long story short, he found that "the fractionated oils, from intermediate to heavy, would extract from gases the illuminating constituents—what we may call the gasolene products, and this to such an extent that the ordinarily permanent gases were absorbed." The information has been of vast economic importance to the shale oil industry; and the work formed the basis of the knowledge that produced (among much else) so much relief, through the oil-washing of gas, when naphthalene troubles accompanied so largely the introduction of high temperatures into the methods of carbonization in the gas industry. This is referred to as an illustration only, of how small difficulties formed the incipient stage to new discovery through the intellect and at the hands of William Young.

We cannot enter, in this reference to Dr. Daniell's appreciation, into any mention of all the paths in which Mr. Young's quest for knowledge and improvement lead him. He made much history in connection with the chemical technology of the gas industry and shale oil industry. The epitome of it all is in the skilfully performed work before us. There is the story of the development of the Aitken and Young process of condensation in gas manufacture, or for the treatment of gas during condensation; of the work encountered in obtaining hydrocarbon vapours from gas; of that directed to the absorption of sulphur compounds from gas by the use of a gasolene condensate from waste shale gases; of his later accomplishments in connection with the

enriching of coal gas and with the Peebles oil-gas process; of his work in relation to tar fog; and of that on the purification of coal gas in closed vessels by means of ammonia. But those among us who only studied his early work as matters of the history of development, will remember him best by the live interest engendered by his later work and writings in connection with the liberation of the gas industry from the naphthalene plague (with his name in this connection that of Glover is honourably associated), and by his work in the chemical and physical problems of carbonization. How great was his compass and his perspective is found not only in the narrative but in the index of Mr. Young's contributions to technology with which Dr. Daniell presents us, and which must have entailed enormous labour.

From the glimpse afforded of the man and his labours, we have those distinguishing features that made his life work what it was brought into striking relief. His powers of observation, initiation, penetration, intuition, cultured by science and practice, had anything but the effect of introducing into his character any narrow-mindedness or self-consciousness that make some clever men intolerable among their fellows. He retained his open-mindedness to the last. His own developments taught him that the results of his work were but stages in a general progress, and that they would in time be left behind. He was content that it should be so. He was content that he had been an instrument in the making of progress. He himself, in connection with the work of the gas industry, saw much of the result of his own labour left behind by the development of the times; but he had the satisfaction of knowing that his own work formed part, and a valuable part, of the fabric that represents the gas industry of to-day. He lived a strenuous life in the interests of the gas and shale-oil industries. "His example remains," writes Dr. Daniell; and we will add, "may the influence be great in the industries he served."

The author of the appreciation has done his work well. It forms, as we have said, the pedestal of the memorial that the North British Association have set up. The lectures that will succeed from time to time will supply the laurels that will be placed by generations around the memorial honouring a life that was in itself monumental.

Reputation or Advertisement.

MANY an old-standing firm, with a good reputation, has been driven to the wall by clinging to the belief that its reputation and the merit of its goods are alone a sufficient ægis against all comers. They learn, and severely learn, their mistake when too late. Competition in all branches of trading was never so fierce as at present; and every trader, however remotely his business may have been established, however good his reputation, has to see to it that the world in which he trades, and in which there is competition against him, knows that he is keeping in line with the spirit of the times, and that what he has to offer gives improved, and the best, value for money. If he tells no one of these things, and only lets the information leak slowly through the uncertain and unreliable channels of private communication, he is bound to lose ground, and the more active competitors—maybe with less virtue attaching to what they have to offer—will be the gainers. There must be spirited work on the part of the old-established trader on the same publicity grounds as are adopted by the competitors, without necessarily imitating them in detail.

This is the point of the paper that Mr. W. M. Mason, of Glasgow, contributed to the proceedings of the North British Association of Gas Managers last week; and we will say at once that his communication accords entirely with our own views, without our necessarily adopting every phrase that he employed. It is quite possible that the paper will not be appreciated by all gas men and gas administrations. The truth is not always palatable. There will be many a head that the "cap" will fit that is found in the following words: "I venture to express the opinion that many of their [gas managers'] methods, so far as the commercial side of the 'business is concerned, are hopelessly out of date.'" We agree with this thoroughly. There are gas managers who are positively not aware, with all the efforts of the technical press and the advertising propaganda of manufacturers, of many of the new inventions that are at hand for business development and protection, and whose districts are simply testimonials to a distressing arrear in the adoption of improvement. Where this is so, how can it be expected that the people in such districts will be aware of the advances in gas utilization? Away, we say, with tradition and away

with precedent, where they are not in harmony with, or are repugnant to, the commercial spirit of the times.

Mr. Mason is for full and active publicity, including the co-operative movement that has been instituted, as well as local effort. He has before him the illustration of the striking successes of the Clyde Valley Electric Supply Company—not successes obtained through superior merit, but through the persistent manner in which they compel attention to the purposes to which their product can be applied. There was presented what purported to be a reply to Mr. Mason's advocacy of modern methods of advertising and educating from Mr. J. Napier Myers, of Saltcoats. All we can say is that what Mr. Myers finds good enough for Saltcoats will not be good enough for other places. Saltcoats, it is clear to those who have the opportunity of taking a broader view, is not a suitable or fair example of the conditions of the industry generally. It would be a bad thing if experience at Saltcoats were allowed to be the foundation for the governing policy of the industry in this matter. We will not trouble to discuss Mr. Myers' so-called reply. There are certain things that have to be done—certain things it is so manifest must be done—that there can be little patience with those who are not fully alive to them. The industry has to advertise, to educate, to keep the world informed of its advances, to defend itself against the abuse and the defamation of character that arise from envy and malice. Those who think otherwise are welcome to their views, and to the result of their blindness. The majority will go forward with the times, and with the necessities of the times animating them. The day will assuredly come when those who cling to tradition and precedent will have occasion to regret their preference. Their undertakings at this very hour—let them mark this—form for the competitors the easiest assailable spots in the industry. And the competitors will find them out.

Among those present at the meeting was the President of the Institution of Gas Engineers (Mr. R. G. Shadbolt); and he made some pertinent remarks on the question of the Gas Publicity Scheme. Although not reported, it may, in the cause of circulating information that will remove a false impression, be stated that the Council of the Institution of Gas Engineers are taking special steps for the establishment of a body (apparently subsidiary to, and yet conjunctive with, the Institution) to carry on the publicity work, in order that all classes of undertaking—company and municipal, large and small—may be properly represented in the administration of the funds and the direction of the work. This should remove any feeling of grievance on the point that may have been imagined, though having no solidity or foundation in fact; it will also remove any question as to the validity of participation in the administration of the funds by others than members of the Institution. The point was also discussed as to the legality of municipal bodies contributing to funds for publicity purposes. There need be no trouble over this. Some of the larger municipal gas undertakings have determined the matter for themselves. It is a proper thing to spend money in business advertising; and the question of the agency through which the money is expended is surely one for determination by the management. The municipal electricity undertakings who contribute to the Electricity Publicity Committee are not worried about the matter, nor (so far as we have seen) is the point used as an excuse for receiving benefits from the work without subscribing to the defraying of its cost. Early in October there is to be the second Gas Publicity Conference; and we emphasize the hope of the President that there will be, by that time, a good accession of subscribers from the ranks of municipal concerns.

Vertical Retorts for Moderate Sized Works.

THE cardinal feature of the paper that Mr. W. Blair read at the meeting of the North British Association on the Glover-West system of continuous carbonization at Helensburgh, is that it brings before us an example of the application of the very latest method of coal carbonization for gas production to a moderate sized gas-works. Helensburgh to-day stands unique in Scotland, in that the whole of its gas requirements is met from the operation of the new settings of verticals. Helensburgh, too, will be able to boast henceforth that it led the way in the United Kingdom in completely committing itself to the vertical system of carbonization. We heartily congratulate the Gas Committee and Corporation of the town, as well as their Manager (Mr. Blair), upon their enterprise. Mr. Blair may be credited with knowing a good

thing in carbonization plant when he sees it. In his paper, he has claimed for Mr. John West an unequalled experience in matters appertaining to carbonization plant; and if we transfer our thoughts back a number of years, we may say that the years that Mr. Blair spent in actively taking part in executing contracts for carbonizing plant, in connection with a well-known firm of contractors, make him a competent judge of what a retort-setting should be. Now here is this installation of Glover-West continuous verticals at Helensburgh, consisting of sixteen retorts, in two beds, with a capacity of 500,000 cubic feet per twenty-four hours. But the point that will most interest managers of small or moderate sized works with a variable demand is that the arrangement of the settings is such that (each setting is constructed with a twin producer) any two retorts can be in operation at one time. So that the installation is capable of being economically worked just as requirements rule. A few years ago there was much discussion as to the lower economic limit at which power charging and discharging machinery could be applied to gas-works; and for ever since the smaller undertakings have taken it as impossible in their case for power machinery for horizontal retorts to be applied with economy to their restricted conditions. Is it to be that their salvation is to be found in succeeding developments of the vertical system? Helensburgh certainly goes far in supplying the answer.

This new installation (which supersedes the old horizontal retorts) is an extension of the works. Site, railway siding, waggon tipper, weighing-machine, and everything in connection with the installation cost about £14,700. We wish Mr. Blair had divided the costs as between the retort installation and the site and railway accessories. But the figure given is sufficient for our point, demonstrating as it does the economy that the Helensburgh gas undertaking is going to secure from this extension and piece of modernization. It is estimated that the plant will effect a saving of £1100 to £1200 a year; and that the labour costs will be some 50 per cent. below those with the displaced settings. From these figures it is patent that the plant is going to pay for itself in a measurable number of years. This point as to the economy to be produced will have considerable weight with those gas managers who have carbonizing plant to which power machinery has not been applied on account of modest productive capacity. As to the advantages claimed, and proved to exist with vertical settings, they are as material (if not on the same scale) in moderate sized installations as they are in larger ones. Regarding results, Mr. Blair's experiences will be especially interesting to those managers in Scotland who are using coal of the same class as that referred to in the paper. They are good; and in them (including the low fuel account of under 12 per cent.), we have the proof that there is no longer any necessity for gas managers of the smaller works looking upon vertical retorts as being beyond their reach.

Another Good Report from Australia.

The report which appeared in the last issue of the "JOURNAL" showing the progress of the Metropolitan of Melbourne Gas Company is now followed by an equally encouraging account of results secured at Sydney by the Australian Gas Company. For the past half year there is an increase in consumption amounting to 11 per cent.—for which, it seems, the extensions going forward in the suburbs are largely responsible. Another satisfactory point is that the Glcbe Municipal Council, who some time ago gave notice to discontinue gas lighting in the streets, have after all entered into an agreement with the Company for gas lighting with inverted burners. This further indicates that the advantages of gas for street lighting are being recognized in Australia as they are elsewhere. Proof also of the popularity of the gas-cooker is furnished. During the past six months the Company sold over 1300 stoves—making the total number disposed of to date nearly 23,000. In fact, the day consumption now equals 46 per cent. of the total sales.

Gas for Domestic Water Heating.

Allusion was made in these columns last week to an article that had appeared in the Engineering Supplement of "The Times," by Mr. R. Herzfeld, on the question of domestic water heating. We pointed out that that gentleman had not paid sufficient attention to the subject in relation to the economies derivable by the use of gas-boilers properly fitted. Mr. Frederick Dye

has supplied the deficiency in a letter to our contemporary; and, characteristic of Mr. Dye, his communication is of a practical character. Instead of paraphrasing the letter here, we give the main part *in extenso* on p. 691; and both the costs and the hints as to the safeguards connected therewith will be found very useful in the hands of the commercial men of gas undertakings. The information exhibits the fact that water heating by means of gas for domestic purposes is to-day undeniably an economical process.

Another Co-Partnership Company.

It is always with a keen feeling of satisfaction that we record in the pages of the "JOURNAL" an addition to the ranks of those gas undertakings who have adopted the beneficent principle of co-partnership. Thus the recent half-yearly report of the Directors of the Harrow and Stanmore Gas Company proved extremely welcome; for it contained an intimation that a proposal was on foot to introduce co-partnership. The proposal, it is gratifying to note, has now become an accomplished fact; the wishes of the shareholders (as well as of the Board), as evinced at the meeting of the Company, being entirely favourable to the adoption of this course. It will be seen from the account of the meeting which is published to-day, that all the regular staff, with the exception of the Engineer and Secretary, are to be included in the benefits receivable under the scheme. The intention is to make the employees shareholders in the concern by giving $\frac{1}{2}$ per cent. bonus upon ordinary salaries and wages for every penny reduction in the price of gas below the standard charge of 4s. per 1000 cubic feet. Calculated on the existing price of gas, the bonus of the present year will be at the rate of 4 per cent.; and in the accounts which were presented at the meeting a sum of £150 was reserved for the scheme. The list of co-partnership gas companies is becoming quite an extensive one; and as time goes on, it may fairly be anticipated that the number will be added to with increasing rapidity, as the advantages of the principle become more and more widely recognized. To secure what practice has proved is obtainable by the adoption of the co-partnership system, is surely worth all, and much more than all, the monetary outlay that it entails. Though the Harrow employees commence with the comfortable bonus of 4 per cent. on their salaries and wages, a study of the Company's affairs leads to the conclusion that this is by no means likely to prove a maximum figure in the future. The business is a continually increasing one; and for the first half of the present year an expansion is recorded in the quantity of gas sold, as compared with the corresponding period of 1910, of no less than $15\frac{1}{2}$ per cent. Railway stations are, it is learnt, still being opened, and new districts developed. Economies, also, are being looked forward to which should soon further reduce the capital expenditure per ton of coal carbonized. All of which considerations would seem to hold out promise in times to come of additional concessions to consumers in the matter of the price of gas. One of the features of the half-year's working of the undertaking, it may be remarked, is the unaccounted-for gas, which is down to the satisfactory figure of $2\frac{1}{4}$ per cent.

Insurance Against Strikes.

A proposal for mutual insurance against strike losses has been advanced by Mr. Alexander Wilson, of Liverpool, in the columns of "The Times;" and in reply to criticisms made upon his suggestions, he addressed a further letter to that paper, which was published some days ago. Though the criticisms were directed more to the practicability than to the desirability of insurance, both points are dealt with by him in the course of his answer. As to the desirability, his argument is that the risk employers have to face is not that of a universal strike, but of sectional strikes, involving stoppage of works and industries far beyond the immediate range of the actual dispute. Further, he believes that the experience of federating different trades as against strikes in that trade, has been far from satisfactory. The underlying essential of insurance is the spreading of risks; and this cannot be effectively done in one trade or in one district. The main advantage of insurance is that it would supply a substitute for the weapon which the Trade Disputes Act has thrown away—namely, a means of exercising real pressure upon workmen to abide by their agreements. Mutual insurance would mean that an employer would be placed in such a position that he could not be coerced by his workmen acting in defiance of their bargains.

The workmen would be well aware of this. They would appreciate the fact that such a strike would mean no loss to their employer, and only loss of employment to themselves. On the second point—that of the practicability of mutual insurance—Mr. Wilson quotes figures from which he arrives at the conclusion that a total premium income equal to $\frac{1}{2}$ per cent. of the yearly wages bill would be equal to the loss of wages caused by strikes in trades where insurance might be beneficial. While admitting that the measure of loss to the employer might be different from the loss of wages to the workmen, he argues that the two things are to an extent comparable. Of course, concludes Mr. Wilson, each trade differs in its risks; and experience has shown that some trades—such as coal mining—are more liable to strikes than others. But if the average of all trades is a rate equal to (say) $\frac{1}{2}$ per cent. of the wages bill, he thinks it is fair to say the risk is one capable of insurance, and at rates which should be by no means prohibitive.

The Government Laboratory.

There seem to be no limits to the variety of the problems that are placed for decision in the hands of the Government Laboratory—though the business is officially classified under only three heads. That is, work in connection with the Board of Customs and Excise; work in connection with other Government Departments; and work in connection with the administration of the Food and Drugs Act, and the Fertilizers and Feeding Stuffs Act. The report of the Principal Chemist (Mr. James J. Dobbie) for the year to March 31 last furnishes much information as to the work accomplished in that period; and by glancing at the document, the wide extent of the ground covered by the operations can be to some extent appreciated. During the year the total number of analyses and examinations made in the two branches of the Government Laboratory in London was 186,044; while including the samples examined at the numerous provincial testing and chemical stations, the total number of analyses and examinations for the twelve months was 349,277. Work in connection with the Board of Customs and Excise, of course, occupies a considerable proportion of the time of the chemists; but it is largely of a standard character. It is in connection with the “other Government Departments” that unusual points more often arise. Here we see that the question of the deleterious effects of motor-oil on plant life was raised in connection with the use of scrapings taken from roads traversed by motor omnibuses—it having been stated that plants failed to grow in soil with which the scrapings had been mixed. In the sample of scrapings examined, however, no harmful ingredient was found. Then suspicion having been cast upon the genuineness of a portion of a document 300 years old, the Record Office sought the aid of the Laboratory, whose report was to the effect that there was no evidence of tampering. The words “gas-works,” too, are noticed. Some dead trout having been found in a brook under circumstances which it was thought pointed to the fish having been killed by drainage from gas-works, four of the fish were forwarded for examination, and also samples of the brook water above and below what was believed to be the point of contamination. Examination of the dead fish showed that the gills were of abnormal appearance; but apart from the state of the gills, there was no chemical evidence of the presence of any substance likely to have caused the death of the fish. On analysis of the samples of water, however, the condition of the gills was fully accounted for. It appeared it was not tarry matter that had passed into the water, but an “ammonia distillate;” and the proportion of free ammonia in the stream above and below the point of contamination fully established the cause of complaint.

Plant for the manufacture of gas for lighting and industrial purposes is about to be erected in Barranquilla, the most important port in Colombia, say “Engineer.” Over 80 per cent. of all imports entering the Republic come *via* Barranquilla, which is a city of considerably over 100,000 inhabitants. The contract for the business has been granted by the Municipality of the Port to Senor Jorge Moya Vasquez.

The members of the Scottish Junior Gas Association (Western District) are to visit the Scottish National Exhibition next Saturday. Arrangements have been made for them to see the four different systems of high-pressure lighting in the Exhibition; and the two different types of compressor will be opened up for their benefit. The contrast between the gas and electric lighting of the concert hall will be shown during the evening. After seeing the different exhibits, the party will be entertained at tea by Messrs. James Milne and Son.

GAS STOCK AND SHARE MARKET.

(For Stock and Share List, see p. 700.)

MARKETS on the Stock Exchange had but a poor time last week. There was something of a rally in the middle period, but circumstances were too strong for it, and it could not live. At the close, all the bloom, such as it had been, was off the markets, and the prospect was far from encouraging. International relations in regard to the Morocco question, and our own domestic troubles, were the dominant debilitating factors. The opening was not promising; being under the influence of some pressure to sell, and prices gave way accordingly. Government issues were heavy, Consols fell $\frac{1}{2}$, and Home Rails, though not uniformly lower, were not strong. Both the Foreign and American Markets were weak. Business was very quiet on Tuesday, but less depressed—on what ground it was not quite clear, beyond the reflection of brightness on Continental bourses. However, all departments mended somewhat, though Consols had first touched 77 $\frac{5}{16}$. Wednesday was more active, and was cheerful under foreign buying influence. Consols rose $\frac{1}{8}$; and buyers were attracted to Rails by cheap prices. But on Thursday there was no support, and prices dropped down again. On Friday, the markets had lost all show of robustness. Consols and other Government issues gave way. Railways were quite weak, and the rest followed suit. This state of things continued on Saturday; and the close was quite weak. Consols were 77 $\frac{1}{2}$ —a loss of $\frac{1}{8}$ in the week. The Money Market was at first firm, but relaxed later on and closed easy. Business in the Gas Market was on a very good scale for the time of year, and, though there were but few changes in quotation, the general tendency was quite firm. In Gaslight and Coke issues, the ordinary was active and very steady; all transactions being within the limits of 106 $\frac{1}{2}$ and 107. There was not much doing in the secured issues. The maximum was done at 83 $\frac{3}{4}$ and 84 $\frac{1}{2}$, the preference at from 101 $\frac{1}{2}$ to 101 $\frac{3}{4}$, and the debenture at 80 and 80 $\frac{1}{2}$. South Metropolitan was marked at 116 $\frac{1}{2}$ to 117 $\frac{1}{2}$ —the quotation being put down $\frac{1}{2}$. In Commercial, the $\frac{1}{2}$ per cent. stock changed hands at 111 $\frac{3}{4}$ to 113, and the $\frac{3}{4}$ per cent. at 106 $\frac{3}{4}$. Among the Suburban and Provincial group, Bournemouth “B” was done at 16 $\frac{1}{2}$, Brighton and Hove ordinary at 157, British at 46 to 46 $\frac{1}{2}$ (a rise of 1), Brentford new at 199 and 200 $\frac{1}{2}$, Ilford “B” at 124 $\frac{1}{2}$ and 125 (a rise of 1), Tottenham “A” at 145 $\frac{3}{4}$ (a rise of 1), and Wands-worth at 144 $\frac{1}{2}$. Two odd lots of Newcastle fetched 104 on the local exchange. In the Continental companies, Imperial made from 182 to 183, Union preference 135, and European 19 $\frac{3}{4}$. Among the undertakings of the remoter world, Bombay marked 6 $\frac{1}{2}$ and 6 $\frac{3}{4}$, Monte Video 12 $\frac{1}{4}$ and 13, Oriental 138 $\frac{1}{2}$, Primitiva 7 $\frac{1}{16}$ and 7 $\frac{3}{16}$, and ditto preference 5 $\frac{1}{2}$ and 5 $\frac{3}{4}$.

ELECTRICITY SUPPLY MEMORANDA.

Varied Municipal Experiences in 1910-11—Deficits and Recessions—
Bootle's Baby—Private Consumers and Metallic Filament Lamps
—The Cost of the Unit—The Mystery of a Fire.

WEEK by week, in most leisurely fashion, the annual accounts of municipal electricity undertakings reach our electrical contemporaries, and the main features are published. Those that have seen the light of day this year disclose, as usual, a varied experience in financial result. There are those undertakings in choice areas that have done well; there are others that have made progress; there are others again that have managed (by what amount of squeezing here and trimming there we do not know) to show a slender amount of net profit; there are others that have had a set-back; while there is still a goodly number confessing deficits. Local conditions appear to affect the results of the operations in some areas more in the case of electricity supply than in that of gas supply; for during the past twelve months the gas industry enjoyed general and brilliant prosperity. In some districts, it is seen that the consumption of electricity for private lighting has increased, compared with the previous year; but in most cases the increase does not by a long way bring the revenue back to the sum derived a few years since from private lighting. The causes, of course, are the metallic filament lamp, and the still greater economy and efficiency effected in gas lighting through the improvements of the past few years. We were recently showing the losses of the Westminster Electric Supply Corporation through the metallic filament lamp (see *ante*, p. 284); and now from Bristol we learn that the revenue from private lighting during the past four years has been as follows: 1907-8, £47,447; 1908-9, £43,416; 1909-10, £40,779; 1910-11, £41,543. Though some undertakings may have stopped in their downward course in private lighting revenue production, for the majority of them there is much to be done to retrieve the income from this source that ruled in pre-metallic lamp days.

Increases in business are shown mainly under the heading of power and heating supplies; but we do wish electricity purveyors would separate the two items, power and heating. The only justification they can find for mixing up business in industrial power and domestic heating is that the prices are somewhat on the same level; the necessity for this being a commercial one. The gas industry, as a rule, supply gas for heating at the same price as for lighting; and they do a large and enlarging lucrative

business, while the electrical industry finds it necessary to run down to power prices to get a comparatively few people to adopt electric heating. It would be very instructive to have separately the figures representing consumption and revenue for power and for heating.

Several excellently circumstanced undertakings, as previously remarked, made surplus profits, some considerable ones, during the year; but others, and not a few, produced deficits. Here are examples: Barnstaple, £547; Beckenham, £1093; Bristol, £768 (this was after appropriating £3000 odd for renewals); Farnworth, £376; Hastings, £2919 (total deficiency to March last, £15,638); Heywood, £652 (excluding loss on tramways); Kingston-on-Thames, £1193; Kirkcaldy, £84; Loughborough, £462; Maidstone, £158; Morley, £530; Redditch, by means of a "grant" of £3000 from the rates, carry forward a sum of £1235 (this is a singular way of conducting a municipal trading undertaking); Stalybridge, &c., Tramways and Electricity Board had a shortage of £5 on the Electricity Department and £5938 on the tramways; Wakefield, £213; and Worcester, £760, but in this case some £900 expenditure was incurred out of revenue in connection with street lighting. As remarked, these are only examples of undertakings making actual loss; there are no doubt many more. A number of undertakings have made small—very small certain of them—balances of net profits; but the information does not go so far as to show us whether these undertakings have anything in the nature of reserves. Some of them, we are afraid, stand a very poor chance of climbing out of the state of inveterate financial depression. Several concerns exhibit recessions in the balance of net profits. The surplus net revenue of Brighton has fallen from £6254 to £4751; but last year £1000 was paid in settlement of the claims of Mr. Arthur Wright, who has retired from the position of Consulting Engineer. Blackburn has had a set-back in its surplus from £1388 to £697; Blackpool, from £6266 to £5270; Crewe, from £1478 to £1268; and Oldham, from £2203 to £1300. These again must only be taken as illustrative; there may be many other instances that have not come under notice. The Epsom undertaking has had an increase in consumption "due largely to the opening of cinematograph theatres." The concern has therefore not been cutting huge slices off the business of the Gas Company.

The Bootle electricity supply undertaking seems to have been hanging about at the entrances to progressive paths without really venturing upon them. That is what we gather from a report that the Borough Electrical Engineer has made to his Committee. It only requires enterprise, and all will be well with the undertaking. Mr. Clothier, the technical chief in question, seems to be a very sanguine and optimistic man; and he does not give his competitors any credit for being in the position to bar his way, if only his Committee will give him power to make a big forward movement. Why at the present time, he tells us, the electric motor connections aggregate 2533-horse power; but there are users of upwards of 9000-horse power being served by steam and gas engines. We can vision Mr. Clothier waiting at the entrance of his generating station to welcome all the latter. He tells his Committee that most or all of these "may change their present arrangements when their plants get older." They would not wait for this, so anxious are they all for the electric drive, if the prices for electricity were at a lower figure—in other words, "the change would take place sooner if electricity were supplied at a lower price." The reduced rates for power would also encourage people to look out for sites for building factories in Bootle. There would be no place then like Bootle for factories. It is wonderful the Committee should hesitate. We see, too, that an experimental lamp replacement scheme is being tried; but that it is yet too early to judge regarding the direct financial effects. We should like Mr. Clothier to acquaint us with the terms of this scheme, in order to see how it compares with the maintenance schemes of gas undertakings. One effect of the scheme has been "to induce several customers to continue, extend, or resume the electric light where otherwise they would not have done so." Surely Mr. Clothier is trying to deceive us! Why the teaching of electrical literature is that once electricity is adopted, on account of the mythical savings in lighting and doctor's bills, the improvement of the air of rooms, the prolongation of life, and the saving of decorations and furniture, it is never again given up. Of course, gas undertakings in the course of their replacement experiences, know the other side of the story. Here in Bootle there are "several" consumers who would have discontinued, or who would have refused to resume, electric lighting, with all its electrically drawn economic and preservative attributes, unless such a comparatively paltry thing as a lamp replacement scheme had been devised. However, there is the admission. Evidently, Mr. Clothier is not altogether sure of the financial result of the scheme, as he declines to hazard even an opinion as to how it will work out. Then our friend states that little progress has been made in Bootle in the use of electricity for heating, cooking, and general domestic purposes, "though in other supply areas the use of electric energy for these purposes is rapidly increasing." Is Mr. Clothier thinking of those seventeen electric cookers that Mr. Seabrook reports have been installed in Marylebone? We will not press the point? But, touching the same matter, it is his view that a reduction of price per unit would boost-up things in this direction. There will be interest in watching the effect of the new diet that Mr. Clothier has prescribed for Bootle's municipal baby.

The metallic filament lamp, we learn from a recent issue of the

"Electrical Times," is not having all its own way among private users of current. Although the lamp has, in one form or another, been with us for upwards of six years, "there is still much work to be done in the way of removing prejudice and misconception. The trouble, as seen electrically, seems to be that many private consumers will not scrap their carbon filament lamps for the more expensive ones; and they cannot be persuaded to see that the turning out of lamps throughout a house that cost 9d. or so apiece, and putting in their places lamps that cost three, four, or more times as much, is a good investment. One or two of the metallic variety put in on trial do not make a sufficient impression on the quarterly account for current to satisfy the private consumer as to the claims. But there is another reason. The writer knows of more than one case where trial metallic filament lamps have been fitted in rooms commonly used in a household; and the glare of the light and the aching eyes, after a spell of reading or writing, have resulted in a return to the less offensive carbon filament lamp. We remember Mr. A. P. Trotter, Electrical Adviser to the Board of Trade, not long since confessing that over his office desk, despite the extravagance, he prefers the carbon filament lamp, entertaining as he does some sympathy for, and interest in the preservation of, his eyesight. The latest forms of incandescent gas-burner are far less offensive in this regard than any type of electric incandescent burner.

What is "actual cost" for electricity? Does it embrace everything, including capital charges and depreciation. The question is asked because Alderman Vorley, at a recent meeting of the Islington Borough Council, quoted certain figures which he said were below cost. The charge for public lighting, he remarked, was now 1'67d. per unit; the average for all London was 1'63d.; while outside London, it was 2'05d. "The price quoted was slightly below cost." Then he went on to say the Committee had at one time overcharged for public lighting. While, however, the Council had paid the Committee £18,000 more than cost price, the Committee had also supplied the Council with electricity under cost to the amount of £12,000; so that through the public lighting, in fifteen years, the Council had paid a sum of £6000 above the actual cost, without reckoning the charge for depreciation. We suppose Alderman Vorley understands what he is talking about. If so, then his statement is presented for what it is worth. We know of some municipal undertakings that are supplying current to metallic filament lamps at 1d. and less per unit for street lighting, in order to compete with inverted gas-burners. The charge of 1'67d. per unit, Alderman Vorley says, is below cost price; and therefore what the worthy Alderman would say to a charge of a fraction of a penny per unit, we do not know. The average cost of the units of electricity generated at Islington during the year covered by the last returns of the London County Council is 2'4d., including 1'15d. for total capital expenses and 0'08d. for rates and taxes.

Can anyone assist the Wesleyan Methodists of Leeds to solve the mystery of a fire that occurred yesterday week, about half-past one in the afternoon, in their beautiful historic place of worship known as the Oxford Place Chapel? The total damage is calculated at between £3000 and £4000—among the damage being the destruction of the organ, the beautiful rostrum, part of the ceiling, and a number of pews. The chapel was closed; and how the fire broke out is described as a "mystery." The fire cannot be put down to the heating apparatus, as Old Sol has lately rendered unnecessary the use of that adjunct to the sacred edifice. One local paper says that it is generally supposed that the fire originated "at the electric switchboard near the organ." Another local paper says that some people "suspect the fusing of an electric wire near the organ." It will be noticed that the papers are cautious, and do not definitely attribute the fire to an electrical cause. They will consequently escape castigation from our electrical contemporaries. But the direction in which suspicion rests is clear; and, under all the circumstances, the suspicion appears to have a fairly substantial foundation. But the origin of the fire is referred to as a mystery, which the worshippers at the chapel would like cleared up.

The current number of the "Transactions" of the Junior Institution of Engineers contains an article by Mr. Samuel Cutler, jun., Assoc.M.Inst.C.E. (Past Chairman), entitled "Across the Alps by Motor." The interest of the contribution is enhanced by the inclusion of a large number of excellently reproduced photographs.

London is to have a Permanent Exhibition of Patents, which it is anticipated by the promoters will fulfil a long-felt want. The exhibition will be situated in a central position, and will be open to the public all the year round. There will be no charge for admission. The object is to establish a centre where inventors may display their patents for the purpose of attracting the attention of possible purchasers. Visitors will be received at the exhibition from all parts of the world, and conducted through the various sections by expert demonstrators, who will not only be able to point out the merits of each patent, but will be able to quote for any country in the world for same. The exhibition has, it is said, already received a considerable amount of support from important firms; and when it opens there should be a noteworthy display of great variety. Further particulars are contained in a prospectus which is being issued at the present time, and which may be had free on application to the Administration Office, No. 165, Fleet Street, E.C.

PERSONAL.

The Wells Urban District Council have appointed Mr. G. A. LUSTED, of South Godstone, as the Working Manager of their gas undertaking.

At a meeting of the Salford Town Council on Wednesday last, a graceful tribute was paid to the Mayor, Alderman PHILLIPS, who is also Chairman of the Gas Committee, for the part he played in the recent labour troubles; and the event was all the more notable from the fact that the matter was introduced by Councillor Purcell, a Labour member, and an outspoken critic of the Mayor and other members of the Gas Committee. Mr. Purcell, before the ordinary business of the Council was entered upon, said that he wished, on behalf of the Trade Unions of the borough, to express their best thanks to the Mayor for his work in regard to the labour disputes, which had, so far as they were concerned, been brought to a successful issue. He (Mr. Purcell) was frequently compelled to be in a position of hostility to the Mayor in many matters; but he felt he was bound on this occasion to thank him for his work in bringing the disputes to a satisfactory settlement. Alderman Worsley, in supporting, said he was sure everybody would acquiesce in the sentiments expressed by Mr. Purcell. They all owed a debt of gratitude to the Mayor for the arduous duty he had performed and the successful settlements he had brought about. In his response, Alderman Phillips said he had only endeavoured to discharge his duty to the best of his ability.

OBITUARY.

SAMUEL WESTALL DURKIN.

Unhappily, Mr. Samuel W. Durkin, of Southampton, has not lived long to enjoy his retirement. Less than three months ago he relinquished the position of Resident Engineer and Manager of the Southampton Gaslight and Coke Company; and last Wednesday news was received of his sudden death at Eastbourne, to which place he had gone a few days previously to spend a holiday. Deceased was for 59 years connected with the Company; and was, of course, well known in Southampton, where his death is deeply regretted—as it will also be by his numerous friends in the gas profession.

Mr. Durkin, who was a native of Southampton, had been associated with gas manufacture since 1852, when he became the pupil of the late Mr. James Sharp, then Engineer of the Company, who was well known as a pioneer in gas cookery. Five years later, Mr. Durkin became Assistant-Engineer; and on the retirement of Mr. Sharp, in 1867, he was appointed Resident Engineer and Manager. In the 59 years of his service, Mr. Durkin, of course, saw many changes in connection with gas supply; and he assisted in great local developments. In 1852, the annual output of the Company was 34 million cubic feet; last year, the figure was 750 million cubic feet; while the whole of the extensive works of the Company were built or rebuilt during his period of office. In 1852, the largest gasholder was one of 60,000 feet capacity. To-day there are five, ranging in capacity from 250,000 to 2,000,000 cubic feet. The high esteem in which Mr. Durkin was held was manifested on his retirement in June last, when he was the recipient of handsome gifts from the staff of the Company.

It will be remembered that in 1902 Mr. Durkin was elected President of the Incorporated Gas Institute; and he was twice President of the South-West of England Association of Gas Managers, which is now merged in the Southern District Association. He was for many years a member of the Southampton Chamber of Commerce—having been elected a Director as long ago as 1889. Prior to becoming a pupil under Mr. Sharp, it may be mentioned that Mr. Durkin was with his brother, who was at the time Manager of the Croydon Gas Company. His successor as Manager at Southampton was his son, Mr. Frank Durkin, who had for many years filled the position of Assistant-Engineer.

Dr. J. F. ARMSTRONG, who died last Tuesday, in his seventieth year, was Chairman of the South Shields Gas Company, as well as Vice-Chairman of the Sunderland and South Shields Water Company. He had been a Borough Magistrate in South Shields since 1880; and for a long period was Senior Honorary Surgeon to the Ingham Infirmary, of which institution he was one of the founders.

The death occurred last week of Mr. H. LEICESTER GREVILLE, F.I.C., F.C.S. In early years, he was a pupil of the late Mr. Keates, Chemist to the old Metropolitan Board of Works, and in due time became his assistant, and then principal assistant. While thus acting, he accepted the position of Chemist to the Commercial Gas Company, of London, which he occupied for a long period, retiring only a few years ago. He was a clever man, and in his particular line as a gas-works chemist established a reputation almost unequalled, both by his industry and writings on technical subjects and answers to correspondents. A number of his original communications have appeared in the pages of the "JOURNAL," extending over a long period; and others have been published in pamphlet form. On his retirement, he continued his profession in a private consultative capacity, settling at Bromley, Kent. After the death of his wife (to whom he was deeply attached), his health gave way; and he died of cancer, aged 62.

TRADES UNION CONGRESS.

Meeting in Newcastle.

THERE was some increase in the number of delegates to this year's Trades Union Congress, as compared with those present at the Sheffield gathering twelve months ago; and the number of members represented was also greater. The gathering last week—which was the forty-fourth of the series—took place at Newcastle-on-Tyne; and, to be precise, there were 521 delegates in attendance, with an aggregate representation of 1,662,133 members, distributed among 200 affiliated Unions. These delegates included 23 Members of Parliament, more than one-half of whom belonged to the Miners' Federation; and there were between 80 and 90 who serve in a public capacity as magistrates, aldermen, or councillors. The largest individual group of workers represented were the miners of the country, who had 132 delegates, in the interests of an aggregate membership of 553,513. The President of the Congress was Mr. W. Mullin, J.P.; while it is stated that the Home Office was represented by Mr. D. J. Shackleton, the new Labour Adviser, and the Labour Department of the Board of Trade by Messrs. I. H. Mitchell and D. C. Cummings. Owing to the death of Mr. W. C. Steadman, it became necessary to appoint a new General Secretary; and the position—to which is attached a salary of £300 a year—fell to Mr. C. W. Bowerman, M.P., who was the only candidate nominated.

Some routine business having been transacted at the opening sitting on the Monday, the President proceeded to deliver his address. There was, of course, no lack of material on which to base his remarks; and a good many subjects were dealt with. Among the opening points was one of general interest: "Your Parliamentary Committee received an official invitation to send two representatives to be present at the Coronation of King George V. and Queen Mary. This is the first time in history that the Trade Union movement has been so honoured; and your Parliamentary Committee decided to accept the invitation." Dealing with the Insurance Bill, the opinion was expressed that certain features called for careful deliberation; but it was admitted that the measure, when brought into practical operation, would make great changes in the industrial conditions as they were known to-day. The fact that a weekly contribution would be required, would cause even the most indifferent to take greater interest in the working of the Act. To the statement that they, as a Trade Union body, naturally looked with satisfaction on the removal, by the passing of the Parliamentary Bill, of a perpetual bar to the declared will of the people, the President added what sounds like a threat: "It behoves those in authority to take heed of the lesson, lest they, too, in turn, fall by the wayside." Referring to the Coal Mines Bill, Mr. Mullin said that this had been beaten into shape in the Grand Committee, and, it seemed to him, more hammered than was necessary so far as the safety of the miners was concerned. But for the strength of the miners' representation in Parliament, it almost looked as if a great deal of the sympathy aroused by the recent disastrous colliery explosions would have been forgotten in the anxiety of the owners to preserve profits. As it was, the Bill promised to be a considerable improvement upon the present Act, more especially from the point of view of a more efficient inspection. It was a sad commentary, but one, he was afraid, with a good deal of truth in it, that until more experience was gained—heaven save the mark, for it meant further loss of life!—on the question of ventilation, coal dust, and electricity in mines, the pecuniary interests of colliery proprietors were not likely to be further disturbed. When would legislators make the life of the individual the first, and the profit and loss account the second, consideration? Some remarks followed on the subject of the recent railway trouble; and these, as may be imagined when the nature of the gathering at which they were made is considered, were anything but flattering to the railway directors and to the Government in thinking "more of sending troops without any applications from the civil authorities all over the country, instead of sharply laying down the law to these commercial magnates." As to the refusal of the companies to officially recognize the Unions, he asked whether there was any trade outside a self-centred railway company that had not found it of inestimable advantage to meet chosen representatives of Labour face to face, instead of workmen who had to go back to their duties. "Nobody knowing what it means," said the President, "enters upon a strike lightly; but just as certainly no Trade Unionist can think of giving up the right to leave work if he believes there is a just call to do so. Of late years the policy as to wages and working conditions has been in favour of mutual agreements, boards of conciliation, and the like. It can hardly be said that they have altogether commended themselves in actual working to organized labour. A drawn-out arbitration agony to men not receiving a living wage, or to others speeded-up to the point of collapse, has its limits."

At the conclusion of the address, various non-contentious resolutions, of which there is no need to take note here, were passed; and the first day's proceedings were brought to a close. Before the commencement of the business on Tuesday, the Lord Mayor (Sir William Stephenson) extended to the delegates a hearty welcome, on behalf of the Corporation and the people of Newcastle. In the course of his speech, Sir William expressed the hope that there would result from the present Congress a practical suggestion in the direction of the prevention of such serious

dislocations of the business of the country as they had recently witnessed, and that there would not be wanting on the part of the employers, as well as the employed, a disposition to deal with the question in a manner satisfactory to the nation as a whole. The virtue of patriotism, he added, should not be lost sight of by either party. In dealing with these matters, he trusted patriotism would come well to the front; for it undoubtedly had a great bearing upon national prosperity. It was not long after the Congress had settled down to work, that the harmony which had so far characterized the meeting was broken. Numerous delegates complained forcibly of the presence, by invitation, of the representatives of the Home Office and the Board of Trade; but a motion condemning the Parliamentary Committee for having issued the invitations was lost by a large majority. A resolution protesting against the use of the military in recent trade disputes met, however, with a better fate.

The remaining business of the morning session was the consideration of the report of the Parliamentary Committee, which dealt with numerous matters of interest to the members. It was stated that considerable interest had been shown throughout the country in the National Insurance Bill. Probably few measures had been more generally welcomed, and at the same time more strongly and closely criticized, than this particular Bill; but, given the desire, there seemed to be no reason why it should not be made thoroughly acceptable. The question of making Trade Union combinations permanent in their character had occupied the earnest attention of the Committee; and it seemed to them that the State Insurance Bill offered a possible means to this end. The whole industrial community were to be compulsorily insured against sickness; while some 2½ millions were to be insured against unemployment. The tendency among organized workmen would be to have each separate Trade Union registered as an approved society for sickness insurance purposes. The Committee, after mature deliberation, were of opinion that it would materially strengthen the Unions, and consolidate the Trade Union movement, if the various Societies were grouped together into as few groups as possible; that each group should be made the sole channel of receiving and paying the money obtained from the Treasury for the purposes of sickness insurance; that the duty of administration should, so far as the Treasury requirements admit, be assumed by a representative body elected from each separate group; and that a united and immediate effort should be put forth to induce the Government to make such alterations in the Bill as would admit of these suggestions being carried out.

The passing of resolutions of all sorts and conditions was then proceeded with—many of which must be passed over. Some of them were of the sweeping order which one has come to look for in connection with the large requirements of Trade Unionists. Quite early, for instance, the Congress instructed the Parliamentary Committee to do all in its power to oppose the Bills of railway companies, public authorities, and private companies refusing to recognize Trade Unions, and to “endeavour to secure by enactment the establishment of a fair wage principle and improved conditions for all workers.” The placing on the market by the authorities, at a low price, in ever-increasing quantities, of prison-made mats, is naturally against Trade Union principles. Then the Parliamentary Committee came in for another “instruction”—that they should take steps forthwith to persuade the Government to secure the appointment of a Royal Commission or else a Parliamentary Committee to inquire into the whole field of industrial life assurance, with a view to its nationalization. Later, the nationalization of the railways was called for. This is a pet idea with some people; but perhaps it was a little unkind of one of the delegates to admit that “the resolution had been put forward for the last nineteen years.” In these times of change, it is more than usually dangerous to prophesy; but one may hazard the opinion that opportunity will be allowed the Congress for bringing it forward for at any rate another nineteen years—that is, if reliance can be placed upon a recently published estimate that the securing of the eighteen leading English Railway Companies might cost the State upwards of £860,000,000, reckoned at twenty-five years’ purchase, apart altogether from any allowance for prospects. The complete reversal of the law as laid down in the celebrated Osborne case was called for; and the meeting then adjourned.

The proceedings on Wednesday were devoted largely to consideration of the advisability of establishing a Labour daily newspaper, and to discussing a resolution in favour of the institution of “a real citizen army, entirely free from military law in times of peace, and officered completely by the selection of the rank and file.” On the first matter, nothing definite was settled; but the citizen army was sent to the “right about” by a large majority—one delegate, in the course of a strong speech in opposition, quietly asking how often the officers were to be elected. A nice little string of seven resolutions was passed, all dealing with workmen’s compensation. The last of these once more “instructed the Parliamentary Committee”—this time to “immediately” press the Government to appoint a Departmental Committee to inquire into the working of the Compensation Act of 1906, with a view to the inclusion of needful amendments. Next day the Congress expressed strong disapproval and condemnation of the system of fining in the textile and other industries, and “urged the Parliamentary Committee” to impress upon the Government the immediate necessity of passing a law to prevent deductions for any purpose or cause whatever from wages earned. The Labour

Exchanges having been criticized, the Congress rejected a motion which was in favour of making any national insurance scheme wholly non-contributory. Subsequently, however, a resolution was passed to the effect that any scheme of State Insurance must place the whole burden of insuring all workers, whatever their age, whose wages are less than 15s. per week, upon the State and the employers; as also was one claiming, among other things, that persons with wages below 25s. should be called upon to contribute less than higher-paid men, or else be relieved of all payments to the scheme.

Some liveliness was witnessed on Friday, though the sitting opened quietly enough. A resolution was passed to the effect that the Congress, “recognizing the increased power of the capitalists, in closing-up their ranks and in their adoption of improved methods, deplores the lack of similar consolidation among the workers. It urges, therefore, the Parliamentary Committee to take steps to call conferences of the different industries, with a view of amalgamating the several Trade Unions connected with each industry.” It was also agreed that there is need for legislation to put an end to employers using the weapon of eviction during trade disputes. Of course, it is an advantage to have all the weapons, as far as possible, on one’s own side. The transport workers having been congratulated on their “magnificent efforts” to redress grievances, it was decided that “no effort shall be spared by the forces of organized labour to arouse and maintain the discontent of underpaid workers with their condition, and to quicken and assist their determination to use all possible means to win for themselves a living wage.” This holds out promise of further activity. Mr. Will Crooks and other Labour Members were next severely criticized for introducing a Bill into the House of Commons dealing with labour disputes, without the authority or consent of either the Trade Unions of the country or the Labour Party; the resolution of protest concluding with the words: “We desire to make it clear that we will by every means in our power resist any attempt to prevent or hinder the right of the workers to strike at any time, when we consider such action necessary in defence or furtherance of their rights.” The extensive powers now exercised by the permanent officials in the various Government Departments was next condemned as detrimental to the democratic progress of the nation; and a number of resolutions dealing with mining matters followed. Afterwards the “unsatisfactory interpretation given to the fair wages resolution by the permanent officials of the various Government Departments” was the subject of a series of motions, as were also the questions of wages and hours of labour. A long resolution on the “Trades Unions Education Policy” was brought forward; and on Mr. J. Sexton attempting to speak against it, the delegates at first refused to hear him. An unruly scene ensued; and the President ordered Mr. Sexton to retire. This, however, he refused to do; and finally Congress settled down to hear what he had to say.

The final session, on Saturday, was largely taken up with elections. In this connection, it was announced that Mr. Will Thorne, M.P., had been chosen as Chairman of the Parliamentary Committee, and would therefore be President of next year’s Congress, which will be held at Newport (Mon.). Among the resolutions passed was one drafted by the General Purposes Committee to meet the demand for unification of labour forces. It expressed the opinion that steps should be taken to unite in one effective central organization the various Unions and Societies at present comprising the Trades Union Congress and the Labour Party, with the object of providing the same facilities for the discussion of Trade Union and Labour matters as at present exist. The Parliamentary Committee were instructed to co-operate with the Executive of the Labour Party in formulating a scheme for the establishment of a central body having this object. One delegate, in the course of the discussion, expressed the opinion that to merge the industrial side of their work into the political was a step in the wrong direction. Yet another motion called for the reorganization of the jury system, and for the appointment of a Royal Commission to inquire generally into the “present method of administering justice as between plaintiff and defendant.”

Scottish Junior Gas Association—Eastern District.

The Hon. Secretary of this Association (Mr. W. Geddes, of Granton) has issued a poster for display at all the gas-works within the district, giving an account of the business to be before the Association during the ensuing winter. The syllabus sets forth the following arrangements: Sept. 30. Opening Meeting, to be held in Edinburgh. Business: The address of the President, Mr. John R. Moyes, of Granton, and an address by Mr. A. Canning Williams, of Edinburgh, on “The Financial Department of a Gas Undertaking.” Feb. 17. Visit to the Granton Gas Works. March 9. Quarterly Meeting, to be held at Dunfermline. Business: “Vertical Settings v. Horizontal Settings,” by Mr. R. J. Philp, of Dunfermline. Question Box. March 30. Joint visit with the Western District to the Alloa Gas and Electricity Works. May 4. Visit to Messrs. Stewarts and Lloyds, Limited, of Coatbridge. May 25. Quarterly Meeting to be held at Perth. Business: An address by Mr. W. B. McLusky, and a paper on “Carbonization in Bulk,” by Mr. E. H. Scott, B.Sc., of Granton. June 15. Visit to the meter works of Messrs. James Milne and Son, Limited, of Edinburgh. July 6. Annual general meeting, to be held in Edinburgh. Business: “Coke-Oven Gas and Town Lighting: The Direct Recovery of Sulphate of Ammonia,” by Mr. W. R. Barry, of Alloa.

WILLIAM YOUNG:

AN APPRECIATION.

By ALFRED DANIELL, M.A., LL.B., D.Sc., F.R.S.E.,

ADVOCATE AND BARRISTER-AT-LAW.

With an Appendix, being an Index to all Mr. Young's Published Writings and Recorded Utterances on Technology.

[Prepared for the "William Young Memorial Lectureship" of the North British Association of Gas Managers.]

On March 1, 1907, we lost our guide, philosopher, and friend, Mr. William Young, at a comparatively early age, as things go now, for he was only in his sixty-seventh year, and was in the full swing of an intellectual activity which seemed progressively to increase and to expand to the very end. But he had lived a strenuous life of service to the gas industry and to the shale industry of Scotland, the value of which it is beyond words to tell. His loss we then felt, and still feel, to be irreparable in every way; but the memory of his presence and his guidance and example are with us, and the North British Association of Gas Managers has decided to found a William Young Memorial Lectureship to keep his memory green among those who come after us. The Association has done me the very great honour of asking me to write an introductory appreciation of Mr. Young. I feel the honour deeply, but I also feel my own inadequacy to the task of doing anything like full justice to the memory of my friend. I fear I can do little more than give, and that very imperfectly, a general idea, to those who did not know him, of what manner of man he was and what the nature of his work and services has been. His presence itself was an inspiration; and words are feeble as means of conveying the impression which his personality produced.

Mr. Young lived but little in the public eye; and Scotland at large knew but little of one of its greatest sons. But in the circles in which he spent his active life he commanded an admiration, a respect, a confidence, and an affection which made him the man of men among us.

The incidents of his unassuming and straightforward life are plain and simple. Born in 1841 at Selkirk, the eldest son of Mr. John Young, the Manager of the Selkirk Gas-Works, who was himself a man much looked up to as an adviser in gas matters, William Young was brought up amid gas working and its problems; and in 1854 Mr. John Young with his family removed to Dalkeith, where for the next fifteen years he was Manager of the gas-works. He was much in request as an experimental lecturer on chemical and physical subjects, and his son William learned much through helping him with his demonstrations. Mr. William Young always spoke, to the end of his life, with the highest affection and respect of his father and his mother; but the young lad seems also to have found what he called a "scientific father" in the person of Mr. Peter Brash, a soap, candle, and oil manufacturer, of Leith, who took a deep and active interest in him, and gave him facilities for pursuing his scientific studies, which he carried on under Professor Lyon Playfair (afterwards Lord Playfair) and others in Edinburgh. Meanwhile, the lad had been apprenticed to a plumber in Dalkeith, and the journeyman who had to teach him his trade was none other than our excellent and lamented friend the late Mr. Bell, sen., of the Dalkeith Gas-Works. Mr. Bell found the lad to have a restlessly inquiring and inventive spirit, and to be continually improving the ways of doing things. At the age of twenty-two, we find Mr. Young engaged as Manager of the Lasswade Gas-Works. The works was a small one, but it presented its opportunities, for close at hand there was a large bing of waste shale, or, rather, shale brought up from a coal pit and thrown aside as waste. Mr. Young thought it might be possible to make gas out of this, and asked permission to take a sample. He was offered the whole bing if he would only take it away. He set to work, and made some 8000 to 9000 cubic feet of very good gas per ton. This turned his attention to shale and its problems, and ere long Mr. Young was managing shale oil distillation not only at the gas-works but also at the coal pit. At that time the shale oil industry was in a very bad way; oil was made in horizontal retorts partly filled with shale, but the products were charred, and, of course, there was no such thing then dreamed of as a yield of ammonia. William Young thought it out; the problem was how to get the products away without their being charred on the way out. Mr. Brash took a practical interest in the experimental work, which was carried out at Lasswade, and presently he got Mr. Young appointed as Manager of the Straiton Oil-Works. The result was what has been called the salvation of the Scotch shale oil industry, by a vertical retort, in which the products were first condensed as far as possible and were then heated and swept through the shale in a downward direction, so as to clear out the condensable constituents of the vapours as quickly as possible, and thus remove them out of harm's way. The two patents, under which oil of good quality was now obtainable, were No. 1278 of 1866 and No. 650 of 1867, both in the names of William Young and Peter Brash.

In 1874, Mr. Young left Straiton to become the Engineer to the Clippens Oil Company, which had just put up large works near Paisley in order to apply his methods; and for the same Company

he also designed and managed new works at Pentland, near Edinburgh, capable of treating 300,000 tons of shale per annum. But he also kept experimental plant going at Straiton. The outcome of the Straiton experiments was the distillation of shale at two temperatures, with recovery of nitrogen as ammonia. Meantime Mr. George T. Beilby, then Chemist to the Oakbank Company at Mid Calder, had arrived at the same result. Mr. Young's patent was applied for in April, 1881, and Mr. Beilby's a month later. The two patentees joined forces a year later, and very soon practically all the shale oil in Scotland was made in Young and Beilby retorts or modifications of them. In 1885, Mr. Young was able to retire from active managership and became a Consulting Chemical Engineer, residing at a quiet little cottage, Priorsford, on the banks of the Tweed at Peebles. Later on he purchased the estate of Harehope, among the hills not far away from Peebles, and found an occasional resort to the air of the hilltops suit his health, which had by this time become seriously impaired. But the indomitable energy of the spirit of the man was so great that between playing the part of an enthusiastic fisher, keeping up continuous plain living and hard thinking, carrying on experimental work of his own and keeping up with the work of others, not only in his own field but in scientific matters generally, he was able to keep on, in spite of the ill-health which periodically laid him aside, rendering continuous service to both the shale and the gas industry. In particular, in 1892, the gas world was startled by the announcement of a process for the manufacture of a truly permanent gas from the heavy oils which had at the time become a drug in the shale oil market. This process was one of great promise, and in itself was a triumphant success; but Welbach mantles, carburetted water gas, cheaper cannels, and high heats in carbonization told against its utilization for enrichment, and Mr. Young had to devise other solutions for the problems of the day, of which some will be found referred to later on, while others will no doubt be touched upon by Dr. Colman in the first of the William Young Memorial Lectures.

Mr. Young's keenness of interest in his work never abated to the end; and his powers seemed to grow as he went on. As the apprentice lad was, so was the man; whatever he touched he tried to improve. He was the keenest of observers in everything, in Nature as well as in his own work; and what he observed he never forgot. It would set him thinking, perhaps years afterwards, when knowledge on the particular point was likely to be helpful. He always pressed forward, making at all times some advance upon his own previous knowledge. The simplest observed fact was of importance in his eyes; it was bound to be an indicator as to something beyond. Hence it is that with him a long, long train of work takes its origin in the simplest of observations; and as I feel I cannot do justice to the whole of Mr. Young's life work, my readers will perhaps bear with me while I attempt to show, by way of typical illustration, how from the simplest of beginnings Mr. Young developed and applied the principles affecting condensation. If I do so my readers will probably understand better than from any amount of eulogy what manner of man we have had among us, what manner of man we have lost.

CONDENSATION IN THE EARLY DAYS.

It appears, then, that in the early days, away back in the sixties, Mr. Young's brother-in-law, Mr. Cusiter, was occupying himself with the question of the choice of a good liquid for use in gas-meters. Water was troublesome, because it evaporated; glycerine was tried, but did not seem to give complete satisfaction for other reasons. Mr. Cusiter asked Mr. Young for some suggestion. Mr. Young, turning over in his mind the requirements, which were that the liquid should not evaporate at ordinary temperatures, should not freeze, should not mix with water, should not corrode the metal, and should be quite cheap, promptly suggested the use of intermediate paraffin oil, which would meet all these requirements, and, besides, would act as a good lubricator inside the meter.

The last thing either Mr. Cusiter or Mr. Young thought of, or was likely to think of at that time, was that such oil, if used in a gas-meter, would rob the gas of its illuminating power. Neither of them knew in the least that such a thing could happen at all. But they were both experts in matters concerning gas and shale oil; and, if Mr. Young and Mr. Cusiter did not know, then clearly the fact was not known—in practice, at any rate.

To-day, with our present range of knowledge, we might find it difficult to realize that there was a time, and that not so very long ago, when so elementary a fact as this still remained to be discovered or to enter into the domain of practical knowledge. One

might possibly say that Mr. Young was fortunate in the time at which he brought his alert and powerful mind to bear upon the problems of the gas industry, which was then, after an earlier period of great scientific activity, more or less resting on its laurels and relying upon a settled and established routine.

Be that as it may, the two friends, like good men and true, set to work in order to see how far the suggested liquid would serve the purpose; and they were both intensely astonished by the unexpected result that the gas which was passed through the meter, when the meter was filled with this liquid, gave no light, or gave much less than before.

To our minds to-day the explanation would appear perfectly clear and simple. Evidently the oil had robbed the gas of something in it to which its illuminating power had been due; the oil had dissolved something out of the gas.

But Mr. Young and Mr. Cusiter had to begin at the beginning and interrogate Nature by experiment in order to reach an ex-

planation of the strange phenomenon. Unhappily, Mr. Cusiter died at a very early stage of the inquiry, which was carried on by Mr. Young; and, very fortunately, the inquiry had fallen into exactly the right hands. It did not result in a barren statistical paper to some learned society—say, upon the “Coefficients of Mutual Solubility of Hydrocarbons of the Paraffin, Olefine, and Benzol Groups”—or anything of that kind; for it had fallen into the hands of a man who was not only keen in hunting and following up the essential facts, but also keen in perceiving how they might be turned to account and applied in the practice of the arts to which he had devoted his life, and in regard to which his knowledge was already excelled by none.

The central fact was soon got at, that the heavier oils dissolved the illuminating hydrocarbons out of the gas, and that then these hydrocarbons could be recovered from the spent oil by volatilizing them out and condensing them into the form of light spirit. But to Mr. Young's practical mind this immediately suggested a prac-



tical problem, and the solution of it in another sphere—not in that of gas manufacture, but in that of shale oil-making.

Some of the members of the North British Association of Gas Managers may remember the appearance presented in many a place by night at that period—“Dixon's bleezes” and all the rest of it—the countryside being illuminated at night by enormous flames of products running to waste, which are now more economically if less picturesquely recovered and collected for sale and for use. The shale oil industry, in the same way, suffered, perhaps without much sense of suffering, since at first very high prices were obtainable for the paraffin that was actually made. But still it suffered—in the sense, if you like, if permitted—a continuous loss of products in the waste shale gases. These waste shale gases were really a very good permanent illuminating gas, and for many years Bathgate and Mid-Calder were supplied with gas from the shale works. But in most works these waste shale gases had to be got rid of, though they deserved a better fate.

Mr. Young's practical mind at once suggested to him that the new principle might enable something of value to be recovered from these waste shale gases; and he devoted himself to experiments, which lasted for several years and opened up quite a range of successive new ideas, and, we may say, gave him a splendid training in the exercise of his wonderful observing faculties.

EARLIEST ASSOCIATION PAPER.

Meantime, although personally engaged in the shale oil industry, he had not forgotten the gas industry, whose problems, being in a sense the converse of his own, cast light upon the questions he was more immediately concerned with. And so we find him at last, in the year 1874, reading a paper before the West of Scotland Association of Gas Managers (now merged in the North British Association of Gas Managers) upon “The Absorption of the Illuminating Constituents in Coal Gas by Heavy Hydrocarbons.” in which he announced the fundamental facts as discovered by

Mr. Cusiter and himself, and afterwards by himself, and pointed out some respects in which the knowledge of these might be of service to the gas industry.

It is strange nowadays to see what a sensation this paper produced at the West of Scotland meeting. The facts brought forward were all new and strange to the members of the Association, which comprised names we have all traditionally borne in high respect. Mr. Key, of Acerington, said they were peculiar, and sufficient to make us wonder.

The paper itself was a very plain and simple one, and very modest, but, at the same time, within its limits, very masterly. He told how, in the gas-meter, oil of '840 brought down 35-candle gas to 16.1 candles, and the bromine condensation from 17.4 to 6.2 per cent.; while with 28-candle gas the candle power fell to 14, and the bromine condensation from 11.8 to 5 per cent. He narrated the different effects produced with paraffin spirit of '768 and '810, with ordinary burning oil of '820, with refined oil of '840 and '860, and with blue oil of '895, and showed that, while the effects were all similar, the heavier the oil the greater was the effect. Then he proceeded to show—and this lies at the basis of much of his subsequent work—that the effects produced depended upon the temperature. For example, that, while with oil of '768, used at 50° Fahr., the loss of candle-power from 28-candle gas was only 5 per cent., if the oil had a temperature of 60° there was no loss of candle power, and at 70° there was a positive gain of 7 per cent.; and, further, that they also depended on the mode of handling, so that heavy oil, which could take away 65 per cent. of the illuminating power if the gas were simply bubbled through it, could take it entirely away if the gas and the oil were shaken up together. Then he showed that where the gas lost in illuminating power the oil gained in weight, and that the heaviest oils were found to gain most in weight. Then, to what material was this gain of weight due? It depended on the nature of the gas treated. When the spent oil was gently distilled it gave off a permanent gas and a volatile liquid; when the gas treated took its origin in a low temperature distillation, the liquid obtained (sp. gr. '703) was very like a paraffin spirit, whereas if the gas treated was coal gas, from what was then called a high temperature distillation, the liquid obtained was of sp. gr. '852, and closely resembled the first runnings of coal tar distillation, containing benzol and other hydrocarbons.

Now, having established his fundamental facts, we see the real Mr. Young beginning to emerge with his thoughtful suggestions. Plain and simple they are at this stage, but they are only his trial flight, and we shall see wider sweeps later on.

He suggests, then, that these facts may be turned to account in examining the nature of the illuminating constituents of gas. These might be such as to drop illuminating power on the way to the consumer; or, again, they might not. It depends on the coal and the temperature of distillation. Hitherto we have only had the bromine test to rely on, but this is inadequate; and it is better to get the actual illuminating constituents themselves out of the gas and to examine them. The suggestion is followed up by demonstration of an apparatus for the purpose of ascertaining the data, and by showing how to calculate out the results, and the remark is made that by returning the liquid to this apparatus in fractional instalments we can, from the vapour-tensions observed, ascertain precisely how far the gas is permanent at different temperatures. Such data would be of practical value as enabling the gas manager to select those coals which gave the most permanent gases at moderate temperatures, or else so to regulate the temperature as, from the point of view of permanence of the gas obtained, best to suit the particular coal in use.

Incidentally Mr. Young remarked, in the course of the discussion—and this is the germ of much that has followed since—that the naphthalene dissolved out from gas by heavy oils would tend to be retained by them upon re-evaporation, its boiling point being so near that of the oils.

It is worth while stopping for a moment to consider what Mr. Young's position was at the time. What was the novelty in his observations, and what was he in quest of in his practical experimenting? As to the novelty, it could not be, and was not, that he was the first man who knew that tars contained benzols and other valuable volatile components, or that some tars contained more of these components than others, and must therefore have got them from somewhere, or that gases deposit them in the tars if cooled down sufficiently, or that the tars would give them up to the gases if heated up sufficiently in contact with them. All this was already well known, and formed part of the stock of public general knowledge. What he found was that the fractionated oils, from intermediate to heavy, would extract from gases the illuminating constituents, what we may call the gasolene products, and that to such an extent that even ordinarily permanent gases were absorbed. That was the novelty which was the outcome of the almost accidental observations made upon the effect of intermediate oil used in a gas-meter, and it was to the application of this in shale oil works that Mr. Young's attention was mainly directed during all the years of experimenting to which reference has been made.

But then, it has to be observed, that while Mr. Young had been devoting himself to his practical experimenting on the shale oil side, time had been slipping away, and other workers in the same field had not been idle, and a select few had come to realize that there were possibilities in the use of oils for absorbing and recovering light oils from waste shale gases. It appears that they did not at first, or at all, reach the stage of success which Mr.

Young ultimately attained; but they did apparently attain some success, which gave rise afterwards to a sharp passage at arms, to which reference will be made later.

THE AITKEN PROCESS AND THE AITKEN-YOUNG PROCESS.

Mr. Young was not the man either to forget the gas industry or to fail to draw inferences as to what ought to be done in the converse case of gas manufacture where the problem would be not to get hydrocarbons out of gas, but to keep them in it. His mind naturally ran at all times to the comparison of converse cases; and to this peculiarity much of his success is due. And be it remembered that the use of the Coffey still was well known in the chemical technology of the time in relation to the separation of alcohol and water; so that it would presumably have been quite easy for Mr. Young, given the analogous problem of separating volatile hydrocarbons from a solvent, to form a clear idea, even though he were not experimenting on the gas manufacture side at the time, that the way to set about solving the problem would be by the use of some kind of Coffey still arrangement.

Still, so far as questions of priority of statement of a Coffey still method of withdrawing the volatile hydrocarbon from the solvent and keeping them in the gases, for gas-making purposes, are concerned, there is no doubt that the priority of statement belongs to Mr. Henry Aitken, of Falkirk, who had, prior to Mr. Young's 1874 address to the West of Scotland Association, put in an application for a patent for a combined method comprising, among other things, the washing of gases by the tars in a kind of Coffey still. The date of the application (No. 2587 of 1874) was July 24, 1874; Mr. Young's paper before the West of Scotland Association was read on Oct. 10, 1874; and Mr. Aitken's patent was completed on Dec. 29, 1874. Mr. Aitken had several ideas. One was that gas would deposit hydrocarbons if it deposited moisture, and would not hold-up so much hydrocarbon if it contained moisture as it would if it were completely dry; so that if you are going to enrich gas you must first pass it over absorbents to take out the moisture. Another, and more to the purpose here, was that if you are going to use oil as a liquid in wet meters, you must use oil saturated with light spirit. Another was to maintain the gases at a sufficiently high temperature, whereby either the gases are prevented from depositing their hydrocarbons in the tars or else the volatile hydrocarbons become revolatilized from the tars into the gases. And, lastly, he showed a form of apparatus for treatment of the crude gases, in which there were several features to note. Of these, the first was that the tars as condensed were made to flow back towards the hydraulic main; light hydrocarbons which had deposited in them would be revolatilized into the gas; the gases would carry them forward to the condenser; there the light hydrocarbons would be in part deposited; and the gas would leave the condenser saturated with these light hydrocarbons. But the gas was not yet done with; it was again passed over the hot-tar cistern to give it an opportunity of picking up more of these light hydrocarbons at the higher temperature of the hot-tar cistern; after it had left the hot-tar cistern it was again subjected to condensation and dropped what it had picked up from the hot tar; and thereafter it was sent out, saturated with light hydrocarbons at the atmospheric temperature. Then Mr. Aitken went on to show a method of treatment of the gases which in the text of the specification he described as carried on by successive stages. Take, for example, the gas at 200° Fahr.; cool it down to 150°; it will then, even though clean at 200°, contain precipitated tar particles. Baffle or filter these out. For this, various means are suggested, such as coke, &c.; but filtering through wire gauze is one of the means mentioned. After this filtration the gas is again clean, and is then subjected to another drop of temperature, which causes fresh precipitation and involves another filtering; and so on until the gas is brought down to the atmospheric temperature and leaves the condenser, saturated with the light hydrocarbons and freed from the tars. And then, particularly in the drawings, Mr. Aitken shows how this stage-by-stage treatment can be carried out in a kind of Coffey still. In this the bottom, where the tar collects, is kept hot and the top is cool. The gas as it enters at the bottom sweeps over the hot tar and is made to ascend in a zig-zag course between trays, in which the products of tar precipitation collect, overflow, and drip into the successive trays beneath, all the way to the hot-tar cistern below. The gas is not allowed to ascend from one tray to the one above without having to pass through a filter (say) of wire gauze, upon which the tar particles deposit, coalesce, and trickle into the tray immediately below—thus starting on their course, as tar in bulk, from tray to tray, towards the hot-tar cistern below. But as the tars descend they meet increasing temperatures, and are obliged to surrender to the gases more and more of the light hydrocarbons they may contain, so that by the time they reach the hot-tar cistern they contain but little of these. Then, in addition to all this, the settling of tar fog was promoted by sending gas at 190° Fahr. into a very large settling chamber, and keeping it there for as long as possible at that temperature; and, further, the capacity of the gas for retaining light hydrocarbons was kept at a maximum by removing the aqueous vapours. Such, then, is an outline of the Aitken patent of 1874, which was published in the early part of 1875.

Mr. Aitken and Mr. Young were very close friends, afterwards associated in the Aitken and Young process for condensation in gas manufacture, which for so many years reigned supreme; and the suggestion might occur to one that Mr. Aitken was more or less inspired by what he knew of Mr. Young's experimental work on shale gases. In fact, Mr. Young himself at a later date, in one

of his historical *résumés* (see "JOURNAL" Vol. 88, p. 241), goes farther, and says that the application of the Coffey still in Mr. Aitken's patent was his own device, though elsewhere, as we shall see, he gives the credit to Mr. Aitken for the filtering action of the wire gauzes. Be that as it may, it was the modified Coffey still part of the combination which proved of value, and we shall soon find Mr. Aitken and Mr. Young associated in a joint patent for an improved use of this.

MR. YOUNG AS AN EXPERIMENTAL LECTURER.

This brings us to the beginning of the year 1875. In April of that year we find Mr. Young reading a second paper to the West of Scotland Association, on "Condensation in Crude Gases." For myself, I might almost say that I feel grateful to the Council of the North British Association of Gas Managers for having allotted to me a task which has made me turn up and read in the "JOURNAL OF GAS LIGHTING" this lecture or address of Mr. Young's. It has produced a great impression on my mind. One cannot go far in reading it without perceiving that, though it was only his second flight, Mr. Young was already a past-master in the art of experimental lecturing. The address, as reported, bears the marks of a kind of nervous but straightforward and confident earnestness, which makes it very telling even to read. It is no wonder that, as I am told, those who were privileged to hear these early addresses by Mr. Young have never lost the recollection of the impression that was produced upon them—such impression being possibly even greater than that produced by Mr. Young's more elaborately prepared and more comprehensive papers of later periods.

In this experimental address, then, Mr. Young followed up the preceding address by propounding a conundrum, which arose out of the practical experience of those before him. The idea upon which they all worked was to leave in the gas as much hydrocarbon vapour as possible, consistently with permanency in the gas sent out. The gas, as sent out, left the tars behind it; and in the tars there was light naphtha, 2 to 10 per cent., according to circumstances. But the gas was still capable of taking up light naphtha, to the improvement of its own illuminating power. Each 1 grain of light naphtha taken up per cubic foot of 12-candle gas improved the candle power by 5 to 10 per cent. The conundrum, then, was, why should the gas ever have dropped the light naphtha into the tars? What had prevented the gas and the naphtha from keeping together during the manufacture; and what caused the naphtha vapours to be removed along with the tars?

The setting of this poser led at once to a fine series of experiments, in which Mr. Young demonstrated that the more volatile a liquid hydrocarbon, the greater the volume of it which would spontaneously evaporate into a given volume of air or of gas, and, again, that the same result followed from raising the temperature or from reducing the pressure. He took a mixture of air and light hydrocarbon vapours; he introduced a small quantity of heavy hydrocarbons; immediately there was a shrinkage; and the heavy hydrocarbons robbed the air of the light hydrocarbons, or a good proportion of them. Reversing the experiment, he brought air and heavy oil into contact; then he added light oil; the air took up some of it and expanded a little, but not nearly as much as it would have done were the heavy hydrocarbon away. The presence of the heavy hydrocarbon, it was thus shown, very much reduces the volatility of the lighter hydrocarbon. Then, further, the heavier the heavy hydrocarbon, as compared with the light, the greater is this effect; so that very heavy hydrocarbons may even retain olefiant gas. But, then, if you keep on supplying successive doses of light hydrocarbon, the heavy hydrocarbon slackens off in its absorption, and ultimately fails to produce this effect. It has become saturated.

Now turn your attention to the heavy hydrocarbon saturated with light hydrocarbons. Heat it up gently; the most volatile of the light hydrocarbons seems to come off first. After a while the light hydrocarbons have all evaporated out of the heavy hydrocarbon, at a temperature which is higher the more of the heavy hydrocarbon there is present, or the more saturated the air becomes with the vapours. Keeping it all closed in, you then let the whole thing cool to the original temperature; the heavy hydrocarbon re-absorbs all the light hydrocarbon vapours, which are condensed into the heavy, and disappear. But, instead of letting the light hydrocarbon vapours cool down in presence of the heavy hydrocarbon, withdraw the latter and let the former cool down by themselves. They will then partly condense, but only partly. There will therefore, on cooling in the presence of heavy hydrocarbon, be re-absorption of light hydrocarbon vapours where there would not be condensation of them in the absence of these.

Then, further, ordinary coal tar, under certain conditions, has similar properties. Mr. Young passed coal gas over tar which had been denuded of its light naphtha, and showed that this treatment of the gas brought down its flame-length from 5 inches to 4.6 inches, and reduced its illuminating power by 20 per cent. On the other hand, do the same thing with ordinary tar, and little or no effect is produced. But, if you heat up your ordinary tar, it enriches any gas passed over it.

Mr. Young pointed out that all this was instructive as regards the current practice in gas manufacture. The crude coal gas was rapidly cooled to 100° to 150°; the tars were liquefied, but took the form of tar-fog, which travelled along and was reduced to the temperature of the atmosphere before it was stopped. The practice also was to send the deposited tar and the ammoniacal liquor in the same direction with the gas, for the twofold purpose

of allowing the weak liquor to strengthen and of allowing the tar to take up naphthalene and sulphur compounds. This practice Mr. Young stigmatized as objectionable in principle.

Above 100° Fahr. all goes well; the tar particles remain destitute of light naphthas, which they do not absorb from the gas. But below 100° Fahr. they can and do absorb light naphthas from the gas, which they rob of some of its illuminating power, while they themselves are brought to the condition of our ordinary tars.

The practical problem then was, How to prevent the tars from absorbing these light naphthas out of the gas or from retaining them. There are many ways. One of the simplest would be to raise the condensers a little above the hydraulic main and make the tars run back through the hydraulic main on their way to the tar cistern. Then the tars as they travelled would meet higher temperatures; and the light hydrocarbons would be partly revolatilized out of them. But the method preferred is a kind of Coffey still analyzer.

Here Mr. Young gave an account of a Coffey still analyzer arrangement which is so fully identical with the form of Coffey still described in Mr. Aitken's patent, in which the tar particles are filtered off by gauze—except, perhaps, that Mr. Young laid more stress upon running the whole of the condensates back into the analyzer, and the advantage of having plenty of light hydrocarbons present in order to promote precipitation of the tar particles, and also upon the effect of the analyzer in keeping the volatile ammonia as well as the light hydrocarbons out of the tars—that I need not here recapitulate the description of a Coffey still which I have already given when referring to Mr. Aitken's patent. Mr. Young added that shale oil experience showed that the tars were not likely to harden through being kept hot in the hot-tar cistern.

So far, then, for Mr. Young's second paper before the West of Scotland Association, and you will perhaps have noticed three things. First, that his own line of thought and demonstration leads him by a direct path to the use of a Coffey still analyzer; second, that he speaks of the analyzer as something the probable working of which was capable of being illustrated by shale oil experience; and third, that he does not mention Mr. Aitken's name. Now, no one who knew Mr. Young would dream for a moment of thinking that if he meant to describe an analyzer devised by Mr. Aitken he would do otherwise than to say at once that it was Mr. Aitken's analyzer. Be all that as it may, Mr. Aitken and Mr. Young co-operated heartily, and the result was soon shown in their joint application, on the 3rd of August in this same year, 1875, for a patent for the "Manufacture of Gas." This was for what was afterwards known as the Aitken and Young method of condensation, or treatment of gases during condensation, in the manufacture of gas. Coupled with this, in the patent was a method of economizing the carbon in coke containing much ash, and of removing and utilizing the graphite in the retorts.

THE AITKEN AND YOUNG PATENT.

It may be said that the central part of the Aitken and Young plant was the Coffey still as Mr. Aitken had described it, among many other things, in his patent of the year before, and that a number of improvements were made in regard to getting the best value out of its use. For one thing, it itself was made to act as a kind of fly-wheel, storing up light hydrocarbons when the gas was too rich, and giving them out when the gas was too poor. Perhaps it would have done that in any case; but the idea was carried farther. Mr. Aitken's analyzer, as we shall call it, had succeeded in sending the gases on highly charged; but in practice there was always some hydrocarbon vapour retained by the tars. The aim of the new plant was to get as much as possible of this into the gas; and if the gas would not carry it permanently, then to provide gas in order to carry it and to remove the excess of light hydrocarbons which had accumulated in the analyzer. For this purpose a poor gas would do. In a small works, then, one might realize an alternation of this kind—first, go on making coal gas in the usual way from the coal and cannel then used, until the analyzer tars come to contain an undue proportion of naphtha; then run poor gas through, made by steaming the hot residue in the retort. This steaming, naturally, makes water gas at the expense of the graphite on the retort walls and of the carbon of the coke. But any other poor gas might do, as, for example, gas from peat or from spent bark or from sawdust, &c. In larger works the thing would not be quite as simple as this plain alternation. Therefore the specification provides other arrangements for producing bituminous gases and the poor gases apart from one another as required and mixing them in the retort; or condensing the rich gases apart, and enriching the poor gases with the tars from the rich gases; or, again, sending the poor gases and the rich gases both into the analyzer, the rich gases high up, so that their hydrocarbons may be chilled-out and drip down to meet the poor gases struggling up from below; or, again, the tars may be entirely denuded of naphthas by heating them highly.

The process as a whole relied upon the combination of rich gas making with that of water gas or other poor gas—the latter being carburetted by hydrocarbons from the rich gas; upon using the surplus hydrocarbons to enrich a volume of poor gas, either by passing it over the tars or by mingling it with the rich gases (it may be in the retort or it may be separately), and subjecting the whole mixture to condensation, the condensed tars being kept hot; and upon the use of poor coke to make a poor gas for the preceding.

Such, in outline, is the nature of the Aitken and Young process;

but, be it remembered, the central point of it is, after all, the use of the Coffey still, or analyzer, with its fractional condensation. If there were no surplus of hydrocarbons, no excess of naphthas, there would be nothing for the poorer gases to do, and no enrichment for them; they would simply spoil the better gas, except, of course, in so far as, if led directly into the retorts, they might protect the better gas from destruction, as in one of Mr. Young's shale oil patents of 1866. But that would be a different story. A quarter of a century later, in his 1900 address to the North British Association of Gas Managers, looking back over the history of methods in use in gas manufacture, Mr. Young pointed out that such had, in fact, been the experience of the Aitken and Young process. With ordinary coals, there never was a stage at which there were more hydrocarbons than the gas could carry; and the added water gas in that case did more harm as a diluent than it did good by taking up benzol, &c., from the tar. But oils, cannel, and shales always did present such an excess; and the addition of the water gas in these cases was of advantage.

THE CONVERSE PROBLEM.

The next item in order of time is a patent applied for by Mr. Young in September, 1875, for "Obtaining Hydrocarbon Vapours from Gases." This represented the outcome of the long-continued experiments on the recovery of the illuminating constituents from the waste shale gases, to which reference has already been made. It seems to me, if I may say so, that the whole construction is very characteristic of Mr. Young's designing. We have, then, a tower, made up of three parts. An upper part, A, filled with coke; a non-conducting partition, B, between the upper part and the lower part; and a lower part, C which is a Coffey still arrangement. A has an inlet pipe for gas at the bottom and an outlet pipe for gas at the top, opposite to the former, and has also means for letting oil drip down from the top upon the coke which fills A. C has a steam pipe led in at the bottom, and a pipe leads from the top of C to the condenser. There is also an outside worm D, and a closed vessel surrounding it, and the needful connections for operating the following cycle: While the waste shale gases are entering A by the inlet, traversing the oily coke in an upward direction and leaving by the exit pipe—for whatever may be the destination of the denuded gas, the cold oils travelling down the coke in A are led off to the worm D. In this worm the charged oils from D are heated by denuded oils from C; and these charged oils then go to the top shelf of C. Here they meet an ascending current of hot steam; and as they overflow the shelves in C, and descend, they become still hotter, and become completely denuded of the hydrocarbons they had picked up in A. Now they are sent round the worm D to warm it in their turn; and then they are cooled down and sent once more to do duty as cold absorbent oil in A; and so on round the cycle of operations repeatedly. A relatively small quantity of oil is thus made to serve the whole purpose of absorbing hydrocarbons from the gases while cold, carrying them to the steam, and surrendering them to the steam when hot, all in rotation; and the hotter portions of it, denuded of the hydrocarbons, are made to heat up the cooler portions. The steam which has become charged in C is led off to a condenser and the gasoline is there recovered. Then, by way of further economy, to save steam, A is made strong enough to stand pressure; the gases and the oils are pumped into it, and the oil absorbs the gasoline hydrocarbons under pressure, and therefore absorbs considerably more of them, bulk for bulk. The quantity of oil required is therefore reduced by this; and the super-saturated oils very rapidly and readily give up their charge in C, so that less steam is required, and correspondingly less cooling is required in the condenser. Incidentally, the outlets from A must, of course, be controlled so as to maintain the pressure in it; and the expansion at the outlets may be utilized either to work the pumping of oil into A or to help to cool the denuded oil which is to enter. The oil used for these purposes was, under the guidance of experience, intermediate oil of '830 to '860 specific gravity.

This method, the direct ultimate outcome of the early observations on the effect of intermediate oil on the illuminating power of gas passed through it in a gas-meter, at once proved a success; and some years afterwards Mr. Young was able to speak of it as having been the means of recovering millions of gallons of light oils, which might otherwise have gone to waste, from the waste shale gases.

DEVELOPMENTS IN THE AITKEN AND YOUNG PROCESS.

The Aitken and Young process also proved a success. It was well adapted to the current practice of the time, in which there was always plenty of cannel and other rich coal. It found almost immediate acceptance; and it was in no way a long time before it revolutionized the practice of the gas industry. Fractional condensation, with a counter-current, took the place of sending the tars and the gases in the same direction.

Meantime, during 1876, Mr. Young was a prominent figure at the Associations. In April he read a third paper to the West of Scotland Association, on "The Manufacture of Illuminating Gas." After showing the difficulty, or, rather, the impossibility, of hitting off and maintaining an ideal carbonization, under which the maximum sperm value was produced and carried in just enough gas to convey it, and, after critically discussing the various methods which had been suggested for promoting uniformity, he comes to the conclusion that it is not of advantage to crack-up coal tar naphthas, but that they should be used as means of enrichment.

For example, a gallon of coal-tar naphtha, cracked-up, will give from 50 to 90 cubic feet of 16 to 30 candle gas, or a sperm value of, say, about 6 lbs.; whereas the same gallon of naphtha, diffused through 10,000 cubic feet of 12-candle gas, will raise it to 14 to 18 candles, where even the lowest figure corresponds to a sperm value of 68½ lbs. Where we have a thoroughly poor gas used, such as water gas, our gallon of naphtha will bring 500 to 1000 cubic feet of it up to 15 to 20 candles; and the sperm value in such a case is, say, 25½ lbs. The percentage return from the addition of water gas to take up the surplus hydrocarbon is found to be better than from the addition of poor coal; but the difficulty in methods involving the addition of water gas is the difficulty experienced in regulating the access of the latter, so as to follow the variations in the richness of the better gas produced. Any method which would store up an excess of hydrocarbons produced at one time, and would give them off when the better gas was poorer, would get over this difficulty, and would allow the supply of water gas to be maintained more nearly uniform. In current practice the condensers had been set to do too much, to act as purifiers as well as condensers; and the result was that we were providing the very best conditions possible to supply the tar distiller with benzols. The tar distiller uses a Coffey still; this is the idea we ourselves should apply, and it is applied in the Aitken and Young condenser. In this, according to the description of it, the rich gas may be followed by a poor gas to wash out the excess of light hydrocarbons; but the result is quite similar if a richer gas is followed by a poorer gas in one and the same carbonization. If water gas be used, it is best to send it direct into the retorts; for then it appears that it shields the hydrocarbons of the better gas from decomposition within the retort. The right amount of it can be determined by preliminary trial as to the bulk to which the whole may be brought up before the candle power falls below the determined value; then simply see to it that the total make does not exceed so much per ton of coal carbonized. In the Aitken and Young plant, the tars are not allowed to retain nearly as great a quantity of impurities (NH_3 , H_2S , CO_2 , sulpho-hydrocarbon compounds, &c.) as hitherto; these things are left over to be dealt with by the washer. The gas reaches the washer very free from tars; and the washing is much cleaner and more efficient. The water from the bottom of the analyzer is capable of taking up NH_3 , while it is still too warm (Hills) to take up CO_2 or H_2S ; and by regulating the temperature of it we can make it take up NH_3 alone, or else NH_3 along with these other impurities, in addition to the sulphocyanide of ammonium which it generally contains in any case. In remoter districts it might be possible to make the rich gas from good coal, and the required supplement of poorer gas from local supplies of peat and the like.

MR. YOUNG'S FIRST N.B.A.G.M. PAPER.

In July came the annual meeting of the North British Association of Gas Managers; and Mr. Young, who had been elected a member at the previous meeting, made on this occasion his first communication to the Association. He took as his theme a particular use which he had found for the gasoline condensate from waste shale gases—namely, as an absorbent for bisulphide of carbon and other sulphur compounds in gas other than sulphuretted hydrogen. He narrated the accidental observations which had originally led up to the investigations that had resulted in the recovery of the very volatile hydrocarbons from waste shale gases; and he pointed out that, in the condensate, components ordinarily gaseous were held bound by heavier liquid components, ranging up to a boiling point of 350° . The new liquid would serve well for air gas, which was, however, a wasteful thing on account of the inert nitrogen; better for enriching water gas, according to Mr. Spice's suggestion of 1875; best of all for enriching poor illuminating gas; or, failing these, it could be used in the old alcohol-benzol "vapour lamp." Mr. Young's first appearance before the Association was thus a characteristically unobtrusive one. But his announcement that the new condensate had a wonderful affinity for the sulphur compounds in gas, and held on to them through distillation in steam, was destined to bear not a little fruit later on—more particularly in an experimental address, on the "Elimination of Sulphur Compounds from Illuminating Gas," given before the North British Association in 1879. In that paper, to which a brief reference may be permitted in this place, he announced that it was not a *sine quâ non* that a liquid which facilitates chemical action between a gas and a solid, or between a gas and a liquid, should be a solvent for both; and that therefore it was sufficient to wet sulphide of calcium with this hydrocarbon liquid to accelerate the absorption of CS_2 and formation of CaCS_3 to an enormous degree, and that agitating an aqueous solution of NaHS with this liquid also had the same effect in making the whole very powerfully absorbent for CS_2 . This liquid has, however, an independent, powerful, absorptive action upon sulphur compounds other than CS_2 , upon which CaH_2S_2 does not act chemically in any way. The danger of CS_2 revolatilizing into the gas would only exist where the liquid was used as a mere absorbent, without any chemical reaction to take away the CS_2 , and where the counter-current principle was not applied in washing the gas with the liquid. Tar naphtha could be used to take the place of this condensate; but this liquid condensate from waste shale gases is by far the best in actual use. As its hydrocarbons consist largely of paraffins, and not of benzols, it is not acted upon by the chemicals used to remove the absorbed sulphur compounds for the purpose of regeneration of the liquid.

The physical law involved in this latter paper is deserving of attention. It was generally believed at the time that the liquid intermediary between a solid and a gas must, in order to permit a chemical reaction between these latter, be a solvent for both. Dr. Odling had pointed out that an alcoholic solution of KHO would absorb CS_2 , while an aqueous solution would not; alcohol was a solvent for CS_2 , water was not. Sulphide of calcium also acted very sluggishly in absorbing CS_2 , because the moisture on it was not a solvent for CS_2 , as Dr. Odling had explained.

ANOTHER EXPERIMENTAL ADDRESS.

In September of the same year (1876), Mr. Young gave another of his experimental addresses to the West of Scotland Association on the subject of "Condensation." He had pointed out in the course of the proceedings that it was of importance never to allow the heavy hydrocarbons to get into the gas at all, for they settled down in the drip-boxes and robbed the gas of light hydrocarbons as they condensed, to an extent which was really no trifle. Going on then with his own lecture, he gave a masterly *résumé* of the whole subject, with a list of the various products of distillation to refer to, and the problem put, how to separate these. He showed as before the solvent action of tars on the lighter hydrocarbons; coal gas will soften powdered pitch or caked tars; some American trials of pitched wooden pipes for gas had failed because the pitch spoiled the gas and went soft. Therefore get the tars away from the gas as soon as possible, and get the tar-fog separated. How is the tar-fog to be separated? Water will not do it; it does not wet the particles; naphtha does wet them (experiments with soot). Tar-fog can be separated (1) by causing condensation of naphtha vapours on the particles, so that they sink, or (2) by subjecting the particles to impact on surfaces wetted with naphtha. The tars themselves deposit in the first place upon the sooty particles; if the heats in the retort are too high, the soot chokes up the pipes, not being removed by a sufficiency of liquid tars deposited on the soot-particles. Tar which has found its way into the gas as sent out will blacken benzol through which the gas is passed. An experiment in which coal gas is first passed through light spirit, then through medium spirit, and lastly through dead oil, and thereafter gas is sent through the same liquids in the reverse direction, shows, by the great difference in the illuminating power of the flame, that the gas ought to be made to leave in presence of the lighter hydrocarbons, and that therefore we must apply a counter-current principle. The water condensate in hydraulic mains, at, say, 150° Fahr., is caustic ammonia (with some sulphocyanide of ammonium), not sulphide or carbonate at all. The tars hold on to sulphur compounds with great tenacity; and oils containing sulphur compounds, if passed through iron oxide, continue to strike a black colour with a solution of lead, whereas if passed through lime they do not, which shows that the sulphur is not present in the form of sulphuretted hydrogen.

The conclusions we may arrive at are, on the whole (1), we must keep the tars and gas warm until they have physically separated from one another; (2) in order to allow the tar particles to separate out we must keep the crude gas warm and let it travel slowly; (3) we should help the separation by having filtering surfaces wetted with naphtha or light tar oil, such as gauzes with condensates trickling down them, which keep them clean; (4) we must use a fractional process of condensation, in which the tars are repeatedly exposed to the absorption of light hydrocarbons, but are only allowed to escape at temperatures at which they cannot retain the light hydrocarbons, all which involves the application of a counter-current principle; and (5) we should aim at an equalizing action in which any naphthas produced in excess at one moment are held back until wanted by a poorer portion of the gas, subsequently produced. In the Aitken and Young analyzer the top tray is the coolest and contains the lightest naphtha, and all the trays contain a considerable bulk of liquid.

In the autumn of the same year the paper read as above before the North British Association elicited what Mr. Young called "a growl" from the Young's Paraffin Light Company, who said they had been using oil for nine years for extracting hydrocarbons from shale gases. Mr. Young's reply was that he had been able to point that fact out in his own patent; but that they had not obtained his results. The best they had done was a specific gravity of .720, whereas the oil he showed the North British Association members was one of .661, containing gases ordinarily permanent.

A CHARACTERISTIC INCIDENT.

For some time after this the Aitken and Young process was being carefully investigated, in its practical working at Hamilton, by a Committee of the West of Scotland Association, and here a characteristic incident arose. The Committee, after working independently of Mr. Young, drew up a draft report which they invited Mr. Young to come and read and discuss with them. He promptly told them, when he saw their draft, that they had been getting results much more favourable to the process than he had been getting in his own experimental working on a smaller scale at Causewayhead and at Clippens, and begged them to withhold their report and repeat their tests. This they agreed to do, and did so. Working at higher heats in the retorts, and in very cold weather instead of very hot, they obtained results more like what he thought they should be for the purposes of a report. The Committee concluded that an expensive first-class coal in large quantities was not required to produce a gas of high illuminating power, and, further, that the only expense or trouble connected

therewith was the providing of steam to keep up the temperature in the analyzer.

The North British Association also was very much occupied with the Aitken and Young process during the year 1877, and Mr. Young's remarks at the annual meeting were subjected to a very careful and full revision by him, of which the product is to be found in the 1877 "Transactions" of the Association.

We may now, I think, say that we leave the Aitken and Young process behind us. Under the conditions of the time, when much cannell was used, it was most successful. When less cannell was used it enabled the best to be made out of a more ordinary class of coal. And generally, it entirely revolutionized current ideas of the day as to the principles upon which condensation should be carried on in order to attain the ends then in view—namely, the production of gas of a high standard of illuminating power, for free-flame combustion.

NEW PROBLEMS.

New conditions, however, import new requirements; and in the sequel we shall see that Mr. Young was at no time in any way a man of one idea only, and that he kept on steadily increasing his own knowledge and communicating it to his colleagues.

TAR-FOG.

In 1878, he closed the series of his papers to the West of Scotland Association by a remarkable paper on some of the physico-chemical laws relating to gases. A portion of this paper deals with condensation or precipitation by impact. He directed attention to the foggy condition to which sudden cooling reduces tar vapours, and compares it to a drifting mist on a misty day, where the droplets are collected by hedgerows, men's whiskers, and so forth. He referred to the plans which had formerly been tried in order to filter this mist out of the gas—the old breeze-box, the dry scrubbers with coke or brushwood, and Mr. Aitken's mode of filtering through wire gauze wetted with oils; and he drew attention to the method applied in Pelouze and Audouin's separator, which, he said, ought to be better known—namely, that of impact. He showed that a slow impact was not at all effective, but that a rapid blow was necessary in order to make the tar particle adhere. The reason for this appeared to him to be that each tar particle was surrounded by a skin of gaseous molecules; that the skin was elastic; and that the skin needs to be positively broken by the impact before the tar inside can stick to the wall at all. One may pause here to observe that this kind of picture of the tar particle is entirely in accord with present-day explanations of the electrification of air by splashing of water. But then, Mr. Young went on to point out, the sudden cooling which brought down the tar-fog has charged the tar particles with light hydrocarbons; and to prevent this it is only necessary to treat the gas in this way while hot, or to make the tar particles impinge on a heated surface. This could be effected by substituting a suitable apparatus for the hydraulic seal, and working direct from the stand-pipe. This would utilize the pressure, and would also prevent pulsations within the retort. These latter, due to bubbling in the hydraulic seal, Mr. Young had found [N.B.A.G.M. paper, 1877] to be a fertile cause of deposition of carbon in the retort. Testing this suggestion experimentally, Mr. Young had found it to lead to success, after introducing a valve arrangement and driving the gas forward in thin sheets or films instead of in small streams. The end was thereby attained without any sooty tar closing up any orifices; and Mr. Young described two patterns of apparatus which realized this improvement.

In a paper of 1880, before the North British Association, Mr. Young resumes the subject of tar-fog in condensation. He remarks that the Aitken analyzer works well in this respect if it be large enough. Experiment shows that a tar-foggy gas clears itself in a few minutes at 150° , where it will not do so in a long time at 40° . The reasons for this are probably that the tar particles are relatively heavier in the hotter gases, and that they themselves coalesce more rapidly, not only through being more briskly agitated by heat but through being drier. If tar-foggy gas be sent through a horizontal tube slowly, while warmed, the fog is deposited; if rapidly, not. If it be sent downwards through a vertical tube, it carries the fog with it; if upwards, it buoys the particles up. So that with vertical currents, either up or down, there is very little precipitation. Horizontal condensers would promote precipitation, but mostly the current would be too rapid to allow this. A large settling chamber would demand a fall of tar particles through a considerable vertical distance, and a very large vessel indeed would be required in order to allow the gas time enough for clearing up. Dividing the distance of the vertical fall by interposing shelves, as in an analyzer, will work very well experimentally.

SOLIDS AND GASES.

In the same address Mr. Young showed a series of experiments to demonstrate that solid dry naphthalene (on sawdust) has no solvent action on illuminating hydrocarbons in coal gas; that tar oil has; that CS_2 (liquid) has; that dry sulphur does not dissolve CS_2 out of gas; that waste shale gases condensate does; that CaH_2S_2 does not (or very slowly does) dissolve CS_2 out of gas; but that the same, wetted with waste shale gases hydrocarbon, very promptly does. The question then is, why do the solids not absorb? Apparently because the molecules of the solid are so far unfree that they cannot take up from the gaseous molecules,

by resonance, the molecular movement which will enable them to assume the liquid forms; whereas, if the other partner be in the liquid form instead of the gaseous, the molecules of the other partner can act upon them, so that liquid CS_2 can dissolve solid sulphur. Be that as it may, we know that naphthalene, once deposited, needs liquid hydrocarbon to remove it, that dry sulphur in the purifying boxes does not absorb CS_2 , that dry lime does not absorb either CO_2 or H_2S .

Mr. Young then proceeded to explain a scrubber-washer carburettor, in which water and shale gas hydrocarbon liquid were used in alternate trays, through which the gas ascended under floating caps, beneath the edges of which they bubbled through the liquid in the tray. An automatic float arrangement controlled the supply of liquid so as to ensure the liquid coming off of a determinate specific gravity.

PURIFICATION BY AMMONIA.

About this time Mr. Young was very much occupied with the fractional distillation of coal and shale and the recovery of nitrogen from coke in the form of ammonia, on which he read papers to the North British Association in 1882 and 1883. For any further reference to condensation we have to move forward to the year 1887, in which year he read a paper to the North British Association on "Purification in Closed Vessels and the Avoidance of Nuisance in the Manufacture of Coal Gas." This is a very practical paper dealing with a large number of points. The main theme is that, assuming the then new methods of carbonization and steaming be adopted, so as very largely to increase the yield of ammonia, then this ammonia can be used in closed vessels, along with hydrocarbons from the coal carbonized, for purifying the gas from CO_2 , H_2S , CS_2 , and other sulphur compounds; and material may be saved by getting the liquids to dissolve the gases under pressure, which would also enhance the effect by permitting higher temperatures to be used. In this case the conditions are such that you are not to apply the counter-current principle to the revived liquor and the crude gas.

PARTICULAR HYDROCARBONS IN CONDENSATION.

In the course of this paper Mr. Young introduced a brief study, not of the behaviour of "light hydrocarbons" as a whole, but of particular hydrocarbons during condensation.

We know how light hydrocarbons come to be in the coal-tar naphtha; and we know that the gas can take up coal-tar naphtha in the absence of the tars or of heavy oils. But suppose we take coal-tar naphtha which has been deprived of its benzol, and present this to coal gas in the presence of heavy oils. What happens then? The result is that the oils take away that particular missing constituent, the benzol, from the gas; not the whole of it, but enough to restore a balance between the benzol in the gas and the benzol in the liquid, and between these and all the other constituents present. Then, generally, if the naphtha is rich in benzol, so is the gas; if the liquor is rich in ammonia, so is the gas; and so for every other constituent. And, on the other hand, if we want to withdraw from the gas some particular constituent, we add material deprived of that particular constituent, of which it will take to itself its full share. Thus we may take naphtha denuded of sulphur compounds and turn it into the gas in the form of vapour. When it condenses out again it will have taken to itself nearly all the sulphur compounds in the gas. If we use it liquid and in conjunction with a solution of NH_4HS the naphtha will act as a carrier, and will hand CS_2 over to the NH_4HS to form NH_4HCS_3 ; and it will go on with this until the supply of CS_2 from the gas is exhausted. Such a method seems to be quite practicable.

CONDENSATION AND THE PEEBLES OIL-GAS PROCESS.

The next period of Mr. Young's activity was devoted partly to shale oil and ammonia recovery, partly to the scrubbing out of valuable constituents from blast-furnace gases and the like, and largely to the cracking-up of oils for the enrichment of coal gas in the Peebles oil-gas process. Six years went by without his producing a communication to the Association; but in the meantime, in 1892, the North British Association showed its recognition of him by making him an Honorary Member, a distinction which I recollect gave him the deepest pleasure.

In the following year, 1893, he read a paper to the North British Association upon the Peebles oil-gas process, in the course of which he said that, as regards condensation, the principles of the earlier papers had been applied in this process. The condensation was so regulated that the oils were allowed to remove from the gas all the hydrocarbons which would not bear distribution; for this end the condensation was fractional and the gas went out perfectly gaseous. In 1894, he contributed another paper to the North British Association on further developments of the Peebles process, and in 1895 he read to the Association a most luminous paper on "The Chemical Constitution of Illuminating Gas and its Illuminating Value, and the Laws affecting Luminosity." This was, in my view of it, a paper of which the Association may well be proud; but, unfortunately, his reading of it was the occasion of his last personal appearance before the North British Association or before any other. Ill-health pursued him; and he found the tranquillity of his home, on the banks of his beloved Tweed, to suit him best. But his mind was active and stored with observation and practical experience, and his pen was busy; and in the next year, 1896, he sent the North British Association another paper on "The Permanency of Illuminating Gas," a question to the importance of which the new oil-gas pro-

cesses had drawn attention. This subject he dealt with in a spirit of keen scientific analysis.

VAPOUR-TENSIONS AND PERMANENCE.

The vapour tension and the dew-point of a simple vapour correspond, but a mixed hydrocarbon vapour has a vapour tension of its own, a "combined vapour tension" which is the pressure which must be applied in order to start condensation. If this be less than the atmospheric pressure, the mixture of vapours is not "permanent;" if it be greater, it is; and if it remain greater at the lowest temperature it may encounter, it is "permanent" in the gas-maker's sense. This "combined vapour tension" depends upon the temperature and upon the mutual solvent affinities of the gases and hydrocarbons. These solvent affinities keep things in the gas which, by themselves or in the presence of merely inert gases, would have partly condensed out, and when condensation begins things condense out which otherwise would not have done so.

In the early experiments which led up to the Aitken and Young process, the combined vapour tension of commingled liquid hydrocarbons was found to be only about the mean of them separately, and varied with the proportions of each. On distillation of commingled liquid hydrocarbons the constituents came off simultaneously in varying proportions, which depended on the boiling point of each and the proportion of each in the liquid.

In practical working the Aitken and Young gas, though permanent at ordinary temperatures, still gave up hydrocarbons to the oil of the leathers of gas-meters, and the tars were therefore called in to reduce the proportion of hydrocarbons in the gas.

The early experiments showed that the permanency of a gas depended on the treatment it receives during condensation; and the carbonization must be so controlled that there is neither an excess of pitch and naphthalene nor an excess of light hydrocarbons, so that the mode of carbonization or, in oil-gas processes, the mode of cracking-up of the oil, as well as the washing, affects the permanency. In tar-fog the scantier the tars are, the less easily will they coalesce and settle down.

Take a mixture of hydrocarbon vapours, under a pressure equal to its "combined vapour tension," and no more; then add another hydrocarbon. Unless the vapour tension of this is high (that is, unless it be a very volatile hydrocarbon), it will tend to cause precipitation of some of the denser vapours already in the gas.

There is an idea afloat to the contrary that it might raise the vapour tension of the hydrocarbons in the gas, particularly of the naphthalene. This may possibly be true with regard to naphthalene, for naphthalene passes directly from the vapour to the solid state, and thus loses its solvent affinity for vapours and gases. It may be that the condition of naphthalene in the gaseous state may be in some way different; but "I am afraid that the high enriching results that have been obtained . . . have been due not directly to the true diffusion of naphthalene vapours through the gas, but to the presence of enriching hydrocarbon vapours. The presence of these vapours would lead, at higher temperatures, to the naphthalene being taken up in a diffused condition, again to be deposited as solid naphthalene on the temperature falling, but in such an extremely fine state of division that it is carried forward with the gas." The vapours of hydrocarbons (in quantities far short of saturation) do not prevent naphthalene deposits during distribution.

Commercially, Mr. Young pointed out, we ought never to have to send out a gas too rich in order that when it reaches the consumer it may have a proper value.

CONDENSATION IN THE DAY OF NAPHTHALENE TROUBLE.

Here we get the echoes of the naphthalene trouble beginning to sound in our ears. Circumstances were changing. Are we then to figure Mr. Young to ourselves as isolating himself from the problems of the passing day and mumbling the remainder biscuit of an effete system of condensation? Not by any manner of means. He was wide awake to the problems of the time, as is shown by the addresses he subsequently prepared, and the various other products of his pen, and he retained the openest of open minds to the last.

At this period we may say that illuminating power in open flames was still the main thing aimed at; that very high illuminating power was not thought of as much consequence as it had been; that it had become important to secure larger yields as regards the volume of gas produced per ton; that for this purpose higher heats than previously had become habitually used; that with this exception the methods of carbonization had remained much as before, the retorts used being still horizontal or inclined; that the high heats had resulted in larger volumes of gas of a quality which mostly needed enrichment, if the old standard of illuminating power was to be maintained; that it was on the whole of advantage to go to the cost and the trouble of carrying out this enrichment; but that there was one serious drawback to the use of the higher heats—namely, the presence of naphthalene in large proportions in the products of carbonization, and its deposition in a most inconvenient form at the most inconvenient points. Mr. Young took up the consideration of this naphthalene trouble and expended a great deal of thought upon it. One of his contributions to the question was in a paper by himself and Mr. Thomas Glover, read by the latter before the Gas Institute in 1897.

YOUNG AND GLOVER.

In this paper the high heats which had come into ordinary use were referred to as establishing a balance between a sufficiency of

carburetted hydrocarbons to be carried forward with the gas, and a sufficiency of condensable hydrocarbons to come down and prevent choking of the apparatus with a sooty pitch, all this being subject to the condition that the condensates must not remove the carburetted hydrocarbons. Now, the peculiarity of the results under the high heats was there was a great gap in the series of products; the paraffins, with the exception of CH_4 , were mostly absent. Cresoles, high olefines, and higher benzols were comparatively scanty, and benzol and naphthalene stood out among the products. All this made it impossible, Mr. Young pointed out, to carry out fractional condensation. The naphthalene tended to come down in a solid form, in the absence of the higher benzols, the cresoles, &c., which would have condensed into liquids along with it and washed it down into the tars; and, further, the gas went on perfectly saturated with naphthalene and, more than that, contained solid naphthalene in the form of a floating dust. Adding cannel to the coal did some good, in providing a supply of those hydrocarbons which were capable of condensing along with the naphthalene, and washing it down; but a practice of condensation had come in, in which the earlier type was reverted to, and the condensates were allowed the fullest opportunity of taking as much naphthalene as possible out of the gas. Naturally, they at the same time robbed the gas of illuminating hydrocarbons; but these could be recovered, and enrichment was resorted to in order to make up any loss.

The illuminating hydrocarbons in the gas were too remote from the naphthalene, as regards their vapour tension, to affect its condensation. It precipitated as a solid even in their presence. And they had no effect (perhaps if the writer were asked he would say no practical effect worth taking notice of) in the way of acting as solvents and keeping naphthalene up in the gas. The deposition of naphthalene as a solid and, later, the deposition of condensates as liquids are quite independent of one another.

In the paper it is suggested that the coal should be distilled in two portions; one at high heats to make bulk, one at low heats to make hydrocarbons, which will bring down the naphthalene in liquid form, and also may, to some extent, go towards enriching the gas. As alternatives we might have water gas, on the one hand, and on the other a purchased oil used in a scrubber. This would take out the naphthalene in the same way as water takes out ammonia, and the naphthalene may be frozen out of it and removed by a press filter. If benzol be added to the washing oil beforehand, the benzolized oil will allow the benzol of the gas to pass, and will absorb the naphthalene only. The washing might be carried out with the earlier portions of tar distillate. If, instead of using liquid hydrocarbons for scrubbing, we charge the gas with vapours of the required hydrocarbons, then, when these condense out, they carry the naphthalene out in a liquid form. But if too much of them be used in this way, they unduly affect the illuminating power through their solvent effect.

Mr. Young was not able to be present at the meeting, and Mr. Glover indicated that Mr. Young would answer questions as to his proposition that hydrocarbons in the gas had no solvent action upon the naphthalene in the condensate. Mr. Young sent a subsequent communication to the Institute, which appears in their "Transactions" for the year 1897, defending this as a general proposition applicable to all vapours and all condensates. He was probably mistaken in this as a general proposition, and had stated the matter correctly in his paper of the previous year. The writer recollects challenging him about it as a general proposition, universally applicable; and Mr. Young does not appear to have adhered to it as such. No doubt, on the other hand, it does express for practical purposes the facts of the case as regards naphthalene. In this communication Mr. Young made the interesting observation that when a gas containing naphthalene and illuminating hydrocarbons is continuously passed through dead-oils, a time comes when there is no apparent effect upon the illuminating power; it seems as if the dead-oil had become saturated with what it could extract from the gas. Nevertheless, there was a difference. The dead-oil went on absorbing naphthalene, and losing some of the light hydrocarbons it had previously taken up; and in this way an equilibrium of vapour tension is kept up. In the end, the oil becomes unable to absorb any more naphthalene.

FRACTIONAL CONDENSATION OBSOLETE.

Three years later, in 1900, Mr. Young presented another paper to the Gas Institute on "Naphthalene from the Retort to the Point of Deposition." In this paper Mr. Young, after comparing the opposed tendencies—to solution in liquid and to diffusion through gases—manifested during condensation, gave a historical *résumé* of the different ideas which had prevailed as to condensation, and pointed out that in any case the separations are not quantitative. He also compared the distillation of tar with the process of condensation by which the tar is formed, and said that, whereas we might expect the one process to be the exact reverse of the other, this could only be the case if we could have perfect fractional condensation and continuous removal of the products. In practice it is impossible to attain this, either in distillation or in condensation; so that it is impossible to separate two liquids by one distillation or condensation. Reverting to the principles of the Aitken and Young process, he said such processes had their advantages at their date, but the advantages were questionable with high retort heats and excessive quantities of naphthalene in the products. The recent English experience was that there was more trouble with naphthalene when the Aitken and Young principles were applied than when the older plan of sudden cooling

was adopted. The explanation of this is, after all, quite simple. The fractional condensation restricts the solvent affinity of the tars for the vapours of hydrocarbons more volatile than the tars; and naphthalene vapour itself is one of these. The gas while hot, therefore, contains much naphthalene; and as the gas cools down the naphthalene is deposited in the cool end of the condenser. It comes down solid for lack of the appropriate accompanying hydrocarbons. As the gas passes over this deposit it may add to it or it may take from it, according to the local temperature, but in any case the gas goes on, after contact with the deposit, saturated with naphthalene. The position of the naphthalene deposit may therefore fluctuate; that of the tar deposit may do the same; they may even overlap. And Mr. Carpenter very ingeniously makes them overlap by reversing the direction of the gas stream from time to time; so that tars are deposited on naphthalene, and wash it out. Sudden cooling, again, produces tar-fog, and tar-fog either dissolves naphthalene out of the gas directly or, later on, interferes with its assuming a crystalline form. This tends to steady the amount of naphthalene left in the gas, whereas fractional condensation exposes it to fluctuations on account of variations in the temperature of the gas passing over the deposit of naphthalene in the condenser. Sudden cooling, on the other hand, makes the tar-fog dissolve out some benzols from the gas; but the whole quantity of benzols in the gas is so far from saturating it, that a very small quantity of benzol removed from the gas is sufficient to establish an equilibrium.

Under the conditions in question, therefore, the liquid tars ought to be precipitated out and also kept in contact with the gas until the whole is comparatively cold; and for the removal of such naphthalene as still remains in the gas we ought either (1) to wash it out, say, with dense oils from the condenser tars, freed from naphthalene, but with an addition of benzol, or (2) to let into the gas the vapours of liquid hydrocarbons of approximately the same vapour tension as naphthalene, and to condense these and the naphthalene out together, in liquid form. Under (1) if we add an excess of benzol we not only prevent deterioration, but positively enrich the gas; and under (2) it may be noted that cannel coal carbonized at low temperatures gives products which have a very high solvent power for naphthalene, while, as to enrichment, the value is twice as great as when the same cannel is carbonized along with ordinary gas coals.

In 1900, Mr. Young sent to the North British Association a comprehensive and suggestive paper on "The Principles Involved in the Production of Gas by Different Processes and their Relative Values." In this paper he discussed the various uses of coke in gas manufacture, the processes of destructive distillation, and the question how gas should be tested, and what is the best gas to supply under modern conditions. Under the second of these heads he showed how the old Aitken and Young process, with its use of water gas or poor gas, protected the hydrocarbons from decomposition, and threw light upon what happens within the retorts; for within these we may for a considerable length of time have simultaneous or overlapping production of richer gases from one part of the charge and of poorer gases from a more spent region.

SELF-CONTAINED CONDENSATION.

In 1902, a paper under the joint names of Mr. Young and Mr. Thomas Glover, based, according to Mr. Glover, on Mr. Young's notes, was read before the Southern Association. The subject was "Further Suggestions for the Elimination of Naphthalene from Coal Gas," and the problem for which a solution was offered was how to apply the principles of the 1900 paper without having recourse to the tar distiller for the necessary washing oils. In this paper the writers discuss the conditions to be met. Colman and Carpenter have emphasized the important part played by solvents in the removal of naphthalene, and the fact that the condensable solvents are insufficient to dissolve out all the naphthalene made in modern practice; the gas can carry more naphthalene than it formerly could have done, because there is now a greater gap than there formerly was between the saturation point of the gases and that of the tars. However prolonged may be the contact between the tars and the gas, the tars cannot remove more than a limited amount of light hydrocarbons from the gas—not exceeding, say, one-quarter gallon per ton of coal; the tars contain 2 lbs. of naphthalene per gallon, and even pure gas led over this takes up naphthalene in diffusion. The conclusion is that even if the gas and the tar are kept in contact throughout during cooling, the gas will still contain naphthalene under modern conditions, and we must do something more efficient than anything we can do by applying the solvent action of hydrocarbons in condensation by present methods. If we are to operate the removal of naphthalene entirely within the gas-works without the aid of solvent from the tar distiller, we must modify our methods of condensation in some way.

The suggestion made in the paper was, briefly, the following: Collect the denser tars while warm, and endeavour to keep the lighter hydrocarbons in the gas. This latter aim is achieved by (1) collecting the tars from the foul main while hot, and using a tar extractor or a Colman separator on the foul main to treat the gas; (2) passing the hot tars to a cooling and settling tank; and (3) using the cold tar to wash the gas, the hot gas and the cold tar being made to flow in opposite directions.

The cold tar has had the bulk of its naphthalene deposited, and has practically a full solvent value, and it exerts in the counter-current a full cooling and washing effect and removes any naph-

thalene deposited. The tars, as they warm up in the counter-current, give up any light illuminants they may carry, but are not heated-up sufficiently to make them throw off naphthalene. The temperature of the tars could be kept under control to suit the results required.

It was not suggested that very dense tars, approaching pitch, would be suitable; but hot precipitation of tars may thus give a suitable material from the gas itself.

MR. YOUNG'S LAST ASSOCIATION PAPER.

Mr. Young's last paper to an Association was that sent by him, appropriately, to the North British Association in 1903, entitled "Remarks upon the Principles Involved in the Production of Gases from Coal, and Suggestions as to their Application in Future Developments." This paper has no special bearing on the problems of condensation; it is directed to the possibilities of the then future in the management of carbonization so as to produce much ammonia, a large volume of gas in which the principal value would lie primarily in the heating power, and in the utilization, towards such enrichment as might be needful, of the tars obtained. These things all pertain to the region of carbonization, which is in the able hands of Dr. Colman. But we may observe here that this, the last paper of a long series, shows all the earnest intentness of the early papers, the same youthful grasp of the possibilities of the future, with the added breadth of view derived from ripe experience. The ideals and aims of his earlier days, the production of good gas for flame illumination, were all being displaced by newer requirements and conditions; but for the future he saw that there remained for the gas industry a Promised Land of extended usefulness, and surveyed it as from a Pisgah top.

During the brief remainder of his life Mr. Young managed to show a youthful ardour of spirit struggling with ill-health of body. His contributions on various questions of interest to the gas industry—particularly in reference to carbonization—were during this period both numerous and interesting, and will be found indexed in the appendix. Here we find a notable survey of the whole field of vertical-retort working, illustrated by the experience of forty years in both shale oil and gas manufacture. But into this field we do not enter here.

As regards condensation, we may here note that Mr. Young points out that his own early process for the extraction of hydrocarbons from waste shale gases had of late years been identically used for recovering benzols from coke oven, and other gases.

HIS SUBSEQUENT WRITINGS.

During this last period of his life, also, the removal of naphthalene was very much in Mr. Young's thoughts, and in the thoughts of others too. A crop of new methods appeared, to which it is needless to refer in detail. But the claims made for them brought Mr. Young out swinging his cudgels, averring, and, apparently, proving, that all these in which there was any success were mere special cases of the application of the principles of the Young and Glover patent, which applied the principles set forth in the papers of 1897 and 1900 above referred to. Retrospectively, he said the Young and Glover work had its origin in the circumstance that at St. Helens, where they used high heats in the retorts and enriched the product by means of the Peebles oil-gas process, the presence of these light oil vapours in the gas had no effect whatever in preventing the deposition of naphthalene in the crystalline form. The tars had become cracked-up, yielding naphthalene and some extra gas; the loss of liquid tars had resulted in a deficiency of suitable solvent for the naphthalene; light hydrocarbons had no useful solvent action in the gas, keeping the naphthalene up in the gas; the suitable solvents must be supplied as a supplement, either in washing-out the naphthalene or in being added to the gas as vapours, and subsequently being condensed out, carrying the naphthalene down with them in liquid form; and the absence of lighter hydrocarbons in the supplementary solvent might result in the temporary impoverishment of the gas, or, on the other hand, their presence might result in preventing impoverishment or even in enrichment of the gas. When the supplementary solvent was saturated with lighter hydrocarbons, its absorbent action was confined to the naphthalene. A large range of possible solvents was therefore indicated, according to the object in view, so long as they contained proper solvents for naphthalene which would either wash it out or make it come down in liquid form on condensation; and the particular solvents suggested by various workers in the field all came under this general category. And, further, the origin of these solvents might be different, so long as they met this condition. The use of light oils was disclaimed in the patent specification.

The St. Helens experience and the inquiries consequent upon it had put an end to any belief that light hydrocarbons and naphthalene, present together in gas, had any mutual solvent action; but they were entirely in accord with certain experiences of thirty years before in the working of the old Aitken and Young condensation process. This process had been found to be unworkable with gas from Newcastle coal. The fractional condensation had loaded the gas not only with illuminating hydrocarbons, but also with naphthalene, and restricting the operation of the process was of no good, since allowing the naphthalene to remain in the tar resulted in the illuminating hydrocarbons also remaining in it.

Naphthalene elimination processes present a difficulty as regards testing them. There is no very simple test for the quantity of naphthalene present in gas; even Dr. Colman's requires considerable skill; and the immediate working results depend enor-

mously upon previous accumulations of naphthalene in the mains, &c., and upon the drift of these under varying conditions of temperature. But where the gases have been mixed with the vapours of the special solvents, the troubles in the mains much sooner disappear than when we simply wash the naphthalene out of the gas. If persistently applied, the Young and Glover method will, Mr. Young says, "on whatever reputation I may possess, prove a perfect remedy for the worst naphthalene plagued distributing system in the country."

A little later Mr. Young, with his ever-fresh mind and open outlook, points out a new source of the naphthalene trouble—none other than his own cherished radiant heat. He had found that radiant heat of a high temperature has a selective power of destroying the very solvents which are required to prevent naphthalene depositing in the crystalline form—these being the toluol, xylol, cumol, &c., and the phenol, cresol, &c.; and the products of the action of the radiant heat upon these are naphthalene, benzol, CH_4 , H_2 , and small quantities of CO . The naphthalene trouble is therefore promoted with high heats by using relatively small charges or relatively large retorts, and this may help to account for the discrepant results obtained in different works from the same coal.

On this ground Mr. Young at once welcomed the appearance of Bueb vertical retorts, with their full charges. He at once said that such a process ought to be practically free from naphthalene, even where the temperatures are extremely high, but that the gas would probably be comparatively poor in heating and illuminating power, as compared with the gas made in retorts, at lower heats, with a free space above the charge.

But where naphthalene is present, Mr. Young found himself able to comment very favourably on Mr. Browne's drastic and sudden cooling, in the absence of the required solvents in sufficient quantity to work a counter-current condensation without supplementary oils. The underlying principle is the same as that of Mr. Young's Institute paper of 1900, to make the less volatile condensed tars to serve as a solvent; and where the cooling is quite sudden, as in water-tube condensers, the new method may be the best method of applying the principle. Atmospheric condensers, on the other hand, remove the tars while they are still warm, so that these tars do not abstract the naphthalene.

The Aitken and Young process was, from its nature, adapted to high-grade gas; and very early experiments had shown that the lower the grade of gas the less was the benefit derived from the application of the counter-current principle, until, at the lowest grade, there was no gain whatever, and there was, on the other hand, no loss if the tars and the gas were kept together down to a temperature from 65° to 60° Fahr. It is quite possible, therefore, on any system in which tars and low-grade gases run together, to ascertain to what temperature it is possible to cool them before deterioration of the gases begins to set in. This having been ascertained, the remaining question would be how to keep the gases and tars in contact with one another until they do reach the temperature? We have Mr. Carpenter's alternating method, and as an alternative to this we might have a continuous method, as follows: (1) Send cold gas from the condensers into the hot products from the retorts, and thus precipitate tar-fog in the latter; (1a) if of advantage, also spray cold tars from the condenser into the hot products from the retort; (2) send the foggy mixture forward through the condenser until cooled down to the determinate temperature; and (3) separate the tar by a tar extractor. The details of the suggested method would vary according to the conditions of the working, but it would present an alternative way of applying the principles underlying the Young and Glover process.

All this illustrates the open-mindedness of Mr. Young to the end. He had revolutionized condensation and had shown that the ancient ways were wrong as applied to the high-grade gas of the period. But time went on, conditions altered, low-grade gas came in; and under these altered conditions Mr. Young was prompt not only in admitting that the ancient ways might now be the best, but in showing how they could be modified so as to become still better.

A very brief reference may be permitted to Mr. Young's last papers, which were published very nearly two years after his death. They were upon "Gasification of Coal in the Producer," and "Purification of the Resulting Gases."* The former of these is a very sweeping paper of suggestions as to the future of carbonization, and the latter is a development in very simple terms of Mr. Young's early ideas, in his patent of 1881 (which anticipated Claus, but was far simpler in its working) and his patent of 1885 (the use of pressure), for the purification of gas by means of the ammonia contained in the products, used over and over. Mr. Young's faith in the possibility of purifying the gas by means of ammonia never faltered, and in this his last message to the gas industry he pointed out once more the path which should be pursued, with suggestions as to the best possible applications of regeneration and the best utilization of the heat employed.

THE ROMANCE OF IT.

Now, readers mine, we have traced the story of condensation from its small beginnings to the close of Mr. Young's life. I do not know how it may strike you, or whether indeed I may have been able to keep your interest alive thus far; but to me the story, in its gradual unfolding, and its increasing sense of grip

* These papers appeared, in the form of "Communicated Articles" to the "JOURNAL," Vol. CV., pp. 17, 87.—ED. J.G.L.

and mastery, seems to present all the interest of a scientific or technological romance. Observe from what a trivial origin the whole thing grew. Mr. Cusiter's oil, unexpectedly spoiling the illuminating power of a gas-flame away back in the sixties, was not much more complex an object of contemplation than James Watt's mother's kettle was. But the one attracted the attention of a James Watt; the other attracted the attention of a William Young. Many a one might have seen such a phenomenon, but Mr. Young saw into it, saw through it, saw all round it, and he kept on seeing, off and on, for forty years, never ceasing to learn, never wearying in continued observation, in reflection, in experimental work, in practical application to varied and sometimes to diametrically opposed ends, and in adapting the principles which experience had taught him to the ever-changing requirements which changes in the current utilities and purposes of gas and in the mode of its manufacture brought successively in their train. Mr. Young was emphatically not a one-ideaed man; he took delight in the fact that new conditions brought new problems, and that new problems called for new solutions; and when the over-abundance of naphthalene in the more modern gas upset all his special work in fractional condensation, we, having known Mr. Young, can understand him and enter into his feelings when he tells us that his "labours in connection with the evolution of the solution of the naphthalene problem were labours for the love of the subject, a recreation, a pleasure, and were not undertaken with the object of the pecuniary gain they might possibly bring to me." That rings true. Mr. Young was always very pleased when the work led to some reward, and the handsomer the reward, why, of course, so much the better; but I have always been under the impression—and, being his junior counsel, I had some opportunities of forming an opinion—that he might have made a great deal more money if he had been more grasping and pugnacious. That, however, was not his line, nor his conception of life. His true delight was in the work itself; and as he was of the temperament described as "contented wi' little an' eanty wi' mair," and was something more than comfortable in his circumstances in a quiet way. Through the fruits of the work done by him up to the age of forty or forty-one, he was happily enabled to devote himself to the work he loved until ill-health came upon him and hampered him seriously. But even then, in spite of ill-health, he was so interested in the work that his industry was indomitable, and his papers gained in power and breadth with each flight.

The papers on condensation seem to me well to illustrate the consecutively progressive nature of Mr. Young's work. For any given set of conditions the solution of the problem was always complete, comprehensive, and well rounded off; but to Mr. Young that never meant that he had reached finality, and his mind was ever fresh.

POINTS OTHER THAN CONDENSATION.

Space fails me, I am sorry to feel. I would like to invite my readers to consider Mr. Young's work and his method of working in other departments than that of condensation. But limits of space restrict me to a few imperfect observations merely.

Look for a moment on Mr. Young's work on radiant heat. He saw that a free space above the charge brought about good results in coal retorting and bad results in shale oil distilling; and he traced this out until he found that these abnormalities were due to a selective action of radiant heat acting within the free space, and found a physical reason for this selective action. Later, he turned this selective action to account in the Peebles oil process; and later still he traced part of the naphthalene trouble to an undesirable effect of this selective action, and was prepared to welcome the principle of the Dessau working, where such action is excluded.

Or take again his painstaking and thorough work in the recovery of nitrogen from coal or coke or shale subjected to carbonization, work which, along with the rest of his work on shale oil manufacture, maybe said to have saved the Scotch shale oil industry from decay, and which may yet have a great future before it in the gas industry.

Or take his investigations into the purification of gases in closed vessels by ammonia, and his ingenious methods of rendering this easier and more effective by subjecting the gases to pressure. It may be that nothing has yet come of this in practice, but Mr. Young stedfastly regarded it as very practicable, and something is sure, one would say, to come of it in the future.

Or take those far-seeing and suggestive papers of Mr. Young's upon the illuminating power of flames and the relation between this and the chemical constitution of the gas, or his ingenious tracing out of the effect of pulsations in the retort, due to bubbling in the hydraulic seal, as a potent factor in the deposition of carbon as graphite in retorts.

CARBONIZATION.

Any account of Mr. Young's lifework would be necessarily incomplete which failed to give at least a full summary of his work on carbonization. This sketch does not profess to be exhaustive as regards Mr. Young's whole lifework; it has been typically illustrative merely. The subject of carbonization, including the cracking-up of oils, as it presented itself to Mr. Young at different stages during his lifework, is one which will repay the most careful study. We are to learn something about it, especially in its more modern aspects, from the inaugural lecture of the series; and in relation to vertical retorts, the course of Mr.

Young's thought and work, from the early days onwards, has been most interestingly reviewed by himself in the series of five articles on vertical retorts which he contributed to the "JOURNAL OF GAS LIGHTING" not long before his death, and which will be found noted in the index. Let me urge upon my readers first to make a study of these five articles, and then, with the aid of the index given below, to go back to the beginning; to read all Mr. Young's contributions on distillation in chronological order; and to saturate their minds with Mr. Young's principles and his methods of thought and work. I can assure them they will not lose their pains. Any one who will follow up Mr. Young's utterances with regard to any of the subjects with which he dealt, will find him to be always the same sleuth-hound, patiently but perseveringly following the trail, passing by the unessential, instinctively avoiding the erroneous, so that it becomes a real intellectual treat to watch him at his work in its successive stages.

MR. YOUNG'S SCIENTIFIC INSIGHT.

But we can go still farther in company with Mr. Young. We can feel that he had a real scientific insight. Personally he was very modest, and he kept his own intuitions very much out of his published papers. Still, here and there they crop out. His conclusion that there must be an elastic skin film of gas molecules covering the particles of tar in a tar-fog dates from over thirty years ago, but is completely modern in its style; and his idea that white light, as distinguished from coloured light, is due to explosive flashes from disintegrating molecules, is one of the newest things out at the present moment, and in one form or another is shifting the foundations of the theory of light.

Of much that Mr. Young knew and thought there is, however, no record. It is only those who had the privilege of knowing Mr. Young and of being able to discuss the problems of Nature up and down with him who can be really able to judge the depths of his scientific insight and the width of his scientific knowledge. As a student of Nature, I think he was very much the type of man that Michael Faraday was, with the same humility of personal bearing towards the foundation truths which he always earnestly desired to understand, and with the same mental power of vividly visualizing his conceptions. He had the same defect as Faraday, too—the want of the mathematical turn of mind. But he had Faraday's great gift—the gift of clear and interesting exposition; he made you see clearly what it was that he clearly saw in his own mind. And when he was roused to explain things to you as he saw them, I have often been struck by the exceeding likeness of his bearing and expression to those of James Clerk Maxwell—the same intentness, the same kindling of the eye, the same swing back of the head, the same obvious desire to understand the "go of things," and in its degree the same instinctive direct rightness of thought, and, may I add, the same sense of humour and the same candour and limpid sincerity of character.

The natural tendency of Mr. Young's mind was what Buckle says, in his "History of Civilisation," is the distinctive tendency of the typical Scottish investigator, to use the deductive as against the inductive method—that is, not to try a lot of things and see what happens, but to marshal the existing knowledge, to think it well out, to conclude that probably the best method would be so and so, and then to see how it works. This method requires a fulness of knowledge, and that a real and practical knowledge. But this Mr. Young possessed. His atoms and hydrocarbon molecules had become, as it were, personal friends of his own; he knew their ways and could play upon their idiosyncrasies, and guide them to do what he wanted them to do for him.

Mr. Young was thus what we may well call an intensely practical man with an intensely scientific mind. The merely "practical man," he certainly was not; if he had been such, and such only, it may safely be said there would have been no William Young Memorial Lectureship. The merely practical man was defined by Lord Beaconsfield as the man who practises the errors of his forefathers. The "experienced practitioner" I have heard the late Dr. Matthews Duncan describe as a man who had done the thing fifty times the wrong way. Mr. Young himself, in urging the necessity of technical instruction, dismissed the merely practical man, not without a touch of kindly pity, as an "imitative animal," helpless in the presence of new conditions. The purely scientific man, on the other hand, is apt to find himself out of touch with practical requirements; and, though it all comes right in the end (for in the multitude of researchers and of inventors there is safety), there does seem to be a waste of time where we have not the practical mind brought immediately to bear upon the results of scientific research, or even guiding the course which this should take. Lord Kelvin was none the worse as a scientific researcher for having a keen eye to practical applications; on the contrary, these gave vividness to his conceptions, and in many cases made the solution of his problems a matter of urgency—thus preventing the consumption of time in following up side issues. On the other hand, the writer has always maintained that the phonograph ought to have been invented long before it was; the principles of it were clearly understood before, and the application of these in concrete form was to hand all the time, but the practical inventor had not, as the phrase goes, "happened along." The scientific man who makes his individual mark upon science is, however, never very far in spirit from the practical inventor, for he has the power of vividly visualizing his own conceptions, or, rather, his perceptions of the facts and fundamental truths of Nature, along with those of other researchers who have preceded him. It was this power, exercised in the field of knowledge and

inquiry, as well as in that of practical applications, which Mr. Young possessed in so marked a degree.

HIS EXAMPLE REMAINS.

It may be that we have lost Mr. Young all too soon; that his guidance and his long experience of what was practically possible at the two extremes of the scale—gas making and shale oil making—would have been of great service in the period of still further change we are now passing through. He himself felt that there was no longer need to address weighty words of counsel and reproof to gas managers on the subject of their own technical attainments, and that there was no fear as to the future of research in the gas industry being well guided. I am happy to think that Mr. Young took occasion to mention your first Memorial Lecturer as one from whom he confidently expected much.

And it may be that as time goes on, as conditions change, as new problems have to be faced and solved, as new methods replace the old, and as those who knew Mr. Young personally drop out of the ranks of active life—it may be perhaps less easy for those who come after us to understand the immense impression produced by Mr. Young during his long life of activity upon those who came in contact with him, or the reasons which have made it seem none other than an act of filial piety to take due steps to keep his name in remembrance. They will not know the outstanding personality, the striking figure, big, erect, strong looking, with muscles taut and faculties all braced-up, hair early white at top, massively rising above a square brow, full beard of dark brown for many a year, but later of patriarchal hue, dark, piercing eyes that looked straight at one and through one, but with a kindly and almost a shy glance, and an unassuming willingness to see all the good that was in one. They will not know his warm hand grasp and his kindly ways; they will not have the privilege of being inspired by the feeling of having come in contact with one of the master minds of our time; they may even lose touch with his personal influence so far as to say, in time to come, that, after all, his record is that of a lifework which was applicable to, and of value only for, old conditions which have passed away. All that may be, but the example of the manly man who rendered such services to the industries of his native country, and indirectly to those of the whole world, who in his sphere so nobly served his day and generation, who bent his mind to his lifework and pursued his labours in the face of ill-health in the spirit of the injunction, "What thy hand findeth to do, do it with thy might;" who cheerfully accepted the consequences of changes in the surrounding conditions even though these might, to a smaller mind, seem vexatiously to bring to nought much of his own previous teaching, laboriously worked out by him, and who for the love of the

subject, as a recreation, a pleasure, laboured to meet these changes which he welcomed; who, confident in the glad prospects of a new era of wider utilities for gas manufacture and of wider possibilities therein, devoted his failing days to preparing a parting message of directions and encouragement to the gas industry whose work he loved—such noble example can never die away nor fail to continue to our successors some at least of the stimulus, inspiration, and guidance for which the present generation has been so deeply indebted to William Young, so long at least as the William Young Memorial Lectures shall endure. And may the day never come when the gas industry shall have died out, and the lifework and the example of William Young have become lost to the memory of men.

At setting out upon the duty which the Council of the North British Association entrusted to me, I felt my own inadequacy; I feel it still more now on laying down my pen. The man was so much greater than anything that can be said about him, and he is his own best interpreter. Let me urge all my readers to make a careful study for themselves of the writings and the recorded utterances of Mr. Young, and I can assure them, as I said before, that they will not lose their pains. Even the dissertations in his successive patent specifications are themselves of great interest, as setting forth the state of the art from time to time, the problems which had to be faced, and the solutions which presented themselves to his mind.

In order to assist those who may wish to make the careful study I have recommended, I have added a complete index, or as nearly complete an index as I have been able to make, of all Mr. Young's recorded utterances and published writings on technology. This index was made for the Trustees of William Young; and it is by their kind permission that I am enabled to furnish forth my own inadequate words with this addition, which, I am convinced, should be of abiding interest and value to workers in all parts of the world.

I am informed that in connection with these pages it is proposed to reproduce a photograph [p. 649] of Mr. Young for which I am responsible. There is, I think, more of Mr. Young in this than in any other photograph of him which I happen to have seen. He was at the moment keenly interested in an exposition I had just given him of the difficulties encountered in taking a photograph under the existing conditions of lighting, and I had just shown him on what principles I came to the conclusion that an exposure of as much as seven seconds would be required. He willingly threw himself, full of interest, into the task of sitting still for the required seven seconds; and the result is as you see it. The photograph was taken in his own greenhouse on a bright winter day, and there was ice on the outside of the window-panes.

INDEX OF VARIOUS CONTRIBUTIONS TO TECHNOLOGY

By MR. WILLIAM YOUNG.

1866—1909.

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ABBREVIATIONS.

N.B.A.G.M. or N.B.A.	= North British Association of Gas Managers.
N.B.A. <i>Trans.</i>	= Transactions of the North British Association of Gas Managers.
W.S.A.G.M.	= West of Scotland Association of Gas Managers.
J.G.L.	= "Journal of Gas Lighting."
G.W.	= "Gas World."
King's Reps.	= King's "Reports of Gas Associations" (J.G.L. Office, annually).

Date.	Description.	Subject Matter.	References.
1866	4 May. Patent 1278/66; Wm. Young and Peter Brash.	Distillation of shale, &c.; re-distillation.	Printed Specification.
17 Sept.	" 2380/66; Peter Brash and Wm. Young.	Oil from shale, &c.	" "
1867	3 March. " 650/67; Wm. Young and Peter Brash.	Distillation of bituminous substances.	" "
4 May.	" 1315/67; Peter Brash and Wm. Young.	Lamps for hydrocarbons.	" "
1870	4 April. " 1014/70; Wm. Young and Peter Brash.	Manufacture of illuminating gas.	" "
1872	21 Aug. " 2487/72; Wm. Young, Peter Brash, and Andrew Scott.	Producing gas and oil from coal, &c.	" "
1874	8 Oct. W.S.A.G.M.; paper by Wm. Young.	"The absorption of the illuminating constituents in coal gas by heavy hydrocarbons."	J.G.L. xxiv. 571.
1875	2 March. J.G.L.; letter.	Steam-jet exhausters.	" xxv. 284.
23 "	" "	" "	" xxv. 401.
27 April.	" "	" "	" xxv. 597.
29 "	W.S.A.G.M.; discussion.	Malam's process.	" xxv. 769.
29 "	" paper by Wm. Young.	"The condensation of crude gases."	" xxv. 803.
	[9th July, Mr. Young became a member of the N.B.A.G.M.]		
3 Aug.	Patent 2725/75; Henry Aitken and Wm. Young.	Manufacture of gas.	Printed Specification.
28 "	W.S.A.G.M.; discussion.	Malam's process.	J.G.L. xxvi. 476.
7 Sept.	Patent 3137/75; Wm. Young.	Obtaining hydrocarbon vapours from gases.	Printed Specification.
12 Oct.	W.S.A.G.M.; discussion.	Malam's process.	J.G.L. xxvi. 584.
7 Dec.	J.G.L.; letter.	Gas-exhausters and deposit of carbon in retorts.	" xxvi. 828.
28 "	" "	Gas-exhausters and deposit of carbon in retorts.	" xxvi. 941.
1876	27 April. W.S.A.G.M.; discussion.	Steam-jet exhausters.	J.G.L. xxvii. 734.
27 "	" paper by Wm. Young.	"The manufacture of illuminating gas."	" xxvii. 778.
14 July	N.B.A.G.M.; discussion.	Key's method of adjusting the seal on dip-pipes, and otherwise reducing pressure in retorts.	N.B.A. <i>Trans.</i> 1876, p. 23; J.G.L. xxviii. 243.

Date.	Description.	Subject Matter.	References.
14 July	N.B.A.G.M. ; paper by Wm. Young.	"The utilization of the gases resulting from the destructive distillation of shale in the manufacture of paraffin oil."	N.B.A. <i>Trans.</i> 1876, p. 28 ; J.G.L. xxviii. 279.
11 Aug.	Patent 3173/76 ; Wm. Young.	Carburetted air and gases.	Printed Specification.
28 Sept.	W.S.A.G.M. ; paper by Wm. Young, and discussion.	"Condensation."	J.G.L. xxviii. 665, 703.
9 Oct.	Patent 3894/76 ; Wm. Young, Alex. Wilson, and Alex. Young.	Distilling bituminous substances.	Printed Specification.
21 "	J.G.L. ; letter.	Recovery of light oil in the distillation of shales.	J.G.L. xxviii. 594.
29 Nov.	Provisional Specification 4613/76 ; Wm. Young.	Gas making.	Printed Prov. Spec.
6 Dec.	J.G.L. ; second letter.	Recovery of light oil, &c.	J.G.L. xxviii. 876.
1877 29 March.	Patent 1246/77 ; Wm. Young.	Distilling coal and making oil and gas.	Printed Specification.
26 April.	W.S.A.G.M. ; discussion.	Aitken and Young's process.	J.G.L. xxix. 786.
26 "	" "	Peebles' gas-governors.	" xxix. 834.
26 "	" "	20 and 25 candle standards.	" xxix. 835.
13 July.	N.B.A.G.M. ; "	Aitken and Young's process.	J.G.L. xxx. 283 ; but this much revised in N.B.A. <i>Trans.</i> 1877, p. 15.
13 "	" paper by Wm. Young.	"The causes affecting the quantity of carbon deposited in retorts."	N.B.A. <i>Trans.</i> 1877, p. 22 ; J.G.L. xxx. 221.
27 Sept.	W.S.A.G.M. ; discussion.	Steam-jet exhausters.	J.G.L. xxx. 647.
27 "	" "	Sugg's illuminating power meter.	" xxx. 685.
27 "	" "	Construction of gas-works.	" xxx. 721.
27 "	" "	Aitken and Young's process.	" xxx. 762.
18 Oct.	J.G.L. ; letter.	Naphthalene.	" xxx. 641.
20 Nov.	" "	Steam-jet exhausters.	" xxx. 868.
19 Dec.	" "	" "	" xxxi. 14.
1878 21 "	Patent 4857/77 ; Wm. Young and Alex. Neilson.	Refrigerating liquids ; treating the same.	Printed Specification.
8 Feb.	" 522/78 ; Wm. Young.	Treating gases.	" "
8 March.	" 937/78 ; Wm. Young.	Cooling or refrigerating apparatus.	" "
20 April.	" 1591/78 ; William Young and George Robertson Hislop.	Revivifying spent lime.	" "
11 July.	N.B.A.G.M. ; discussion.	Value of gas.	N.B.A. <i>Trans.</i> 1878 p. 20 ; J.G.L. xxxii. 204.
11 "	" "	Pressure of gas.	J.G.L. xxxii. 240 ; N.B.A. <i>Trans.</i> 1879, p. 26.
11 "	" "	Bruce-Peebles governors.	J.G.L. xxxii. 241 ; N.B.A. <i>Trans.</i> 1878, p. 30.
15 Aug.	J.G.L. ; letter.	Causes and cure of naphthalene.	J.G.L. xxxii. 307.
26 Sept.	W.S.A.G.M. ; paper by William Young.	"Notes on some of the physico-chemical laws relating to gas."	J.G.L. xxxii. 715.
26 "	" discussion.	Drying of coal.	" xxxii. 751.
1879 29 May.	J.G.L. ; letter.	The analysis of gas coals.	J.G.L. xxxiii. 841.
25 June.	Patent 2537/79 ; Wm. Young.	Using mineral oil products for making gas.	Printed Specification.
10 July.	N.B.A.G.M. ; paper by William Young and discussion.	"The elimination of sulphur compounds from illuminating gas."	N.B.A. <i>Trans.</i> 1879, pp. 10, 16 ; J.G.L. xxxiv. 181.
	N.B.A.G.M. ; paper by William Young and discussion.	"On the proportion of carbon present in gas in relation to its illuminating power."	N.B.A. <i>Trans.</i> 1879, pp. 25, 33 ; J.G.L. xxxiv. 220.
	N.B.A.G.M. ; remarks.	Research fund.	N.B.A. <i>Trans.</i> 1879, p. 51 ; J.G.L. xxxiv. 257.
	" discussion.	Needle governors.	N.B.A. <i>Trans.</i> 1879, p. 21 ; J.G.L. xxxiv. 220.
	" "	Gas compressors.	N.B.A. <i>Trans.</i> 1879, p. 51 ; J.G.L. xxxiv. 259.
	" "	Lime in purifiers.	N.B.A. <i>Trans.</i> 1879, p. 61 ; J.G.L. xxxiv. 301.
31 "	J.G.L. ; letter.	Elimination of sulphur compounds from illuminating gas.	J.G.L. xxxiv. 211.
1880 14 Jan.	" "	Hydraulic main.	" xxxv. 91.
17 April.	Patent 1578/80 ; Wm. Young.	Distilling shale to obtain mineral oil.	Printed Specification.
8 July.	N.B.A.G.M. ; paper by Wm. Young.	"Jottings on the principles involved in gas manufacture."	N.B.A. <i>Trans.</i> 1880, p. 23 ; J.G.L. xxxvi. 299.
	" discussion.	Spence's metal.	N.B.A. <i>Trans.</i> 1880, p. 16 ; J.G.L. xxxvi. 262.
	" "	Scrubbers.	N.B.A. <i>Trans.</i> 1880, p. 12 ; J.G.L. xxxvi. 224.
1881 12 April.	Patent 1587/81 ; William Young.	Making mineral oil, ammonia, and coal gas.	Printed Specification.
21 July.	N.B.A.G.M. ; discussion.	Gas service-pipes.	N.B.A. <i>Trans.</i> 1881, p. 14 ; J.G.L. xxxviii. 264.
21 "	" "	Regenerative gas firing.	N.B.A. <i>Trans.</i> 1881, p. 23 ; J.G.L. xxxviii. 350.
21 "	" "	Malam's second system.	N.B.A. <i>Trans.</i> 1881, p. 36 ; J.G.L. xxxviii. 429.
21 "	" "	Valentine's purification.	N.B.A. <i>Trans.</i> 1881, p. 41 ; J.G.L. xxxviii. 470.
1882 21 March.	Patent 1377/82 ; Wm. Young and G. T. Beilby.	Obtaining ammonia from coal, shale, &c.	Printed Specification.
21 July.	N.B.A. ; paper by Wm. Young and discussion.	"The fractional distillation of coal in connection with gas manufacture."	N.B.A. <i>Trans.</i> 1882, p. 9 ; J.G.L. xl. 257.
21 "	" discussion.	Price of gas.	N.B.A. <i>Trans.</i> 1882, p. 58 ; J.G.L. xl. 399.
21 "	" "	Regenerative firing.	N.B.A. <i>Trans.</i> 1882, p. 63 ; J.G.L. xl. 437.
1883 25 Oct.	Patent 5084/82 ; Wm. Young and G. T. Beilby.	Obtaining ammonia and gas from coal, &c.	Printed Specification.
19 July.	N.B.A. ; paper by Wm. Young and discussion.	"Further notes on the fractional destructive distillation of coal for the recovery of bye-products in connection with gas manufacture."	N.B.A. <i>Trans.</i> 1883, p. 9 ; J.G.L. xlii. 317 ; King's Reps. 1883, p. 135.
1884 8 April.	Patent 6094/84 ; Wm. Young and G. T. Beilby.	Distillation of mineral oils.	Printed Specification.
29 May.	" 8409/84 ; "	" "	" "
1885 31 Dec.	" 16052/85 ; Wm. Young.	Purification of coal gas, &c.	" "
1887 21 July.	N.B.A. ; paper by Wm. Young and discussion.	"Purification in close vessels and avoidance of nuisance in the manufacture of coal gas."	N.B.A. <i>Trans.</i> 1887, pp. 20 and 39 ; J.G.L. l. pp. 202 and 242 ; G.W. 7, pp. 161 and 166 ; King's Reps. 1887, p. 143.
1889 16 March.	Patent 4597/89 ; Wm. Young and Geo. T. Beilby.	Distilling oils.	Printed Specification.
6 Nov.	" 17673/89 ; Coltness Iron Co., Ltd., and Wm. Young.	Treating gases from blast-furnaces, producers, &c.	" "

	Date.	Description.	Subject Matter.	References.
1890	22 Feb.	Provisional Specification 2684/90; Wm. Young.	Treating paraffin wax.	(Not printed.)
1892	5 July.	Patent 12421/92; Wm. Young and Alex. Bell. [Mr. Young made an Honorary Member of the N.B.A.G.M.; N.B.A. <i>Trans.</i> 1892, p. 6]	Decomposing mineral oil gas.	Printed Specification.
1893	17 Jan.	Provisional Specification 1017/93; Wm. Young and Robert Young.	Producing water gas and hydrogen.	(Not printed.)
	23 June.	Patent 12355/93; Wm. Young.	Gas from mineral oils.	Printed Specification.
	5 July.	" 13126/93; Wm. Young.	Producing illuminating gas.	N.B.A. <i>Trans.</i> 1893, pp. 29 and 61; J.G.L. lxii. pp. 262 and 309; G.W. 19, pp. 123 and 184; King's Reps. 1893, p. 152.
	27 "	N.B.A.G.M.; paper and discussion.	"The principles of the production of illuminating gas from liquid hydro- carbons."	(Not printed.)
	7 Nov.	Provisional Specification 21123/93; Wm. Young.	Gas, benzol, &c., from liquid hydro- carbons.	G.W. 20, p. 9.
1894	1 Jan.	"Gas World;" letter.	Tatham and Peebles' processes of gas enrichment.	J.G.L. lxii. 72.
	4 "	J.G.L.; letter.	Peebles process and Huddersfield oxy-oil plant.	" lxii. 154.
	17 "	N.B.A.G.M.; paper and discussion.	"Further developments" of the Peebles process."	N.B.A. <i>Trans.</i> 1894, pp. 43 and 56; J.G.L. lxiv. pp. 236 and 326; G.W. 21, p. 101; King's Reps. 1894, pp. 176 and 191.
	26 July.	" discussion.	Incandescent gas lighting.	N.B.A. <i>Trans.</i> 1894, p. 70; J.G.L. lxiv. 329; G.W. 21, p. 172; King's Reps. 1894, p. 205.
1895	15 Jan.	"Gas World;" letter.	Oil gas enrichment at Huddersfield.	G.W. 22, p. 68.
	17 "	J.G.L.; letter.	Carpenter's paper at Soc.Chem.Industry.	J.G.L. lxv. 178.
	26 "	"Gas World;" interview.	The efficiency of luminous combustion.	G.W. 22, p. 98.
	7 Feb.	J.G.L.; letter.	"Notes on the chemical constitution of illuminating gas, and on some of the physico-chemical conditions which in- fluence the luminosity of gas-flames."	J.G.L. lxv. 317.
	25 July.	N.B.A.G.M.; paper and discussion. [The last paper read personally by Mr. Young.]	illuminating gas.	N.B.A. <i>Trans.</i> 1895, pp. 20, 45; J.G.L. lxvi. 230, 236; G.W. 23, pp. 104, 132; King's Reps. 1895, p. 160.
	4 Sept.	Provisional Specification 16539/95; William Young.	illuminating gas.	(Not printed.)
1896	2 June.	Provisional Specification 11955/96; William Young and George Robertson Hislop.	illuminating gas.	" "
	22 July.	N.B.A.; paper by Wm. Young. [Read in his absence.]	"The permanency of illuminating gas."	N.B.A. <i>Trans.</i> 1896, p. 33; J.G.L. lxviii. 166, 216; G.W. 25, p. 119; King's Reps. 1896, p. 187.
	Aug.-Nov.	Correspondence with A. F. Browne.	Permanency of illuminating gas.	J.G.L. lxviii. 320, 419, 598, 647, 795, 910.
	11 Sept.	Patent 20125/96; Wm. Young, Samuel Glover, and Thomas Glover.	Gas.	Printed Specification.
1897	3 June.	" 13665/91; Wm. Young and John Fyfe.	Retorts.	" "
	15 "	Incorporated Gas Institute; paper by Wm. Young and Thomas Glover, and further com- munication to Institute by Mr. Young.	"Naphthalene in modern gas manufac- ture, and the carburetting of illumina- ting gas."	Incorp. Gas Inst. <i>Trans.</i> 1897, pp. 113, 154; J.G.L. lxx. 16, 26; G.W. 26, p. 1040.
	3 Aug.	Provisional Specification 18085/97; William Young and Alexander Bell.	Water gas.	(Not printed.)
1898	3 Aug.	Patent 8873/98; Wm. Young, W. R. Herring and Alexander Bell.	Gases.	Printed Specification.
	14 Sept.	Provisional Specification 19529/98; William Young, Samuel Glover, and Thomas Glover.	Separating from gases suspended parti- cles, &c.	(Not printed.)
	25 Nov.	Provisional Specification 24891/98; William Young and John Fyfe.	Retorts.	" "
	Nov.-Jan.	Correspondence with C. E. Botley.	Carburation of coal gas.	J.G.L. lxxii. 1167 (1231), 1298 (1362), 1420 (1478), lxxiii. 32 (85), 132.
1899	21 July.	J.G.L.; letter.	The naphthalene question.	J.G.L. lxxiv. 239.
	25 "	Patent 15238/99; Wm. Young and John Fyfe.	Retorts.	Printed Specification.
	31 Aug.	" 17620/99; William Young and Samuel Glover.	Scrubbing and washing gases, &c.	" "
	Aug.-Oct.	Correspondence with C. E. Botley.	The Hastings carburation process.	J.G.L. lxxiv. 490 (542), 602 (652), 705 (769), 825 (887), 944.
1900	31 March.	"Gas World;" interview.	Naphthalene in coal gas.	G.W. 32, p. 504.
	12 June.	The Incorporated Gas Institute; paper by Wm. Young.	"Naphthalene from retort to point of deposition."	Incorp. Gas. Inst. <i>Trans.</i> 1900, p. 144; J.G.L. lxxv. 1712; G.W. 32, p. 1041.
	19 June.	"Gas World;" letter.	The Institute discussion.	G.W. 32, p. 1079.
	4 July.	N.B.A.; paper [no discussion, Mr. Young ill.]	The naphthalene question.	G.W. 33, p. 13.
	26 "		"Jottings on the principles involved in the production of gas by different pro- cesses, and their relative values."	N.B.A. <i>Trans.</i> 1900, p. 63; J.G.L. lxxvi. 282; G.W. 33, pp. 135 and 213; King's Reps. 1900, p. 222.
	29 Dec.	Provisional Specification 23765/1900; William Young and Samuel Glover.	Treating refuse, &c.	(Not printed.)
	31 "	Provisional Specification 23813/1900; William Young, Samuel Glover, and Thos. Glover.	Removing naphthalene deposits.	" "
1902	6 June.	Provisional Specification 12918/02; William Young, Samuel Glover, and Thos. Glover.	Gasification of bituminous coals, &c.	" "
	6 Nov.	Southern District Association of Gas Engineers and Managers; paper by Wm. Young and Thos. Glover.	"Further suggestions for the elimination of naphthalene from coal gas."	J.G.L. lxxx. 1272; G.W. 37, p. 742; King's Reps. 1902, p. 434.
1903	5 May.	J.G.L.; contributed article.	Utilizing water gas in the production of illuminating and heating gases.	J.G.L. lxxxii. 285.
	30 July.	N.B.A.; paper and discussion.	"Remarks upon the principles involved in the production of gases from coal, and suggestions as to their applications in future developments."	N.B.A. <i>Trans.</i> 1903, p. 22; J.G.L. lxxxiii. 298 and 301; G.W. 39, pp. 177 and 181; King's Reps. 1903, p. 205.
1904	Oct.-Dec.	"Gas World;" three letters.	The Leicester remedy for naphthalene.	G.W. 41, pp. 681, 1078, and 1176.
	"	J.G.L.; four articles.	The removal of naphthalene.	J.G.L. lxxxviii. 241, 401, 464, 837

Date.	Description.	Subject Matter.	References.
1904 20 Dec.	Provisional Specification 27771/04; William Young and James Milne.	Removing naphthalene from coal gas.	(Not printed.)
1905 11 March.	J.G.L. and "Gas World;" article.	The removal of naphthalene from coal gas during the process of condensation.	J.G.L. vol. 89, p. 706; G.W. 42, p. 416.
20 "	"Gas World;" letter.	The removal of naphthalene.	G.W. 42, p. 501.
1 April.	" article.	The naphthalene process at Leicester.	" 42, p. 551.
17 Nov.	Patent 23650/05; Wm. Young and Samuel Glover.	Carbonizing coals.	Printed Specification.
12 Dec.	J.G.L.; article.	The removal of naphthalene.	J.G.L. xcii. 742.
1906 5 Jan.	" letter.	Naphthalene experiences at Sheffield.	" xciii. 114.
9 "	" article.	Removal of naphthalene.	" xciii. 98.
	" five articles and sketch.	Vertical retorts.	" xciii. 560, 714, 851; xciv. 95, 163, and 758; and vide xciii. 531.
1909 5 Jan.	} J.G.L.; two posthumous contributions.	{ "Gasification of coal in the producer."	J.G.L. cv. 17.
12 "		{ "Purification of the resulting gases."	" " 87.

Personalia.

J.G.L., vol. 97, pp. 589 (editorial), 593 (biography), 637 (appreciation), 675 (funeral), 700 (*re* sanatorium).
 " vol. 98, pp. 159 (Mr. W. Young's remarks on his namesake at the Waverley Association).
 G.W., vol. 45, p. 1017 (illness).
 " vol. 46, pp. 83 (illness), 303 (biography and appreciation), 358 (will, 20 lines), 612 (will, 10 lines), 645 (will).
 Report of the Alkali Works Inspector for 1907 (p. 218); fine appreciation by Mr. R. Forbes Carpenter.

PROPOSED STANDARD SPECIFICATIONS FOR STREET LIGHTING.

IN the "JOURNAL" for July 11 and 25 (pp. 99, 225), we reproduced from the pages of the "Illuminating Engineer" some of the replies sent to them to a series of inquiries, as to a proposed "Standard Specification for Street Lighting," which were circulated previous to a meeting of the Joint Committee of various Technical Associations who are considering the matter.

It may be a convenience to repeat the list of questions. They were as follows:—

1. Ought the specification to contain a statement of: (a) The electrical energy or gas to be consumed; or (b) the amount of light provided; or (c) both energy or gas consumed and amount of light?
2. Should the amount of light supplied be specified in terms of: (a) The provision of a certain actual minimum illumination in the street; or (b) the provision of lamps of a certified candle power?
3. If illumination is to be measured, should this measurement be carried out (a) in a horizontal plane at a stated height above the ground; or (b) in a vertical plane; or (c) in some other inclined plane such as 45 degrees? (d) Should both the mean and the minimum street illumination be measured and specified?
4. If candle power is to be tested in the street, should (a) the mean spherical or mean hemispherical candle power, or (b) the candle power in several specified directions be tested?
5. Should the contract demand (a) actual measurements in the streets, or (b) only laboratory tests of the competing lamps previous to the acceptance of a tender, or (c) preliminary laboratory tests supplemented by periodical tests of the actual lighting conditions when the lamp is in position?
6. Should any test of the constancy of the candle power of the lamps be prescribed?
7. Do you advocate the introduction of any stipulation regarding the efficient shading of lamps, height above ground, &c., with a view to the avoidance of glare, such as is recognized to be dangerous and inconvenient to traffic and pedestrians?
8. Should any specific colour of the light be prescribed? If so, how should this be tested?
9. What other clauses would you suggest being inserted?

According to the current (September) issue of our monthly contemporary, Dr. Hugo Krüss, of Hamburg, has replied as follows:

1. Under all circumstances, it is of interest and great importance to determine the energy used (electric current or gas consumption), and also the amount of light produced thereby.
2. As a measure of the light, the determination of candle power does not suffice. The resulting mean illumination should be investigated and not the minimum only.
3. No general rule can be laid down as to whether horizontal or vertical illumination should be measured. In the case of illuminants distributed over extensive flat areas, squares, &c., measurements should be made in a horizontal plane; but in the case of streets provided with lamps arranged in a line, the measurements in a vertical plane are preferable. Besides the mean illumination, the maximum and minimum should be determined as a measure of the uniformity.
4. In the determination of intensity, mean spherical and mean hemispherical candle power are not sufficient. The polar curve of light distribution should also be obtained.
5. Measurements carried out in the laboratory are not enough, and should be supplemented by determinations of the illumination in the street.
6. Complete constancy on the part of many lamps (*e.g.*, arc lamps) cannot be secured. It should, however, be prescribed that the light should not vary by more than a certain percentage—say, about 20 per cent.
7. Recommendations are desirable, but must be adapted to the variety of lamp.
8. As regards colour, an approximation to the quality of light yielded by a white cloudy sky should be aimed at.

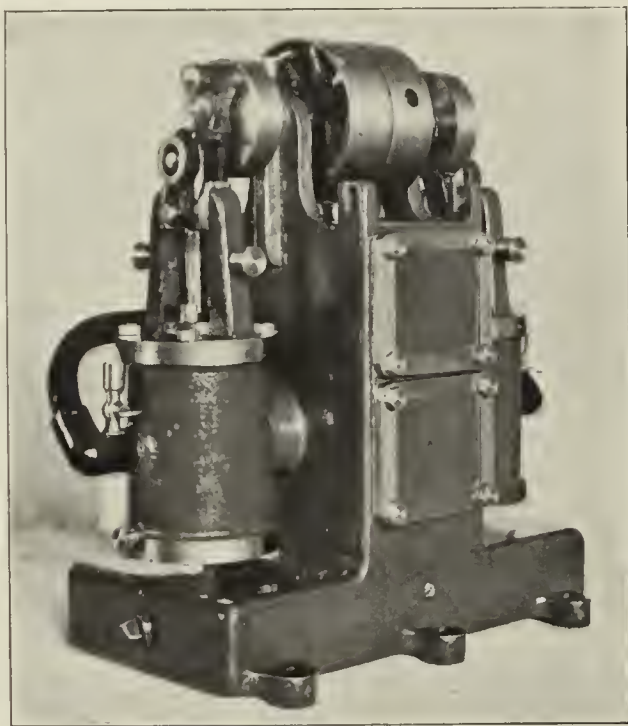
The list of queries has also been submitted, by Dr. Strache, of Vienna, to the Verein von Gas und Wasser Fachmänner in Austria-Hungary; and the Photometric Committee of the Verein has sent the following expression of their views on the various points raised:—

1. The Committee is of opinion that in the case of contracts only the candle power of the lamps to be used should be specified. It should be left to the contracting party to select the most efficient form of burner to furnish the required light. But when the critical comparison of existing examples of street lighting is in question, the consumption of gas or electricity of the lamps should also be stated.
2. In the case of a contract, it would not be practicable to specify the minimum illumination in the street; and it is greatly preferable to require only a certain candle power, as directed in 1. It would be a very tedious process to determine the minimum illumination in all parts of a street beforehand. The securing of a serviceable and uniform illumination is the concern of the local authorities, whose duty it would be to decide upon the number and spacing of the street lamps, and to stipulate how they should be arranged in the contract. But, again, in the examination and testing of existing installations, the determination of illumination is exceedingly important. Not only the mean horizontal illumination, but also the maximum, mean, and diversity factor should be ascertained.
3. The Committee holds the view that, on practical grounds, measurements of illumination should be made in a horizontal plane 1 or 1½ metres from the ground. The illumination of a vertical surface varies according to the plane selected, and is thus not adapted for precise definition. It would, however, be desirable to find a convenient method of rapidly determining the least and greatest illumination which such a surface can receive when turned in all directions.
4. The Committee considers that for purposes of street lighting, mean lower hemispherical candle power should be considered, and that this should be specified in contracts. Tests of mean hemispherical candle power should be made on lamps equipped exactly as they would be in the streets—*i.e.*, with reflectors, diffusing globes, &c. In addition to this quantity, the spherical reduction factor, and the polar curve of light distribution, should be required.
5. As a means of checking compliance with the conditions of the contract, only tests made in the laboratory are satisfactory. For this purpose, measurements carried out in the streets are too unreliable. The same applies to tests of the diminution of candle power in course of time, which should also be carried out in the laboratory. On the other hand, as far as the judgment of street illumination in general is concerned, periodical tests of the candle power and illumination in the streets may be carried out with advantage.
6. In contracts, the permissible diminution in light on the part of specified lamps should be prescribed. In the absence of any specific requirement of this kind, a maximum diminution of 25 per cent. might be allowed.
7. The Committee considers that the height of suspension should be stated separately for each street to be lighted; since the desirable height depends on the breadth of the street, the intensity of the sources selected, and other circumstances. If (under 1) the contract states the intensity of light demanded, but not the nature of the illumination, recommendations regarding the "glare" from the lamps selected are desirable. By "glare" is understood the specific intensity in candles "per sq. cm." of the light-giving surfaces of the source. This shall be taken to apply to the projected area of the illuminating surface in the normal direction of view. This applies particularly to electric glow lamps, for which not the actual superficial area of the filament, but the area enclosed within its limits should be considered. For the eye cannot perceive the actual form of the filament in lamps in the street. The permissible height of lamps must be judged according to the local circumstances; but the impression of glare depends to a great extent on the height of suspension. For street lighting it can be assumed in general that a brilliancy of 100 H.K. per sq. cm. is permissible. If the intrinsic brilliancy exceeds this value (as, for example, in the case of the electric arc) some method of diffusing the light—such as the use of opal glass globes—is desirable.
8. A source of light approaches natural conditions most closely when the colour of its light is as nearly as possible pure white. Artificial light can, in general, be regarded as a mixture of white light with light of some other colour. In a light of given composition, the percentage

of white can be determined by spectro-photometric means; and the minimum permissible value of this percentage could be agreed upon. Convenient methods of determining the percentage have still to be worked out. In order to form a judgment as to the qualities of a given street-lamp in this respect, the distribution of light in the spectrum must be determined.

A VALVELESS COMPRESSOR.

AMONG the numerous high-pressure gas appliances which are supplied by Messrs. Melville, Ingram, and Cree, Limited, of No. 66, Victoria Street, Westminster, S.W., is a compressor of the valveless reciprocating type. It is a well-made machine, and has been designed with the object of securing simplicity by the employment of a minimum of working parts. Since the compressor was introduced some two years ago, over 150 have been supplied in London alone; and it is confidently anticipated that this number will very soon be largely added to—not only in London, but throughout the country, in connection with factories and for other purposes where high-pressure gas for lighting or heating is desired. The compressor is made in two sizes—a double-cylinder type, having a capacity of 1000 cubic feet per hour, at 60 inches pressure (as shown in the accompanying illustration); and a similar machine having a single cylinder, with a capacity of 500 cubic feet per hour. Where power to drive the compressor is not available, a small gas-engine may be substituted; and it is stated that a 1 B.H.P. gas-engine efficiently drives up to four 1000 cubic feet machines.



Double Cylinder Valveless Compressor.

It may be explained that the piston has a transverse central diaphragm connecting the two ends, whereby separate chambers are formed in the piston. Each chamber has an opening in the piston end; the opening of one chamber being at the opposite end of the piston to that of the other. During each stroke of the piston, a partial rotatory movement is imparted to it, so that the admission and emission ports will be alternately open to either chamber. By these means, it is pointed out, each end of the cylinder is open to the emission port during each of its periods of compression, thereby maintaining a practically constant flow of compressed gas or air to the reservoir or burner; while the inlet port is alternately open to each end of the cylinder during the period of suction. Thus the necessity for inlet and outlet valves is done away with. There is a bye-pass connecting the inlet gas chamber with the compressed gas reservoir; suitable means being provided whereby any excess of gas or air in the latter, at any predetermined pressure, is permitted to pass away into the chamber communicating with the source of supply, whence it again passes through the compressor.

Another branch to which the firm are giving particular attention is the supply of irons for employment with high-pressure gas. The special pattern of iron to which they are drawing attention is one which has only a very small aperture all round—just sufficient to allow the products to escape, but not large enough to give rise to scorching of the goods on which the appliance is being used. The irons are made in all sizes, to suit the various requirements of laundries, tailoring establishments, &c.

The advantages of high-pressure gas are now so generally admitted, that Messrs. Melville, Ingram, and Cree have a wide field open to them.

Mr. Ernest A. Stickland, Assoc.M.Inst.C.E., Borough Surveyor of Windsor, has been nominated by the Council of the Institution of Municipal Engineers as President for the year 1911-12.

THE "ROSS" PATENT MANTLE.

THE chief distinguishing feature of the "Ross" mantle is that it is neither knitted nor woven, but braided, not of one continuous thread, but of hundreds of ramie threads which lie loosely across

one another—thus avoiding any tension at the crossing points, and eliminating acute angles, with their attendant danger of cutting the thread. The fabric proper is supported by a strong skeleton of vertical and diagonal strengthening ribs; and it is this skeleton of supporting ribs that has been further improved. Hitherto, these ribs consisted merely of stronger (six-ply) thread; whereas now they are in themselves a miniature braid made on exactly the same principle as the fabric proper of the mantle, thus further adding to the elasticity, and resisting power, of the whole mantle.

The accompanying illustration shows a raw stocking on the mould over which it is slipped in order to obtain the conical shape (and it might be mentioned incidentally that the braided fabric is said to be the only fabric that lends itself to obtaining the natural tapering of the mantle without having to gather the stocking in pleats or rucks at the shoulder, because owing to the braiding, the fabric can be pulled into any shape required. A, B, and C illustrate some of the vertical ribs of the supporting skeleton after they have been pulled taut in shaping the mantle. B clearly shows the braided structure of the individual



rib, as it has been opened out for the purpose.

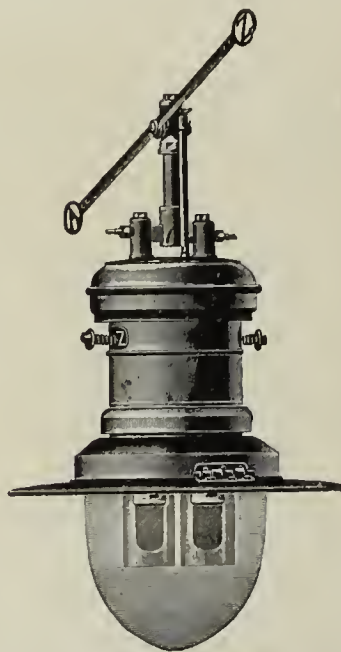
We are informed by the Patent Appliances Company, of 15 and 17, City Road, E.C., that their last season's sales of the "Ross" mantle were three times as great as those of the season before. This shows the rapidly growing popularity of the mantle, which, it is claimed, is an ideal one for street lighting, on account of its singular strength and high efficiency. In consequence of this rapid increase in the output, a considerable reduction in cost has been effected.

"GRAETZIN" OUTDOOR LAMPS.

ATTENTION is drawn by Messrs. J. & W. B. Smith, of Farringdon Road, E.C., to a new type of "Graetzin" high-power low-pressure

inverted outdoor lamp, which is claimed to give about 300-candle power per burner, with a consumption of some 7 cubic feet of gas per hour. It is made in one, two, or three burner sizes. There is a black enamelled wind and rain proof outside casing, with a white inside reflector.

These lamps are supplied with a pear-shaped globe, similar to those used on high-pressure lamps. The globe can be wired, if desired. There are special large size glass inner cylinders and mantles. The gas-regulator is outside the top of the casing, and is operated by a loose key, which can afterwards be taken away, so that the gas adjustment cannot be tampered with. On the top of the gas-adjuster is a nut, and if this is removed, and the gas turned on, any foreign substance can immediately be cleared and blown out. The lamps are also fitted with a special flash bye-pass.

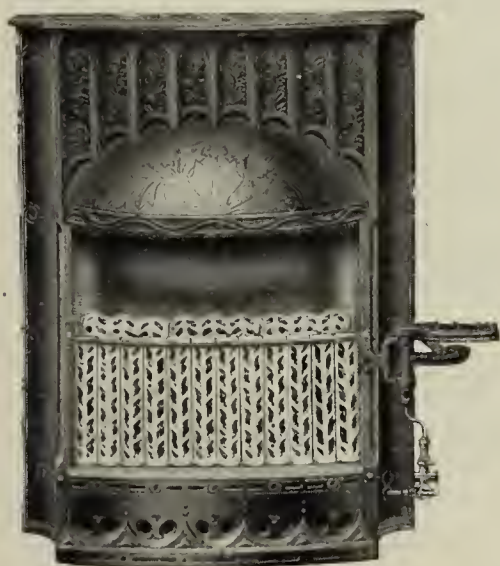


New Type of "Graetzin" Outdoor Lamp.

Carbonizing Chambers in Vienna.—The correspondent who forwarded the photograph of the carbonizing chambers at the Leopoldau (Vienna) Municipal Gas-Works reproduced in last week's "JOURNAL," p. 586, writes to point out a mistake that was, by inadvertence, made in describing the chambers as "inclined." The type of chamber employed is the horizontal, built on exactly the same principle as that adopted by Messrs. Koppers for their coke-ovens.

WRIGHT'S NEW GAS-HEATING APPLIANCES.

HE was a wise man who said long ago, "To everything there is a season;" but to anything so ingeniously devised and so carefully perfected as the gas apparatus Messrs. John Wright and Co. have taught us to expect from them, there is not one season, but many. Their brilliant succession of inventions, beginning with the epoch-making "Wizard," and ending—will it ever end?—have changed heating by gas from the luxury of the few to the daily comfort of the many, and have set the high standard of constructive design, of ornament, and of technical efficiency to which a whole industry is gradually learning to aspire. And, truly, each successive season has seen a fresh crop of new creations emanating from the same source.



"Arch Druid."

This year Messrs. Wright have exercised a wise restraint in resolving to allow the present wide range of their recent inventions to continue, and even improve upon, the success they have already achieved, without for the present increasing "the embarrassment of the choice" by a group of new productions as numerous as in former seasons. Accordingly, this winter's gas-fire programme restricts itself to the augmenting of the existing "Wizard" and "Mascot" series by the addition of two fires which follow the lines originally laid down and hall-marked by wide public approval in successive (and successful) seasons, but go still further in the direction of plain-surface design, so as to present a neutral attitude to any scheme of ornament in the room where the stoves may be installed. This plain class of design, already foreshadowed in the early "Wizard" and "Mascot," also lends itself peculiarly to the porcelain-enamel finishes which have come to stay in gas-fire manufacture.

The "Merlin" is a round-topped fire and its companion the

"Talisman" is of square outline. The "lines" of both fires are exceedingly graceful, and no more attractive fires have ever been offered to the public. Both stoves are made in three sizes—viz., with 10-in., 14-in., and 17-in. fires. A very effective variant on the ordinary black finish is the brass beading ornament with which they can be supplied. Gas authorities who are interested in the keeping down of all maintenance charges—and which of them is not?—will welcome the further extension embodied in the "Merlin" and "Talisman" of Messrs. Wright's original interchangeability method, by which, with the obviously necessary exception of the stove-front and fender, every part of these stoves is interchangeable with the same size equivalent parts of any and all of the entire range of "Thermo X" fires; so that, though a dozen patterns be listed by a gas authority, they only need the one stock of parts, and they can add the "Merlin" and "Talisman" to their hire list without putting a single extra spare part into their stores. The great value of this clever contrivance to the gas undertaking, in pounds, shillings, and pence, is too manifest to be enlarged upon.

To enable consumers who have a "dog" coal-grate to replace it by gas-heating, the "Gelert" "dog" gas-fire will be welcome, as embodying the whole of the latest Essex Works perfectionments, including the duplex burner and the patent "Unitap," in a stove of singularly attractive design.

The trivet burner which Messrs. Wright have pressed on the industry as preferable for hygienic reasons to the old "nursery fire" method is this year improved, and has the original arrangement which automatically fixes it in the position it is moved into, so that accidental displacement is prevented.

Not least is an improved construction of the "radiants," rendering them much more resistant to the dangers of breakage in transit, while conserving all the unique capacity for radiation that has made the "Thermo X" the name to conjure with that it is to-day.

The "Garajo" boiler is another of those successes that look like happy hits to the outside world, but are known to be really the result of "an infinite capacity for taking pains" by all who, like ourselves, have had the opportunity of seeing on the spot the methods of patient and exhaustive experiment that attend the birth, or rather the evolution, of the Essex Works inventions. Such further evolution is now nearly completed, and shortly we hope to give some particulars in these columns of a new boiler of this class, but of greater capacity, and (shall we add) of greater capacities.

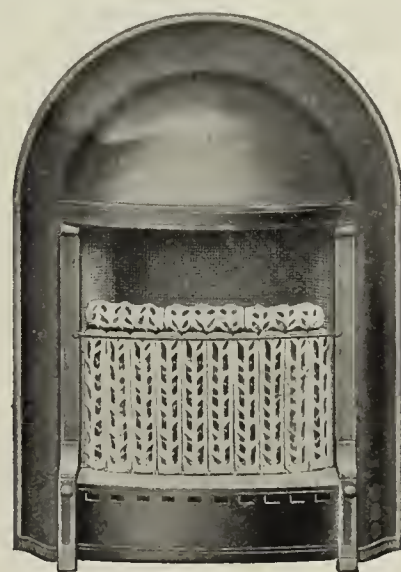
Delivery is much, but despatch is almost as important; and the very success of new apparatus is apt to cause a sudden and extensive demand that may prove an embarrassment as well as a blessing. To grapple with this, Messrs. Wright have been this year building large additions to their already huge warehouses for finished stock. These are now occupied, and they bring up the total floor-space to something like three-quarters of a mile in length; so that the enormous stock of fires they contain should meet the largest possible demand. The last enlargement covers the utmost available inch of land on their very large site; and so Messrs. Wright have bought a further site adjoining, and already the builders are at work on a suite of workshops to accommodate their rapidly increasing gas-furnace business, and to permit of a further increase of their huge foundry.



"Merlin."



"Gelert."



"Talisman."

Lectures on Illuminating Engineering.

A course of twelve lectures on illuminating engineering has been arranged to be given at the Polytechnic, Regent Street, during next winter—from Oct. 31 to Feb. 15. The first six lectures will be delivered on Tuesday evenings, at 7.30, from Oct. 31 to Dec. 5. The two on Oct. 31 and Nov. 7 will be on electric lighting, by Professor J. T. Morris. Then on Nov. 14 and 25, Mr. J. G. Clark will lecture on gas lighting. Mr. E. Scott Snell will deal with oil, petrol, air gas, acetylene, &c., on Nov. 28. The last lecture of

the first set will be by Dr. W. J. Ettles, on "Illumination and the Eye." The second series of lectures will be by Mr. J. S. Dow, who on the Thursdays from Jan. 11 to Feb. 15, 1912, will successively deal with: "The Measurement of Light," "Illumination and its Measurement," "Shades and Reflectors," "Daylight and Artificial Lighting," "The Colour of Artificial Illuminants," "Practical Lighting Problems." The lectures will be open to non-members of the Illuminating Engineering Society at a fee of 12s. 6d. for the entire course, or 2s. for single lectures. They will be illustrated by lantern slides and demonstrations.

SOME DEVELOPMENTS IN GAS FIRES.

WE give to-day some particulars and illustrations of the Davis Gas-Stove Company's programme for the coming winter season.

To deal first of all in a general way with the "New Barless" series of fires for 1911-12, the main object in view all along has been to cut down as much as possible the number of parts to be stocked by gas companies. Standardization and interchangeability of parts, and all other maintenance considerations, have received first care; and the result is a series of fires that achieve a great measure of simplicity, which must make a forcible appeal to every engineering mind. Each of the fires under review is made up of two distinct portions—one useful, the other ornamental. The first is known for trade purposes as the "back," and comprises the burner, fuel, brick, cast-iron back, and canopy in one piece, the gas-controller, and the right and left hand gas-connection. This portion actually constitutes a complete and usable gas-fire in itself. The second portion is a "front" of ornamental design, made in a great variety of shapes and finishes. The illustrations clearly show the principle.

Alluding to what may be called the mechanism of the "New Barless" gas-fires, there are many important points to be noted; and we will here endeavour to touch upon the outstanding ones as briefly as possible. All parts are most carefully machined, so that any variety of front can be transposed at the shortest possible notice, without additional fitting of any kind. The Davis Company are to be congratulated upon the constant combination of



Back.



Specimen Interchangeable Front.



The "Royal."



The "Apollo."

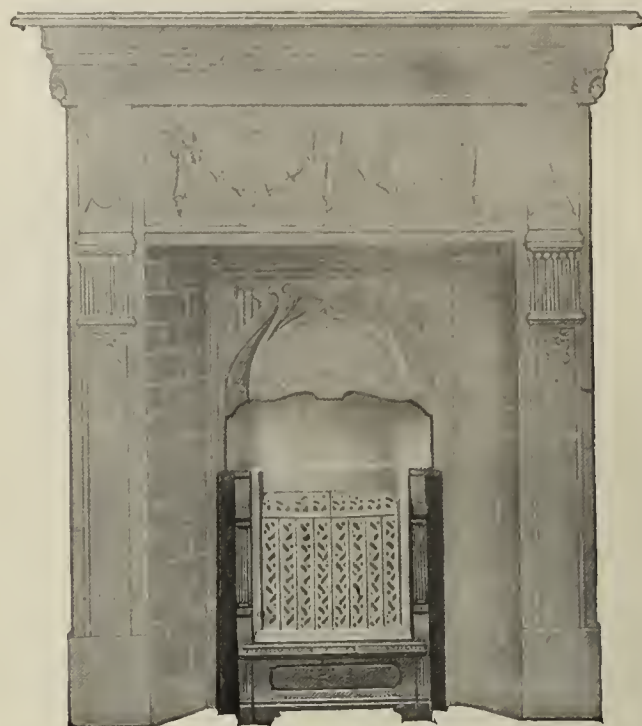


The "Vesta."

A SELECTION FROM THE "NEW BARLESS" SERIES.

the results obtained in their chemical and physical laboratories with those of a practical nature emanating from the workshops; and this happy intermingling of research and skill is apparent in the improvements which have been introduced into the fires now being launched on the market.

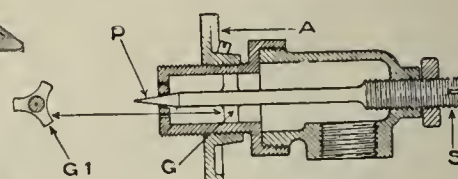
The burners are of entirely new construction, tending towards still greater heating efficiency. The fuel, changed both in design and chemical composition, has been so fashioned as to exactly fit the shape of the flame. The flame is aerated throughout its entire length, and uniform combustion thus takes place. The method of attaching and detaching the fuel is worthy of notice. The pillars are put in and taken out of the fire with the greatest ease, and are held in position by two fuel-clips—one at the top and the other at the bottom; the latter being finished in white enamel, and so adding considerably to the general appearance of the fire. The fire-brick has also been improved both in material and construction, to increase its radiating efficiency. The greatest attention has been expended upon the canopy chamber, which has been carefully rounded-off to lead all the gases by a natural course into the flue, in order to effectually prevent bye-passing. The fire casting itself is made entirely in one piece, thus obviating cement joints of any kind. The interchangeable principle already referred to extends to the brasswork of the "New Barless" gas-fires; there being one standard set of brass fittings for every fire in the series, whether simplex or duplex, nursery, side-boiling burner fire, or any possible combination. The air-adjuster is in a position where it is entirely accessible, but is at the same time hidden from view. The three-way cock provided can be used either with the simplex or duplex burner arrangement, and is especially designed to give



The "Inset" Fire.



Adjustable Trivet.



Section of Gas-Regulator.

free passage to the gas passing to the fire. We may also add that the right and left-hand gas connection is a standard fitting to all "New Barless" fires.

A notable example of attention to small details—a feature always prominent in connection with Davis specialties—is found in the gas-regulator, of which there is a sectional sketch. To the screw S, controlling the regulating pin P, is attached a guide G G¹, which ensures the pin taking a dead central position in relation to the gas-inlet, and remaining in that position. A represents the air-adjuster.

As regards the fronts or ornamental portions of the fires, these have been so constructed as to do full justice to any variety of finish which the intending customer may fancy. Particularly pleasing results are obtained with the leadless porcelain enamel and armour-bright finishes, which are a speciality of the Davis Company. Their large new enamelling works at Luton are now in full working order; and it is anticipated that there will be a big demand for fires treated in this department during the coming season.

There is one speciality introduced this season by the firm which is of considerable interest. This is their "Inset" fire, which is illustrated in combination with a suitable mantel register. The illustration makes clear the function of the fire, which is to fit in an ordinary register grate without unsightly projections of any kind. At the same time, it is claimed for this fire that it gives efficiency equal to that of an ordinary gas-fire fitted in front of the grate. The "Inset" is one of the "New Barless" fires; and all its wearing parts are interchangeable with the other stoves of the series.

Mention may be made of one or two accessories which combine to make the "New Barless" series of fires specially useful, as well as ornamental—more particularly the side boiling-burner, the brass wire dress-guard, and a special adjustable trivet, the advantages of which will be apparent. In bringing out the new series of fires, a successful endeavour has been made to meet the wishes and tastes of consumers who prefer to have a gas-fire with the old type of front bar. Any fire of the "New Barless" series may be fitted with a detachable bar. The Davis steamless radiator, as readers are aware, has already proved a very popular type of heater with gas undertakings and consumers alike. The Company give a three years' guarantee with every radiator sold; and it is stated that not a solitary part has had to be replaced under the condition of the guarantee since the introduction of the "Steamless" four years ago.

Enough has been said to show that the Davis Gas-Stove Company's programme for the season is one on which the Company must be congratulated.

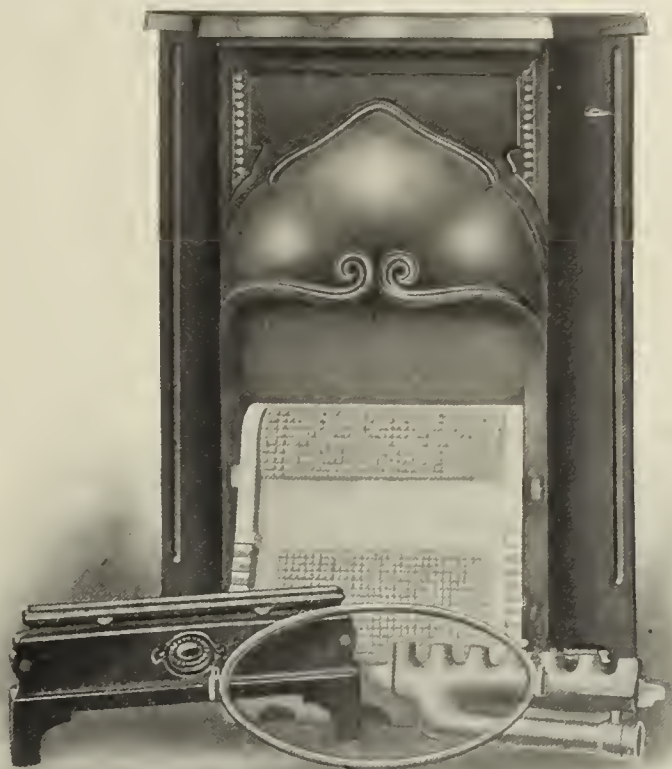
According to an abstract published from the report of the British Consul at Kobe, the outstanding feature in Japan during last year was the number of gas plants which were erected both for the illumination of towns and for driving suction-gas electricity stations. In the early part of the year, the greater part of the orders were for British machinery; but during the latter portion several important contracts were secured by Continental firms and by local manufacturers.

NEW PARKINSON FIRES.

By calling at the High Holborn show-rooms of the Parkinson Stove Company, one is able to make personal acquaintance with an attractive new series of gas-fires which the firm are introducing for the forthcoming heating season. They are respectively named the "Pathan," the "Spartan," and the "Cretan;" and they possess various claims to consideration, in addition to their pleasing appearance.

In the first place, as the result of exhaustive experiments, the Company state that they have provided pillar fuel of a character which results in instantaneous incandescence being effectually secured—economy in gas consumption resulting from the fact that it is only necessary to light up at the moment that the fire is required. The fuel, it is noticed, is more open in construction than that hitherto used. The spacing-rack holds each "pillar" of fuel exactly over the centre of its burner-jet; so that the flame is utilized to the greatest advantage. The fender of the fire is removable by undoing two screws; and this permits of the easy lifting out, when necessary, of the burner, the fuel, or the back-brick. A reliable reversible burner is fitted; and there is a very substantial and extremely simple gas and air adjuster. In order to separately regulate the proportions of the gas and air, it is not necessary to remove the fender of the stove; and the object aimed at in the construction of the adjuster is the highest heating efficiency combined with the lowest possible gas consumption. The oval fuel-guard is of an even lighter pattern than before; and it is so designed as to take up correctly any expansion, and thus eliminate fuel fractures. The three patterns comprised in this new series of fires are each made in two sizes, so that there are six separate fires. But a point which is of much importance is that there are in all only two sets of parts.

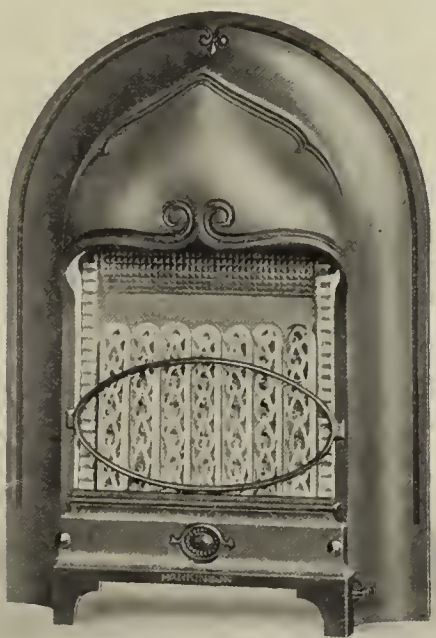
To revert to the matter of appearance, it has already been remarked that the fires are attractive; and it may be added that they are excellently suited to the schemes of interior decoration now in vogue. There is nothing elaborate about their appearance—in fact, strict simplicity characterizes them throughout—



The "Cretan" Gas-Stove (showing loose interchangeable parts).

and they are eminently adapted for art black finish, though, of course, they can be had in porcellanite colours, if preferred.

There is every reason to predict a good measure of popularity for the "Pathan," the "Spartan," and the "Cretan" patterns of gas-fires during the coming season.



The "Pathan" Gas-Fire.



The "Spartan" Gas-Fire.

ARTIFICIAL LIGHT IN SIBERIA AND MANCHURIA

WE have received from an esteemed correspondent who has just travelled to Kharbin by the Trans-Siberian Railway some interesting remarks on the methods of lighting which he has observed *en route* and at his destination.

He reached Kharbin (which he mentions is spelt Kharbin by the Latin races, Harbin by the German, and Charbin by the Russo-Asiatics) after nine days and nights from Moscow in the Trans-Siberian *train-de-luxe*. From Cheliabinsk, which is the first place of importance after Siberia is entered, to Manchuria, there appeared to be only one town—viz., Irkutsk—which was lighted by gas. At the smaller stations, electric light or more frequently high-pressure petroleum lights were found. The *train-de-luxe* was electrically lighted, and had a Deutz engine; but other express trains had miserable oil-lamps, and the fast trains candles. The mixed trains were either without lights or had a feeble lamp by the door at each end of the cars. Even the technical traveller is forced, he says, by the contrast of these lights with the moonlight on Lake Baikal and the sunshine on the Ural Mountains, to be-

come an enthusiast for Nature. Kharbin, however, with its arc lamps brings a change, and would make the traveller believe that he had been transported back to a badly-paved European commercial town, were it not that the yellow wearers of the pigtail remind him that he has travelled 6000 miles. In the adjacent Chinese town of Fu-Dza-Dzan, however, the primitive oil-lamps sold by the Standard Oil Company are to be found side by side with every conceivable mode of lighting. A year-and-a-half ago, Kharbin, which has a population of 60,000, had no public lighting at all; and seven years ago it was still a swamp, in which fifty coolies were required to liberate a vehicle which had stuck fast, and a journey of half-an-hour cost half-a-sovereign. But in the absence of political disturbance, the town will become a rival of Shanghai.

Kharbin occupies an incomparable position, being the starting point for East Asia, South China, and the Amoor district, the junction of three great railways, and situate on the Sungari river, which is navigable by ships for 1000 miles. It is bound to become, he considers, an exceptional commercial centre; and there is a great chance for speculators and a crying need for "more light." But all depends on whether the Russian General or the Chinese Governor has the last word.

NORTH BRITISH ASSOCIATION OF GAS MANAGERS.

Jubilee Meeting in Glasgow.

The North British Association of Gas Managers has been the first Association for the promotion of the gas industry to reach the Year of Jubilee—founded as it was on the 30th of July, 1862. The Jubilee Meeting was held last Thursday in the hall (in Bath Street) of the Philosophical Society of Glasgow—a lecture theatre in which the Association have been privileged to make a good deal of their history. There was this year a change in date from the end of July to the beginning of September; the earlier date being considered by many of the members to be inconvenient, because it arrived before the financial affairs of the previous year had been finally dealt with. Judging by the number who were present last Thursday, the change in date, it may be concluded, has approved itself to the majority of the members. Mr. GEORGE KEILLOR, the Gas Manager to the Corporation of Broughty Ferry, was President, and opened the proceedings shortly after half-past ten.

The PRESIDENT said that, on taking the chair at the fiftieth annual meeting of the Association, and before proceeding to the ordinary business of the Association, he wished to mention how pleased he was to see so many members present. They were especially glad to have with them that day Mr. Shadbolt, the President of the Institution of Gas Engineers; and they had with them some other fraternal visitors. He wished to give them all a very hearty welcome.

Apologies for absence were intimated from Dr. Beilby, Dr. Harold G. Colman, Mr. W. Doig Gibb, Mr. John Young, and from the Presidents of all the English District Associations.

The PRESIDENT announced the receipt of the following telegram: "Congratulations on attainment of Jubilee of North British Association—Canadian Gas Association."

The HON. SECRETARY and TREASURER (Mr. Laurence Hislop, of Uddingston), having read the minutes of the meeting held at Dunfermline last year, these, on the motion of Mr. J. McLEOD, of Greenock, seconded by Mr. R. SIMPSON, of Cambuslang, were unanimously adopted.

REPORT OF THE COUNCIL.

In introducing the subject of the report of the Council, The PRESIDENT referred to the death, since the report was prepared, of Mr. Peter Hurrell, one of the extraordinary members. He also took the opportunity of pointing out what might appear an apparent inconsistency between the report and the agenda of business. They would observe that the Council had arranged for the inaugural lecture in connection with the William Young memorial scheme to take place that day; but about a month since they had an intimation from Dr. Colman that he found it impossible to fulfil his obligation in this matter; and the Council, most reluctantly, had to accept the situation. On account of this, they were not having the lectureship inaugurated that day. He moved the adoption of the report.

Mr. S. MILNE (Aberdeen) had very great pleasure in seconding. The William Young Memorial Fund, he said, had become an accomplished fact. The Council regretted that so few of the members came forward with papers for the annual meetings. This was unfortunate; and they hoped that the mere mention of the fact in the report would make members take the matter to heart, and that they would come forward with papers which would be of interest to them all.

The report was then agreed to. The following are its principal contents:—

ANNUAL REPORT OF THE COUNCIL.

In the course of their report, the Council state that the membership of the Association at June 30 last was 260, compared with 266 at the close of the previous year—a decrease of six. The membership is now made up as follows:—

Ordinary members	166
Associate members	12
Extraordinary members	78
Honorary members	4
	260

The Council record that the following members have ceased (by resignation or otherwise) to be connected with the Association:—

- Honorary Member—Thomas Whimster, of Perth—deceased.
- Ordinary Member—William Mitchell, of Dalry—resigned.
- Do. —James M. Paterson, of Langholm—deceased.
- Do. —David Small, of Largs—resigned.
- Extraordinary Member—James Brown, of Hamilton—deceased.
- Do. —James Milne, of Edinburgh—resigned.

They add: All will note, with regret, the gaps which have been left by death in the ranks of ordinary and extraordinary members, while from among the honorary members the Council have to deplore the loss of Mr. Thomas Whimster, of Perth, who was for the long period of 44 years the valued and highly respected Gas Engineer and Manager to the City of Perth. Mr. Whimster was at all times a progressive and versatile worker, and a liberal contributor to the "Transactions" and discussions of the Association. He was President upon three occasions—viz., in 1865, 1870, and in 1883; while he had the signal

honour of reading the first paper to the Association, the subject being "An Improvement in the Working of the Hydraulic Main." He was made an honorary member in 1887; and he died at the ripe old age of 92. Mr. Whimster was among the first to join the ranks of the Association, immediately upon its inception in 1862; and his death, in September last, removed the last remaining personal tie between that period and the present time.

In accordance with the rules, the Council recommended the following for membership:—

Ordinary Members.

A. P. Dale	Beith
James Jardine	Dalbeattie
James A. Tait	Bridge of Allan

Associate Member.

Thomas Carmichael . . . Dawsholm Gas-Works, Glasgow

Extraordinary Member.

George Clark, Managing Director of the Bryan Donkin Company, Limited, of Chesterfield.

Mr. George Keillor (Broughty Ferry) was appointed delegate to represent the North British Association on the Council of the Institution of Gas Engineers for the year 1911-12.

During the past year the Council had two applications for assistance, which, after careful investigation, were duly granted and suitably acknowledged.

The Western District and North-Eastern District Commercial Sections continue, they say, to do good work, numerous subjects of interest to the gas industry having been considered by them during the past year.

After referring to an exchange of telegrams between the Association and the German Association of Gas and Water Engineers, in October last, the report proceeds to deal with the "William Young Memorial Lectureship Fund." They say: The Council are pleased to report that the fund is now an established fact. The Council considered it advisable to inaugurate the lectureship at the earliest possible date, and, consequently, agreed to invite Dr. Harold G. Colman to deliver the inaugural lecture at the present meeting. It was arranged that the subject would be "Carbonization," with reference to William Young's work. At the same time, it was agreed that an appreciation of the life and work of William Young should be written and circulated among the members. This important task was entrusted to the capable hands of Dr. Alfred Daniell.

The Council regret that members of the Association do not come to their assistance and volunteer papers for discussion at the annual general meetings. It is, they say, becoming increasingly difficult to make up a programme for the annual meetings, and, as the number of papers or communications, "volunteered or canvassed, has reached vanishing point," the Council consider it their duty to mention the fact in their annual report, and appeal to members to give this important matter their earnest consideration. They invite suggestions and discussion thereon.

Having regard to the volume and importance of the secretarial work of the Association, the Council unanimously recommend (according to the rules) that the remuneration to be paid to the Secretary should be fixed at thirty guineas per annum.

(Signed) GEORGE KEILLOR, President.
L. HISLOP, F.C.S., Secretary and Treasurer.

Final Report of Special Committee on William Young Memorial Fund.

The Committee report that the capital sum required to establish "The William Young Memorial Lectureship Fund" has now been fully subscribed. At the date of the Committee's last report, a second circular inviting subscriptions was sent to those members of the Association who had not then contributed; and the response to this, together with further donations from some who had already subscribed, brought the total amount of subscriptions (including bank interest) up to £654. After considering various investments, the Committee purchased 3 per cent. debenture stock of the North British Railway Company; and £810 worth was secured, at a price of 80 per cent., or a total cost, plus stamps and commission, of £654 14s. 3d. This will realize an annual income of £24 6s. (less income-tax). A draft of the "Deed of Declaration of Trust" was prepared; it was agreed to nominate the President, the Vice-Presidents, and all the Ordinary Councillors (and their successors in office) as trustees.

The Committee express their best thanks to all those, inside and outside the Association, who so generously contributed to and otherwise assisted in bringing this matter to a successful issue.

(Signed) ALEX. BELL,
Honorary Secretary to the Memorial Committee.

EXTENDING THE USEFULNESS OF THE ASSOCIATION.

Mr. S. B. LANGLANDS (Glasgow) said that, in the annual report, a point was raised in connection with the extension of the usefulness of the Association. He took it upon himself to mention this matter, because—not being a gas manager—he could speak on behalf of those who were. He would like if their basis of membership could be broadened, and be not strictly confined to gas managers. They had many among them, connected with the distribution and sales departments, whom it might be advisable that the Association should recognize in the full capacity of members. He was not a gas manager now, and seeing they had given him the privilege of membership, they might extend the same advantage to others. He was not going to propose any resolution; but perhaps the Council might consider the matter, and bring forward a proposal upon it. They might give a lead to other Associations in this respect,

The PRESIDENT remarked that they were all pretty much in sympathy with Mr. Langlands' views, and the Council would take the subject into consideration.

STRENGTHENING THE BENEVOLENT FUND.

Mr. J. W. NAPIER (Alloa) directed the attention of the meeting to the amount at the credit of the "Excursion Fund" account—£35. He thought this was too much for the purposes of the fund. He would propose that £20 of the amount be transferred to the "Benevolent Fund" of the Association. This fund was deserving of the best support of the Association. It was a fund which it should be their best endeavour to increase; it was a fund which appealed to their sympathies.

Mr. A. MACKAY (Montrose) seconded, and the proposal was agreed to.

The PRESIDENT said this question was discussed by the Council some months ago, and they decided to leave the balance as it was, because sometimes, on an excursion, both ends did not always meet. But he agreed that £20 might very well be transferred to the Benevolent Fund.

THE PRESIDENT'S ADDRESS.

The PRESIDENT in his address said:—

Gentlemen,—Permit me again to thank you for the honour you so graciously conferred upon me at the last annual general meeting of the Association. In electing me to the presidency at that time, you not only conferred an honour upon me—an honour I highly appreciated—but you also bestowed a seasonable compliment upon the district which gave birth to the first regularized Association of Gas Managers, and to the town of Broughty Ferry, in which was held the first technical meeting of the Association, the Jubilee Anniversary of which we have the honour to celebrate to-day. At the time of my election, I was deeply conscious of the fact that the custom of your procedure alone, and not personal merit, was responsible for my elevation to the presidential chair; and to-day, with a fuller knowledge of the duties and responsibilities involved, I am more conscious than ever of my inability to follow in the footsteps of your distinguished Past-Presidents. However, the honour of the chair, and the conduct of the affairs of the Association, having been entrusted to my care, I determined with what ability I possessed to maintain the traditions and prestige of the office—well knowing that the heritage bequeathed to me by my predecessors in office (in the building-up of which so much zeal and industry had been expended) had to be again transmitted untarnished, and with even larger additions, to another.

A survey of the past year's work encourages me to claim on behalf of the Council and myself that the fifty years' heritage, of which we are so proud, has not been tarnished while in our keeping; neither has it diminished in value nor in usefulness. Indeed, I venture to opine that the Association is at the present time more firmly established than at any previous period in the annals of its history. For this satisfactory state of affairs, we are primarily indebted to those who, in the early sixties, settled the foundations of our Association upon a firm and permanent basis. Credit is also due to the long line of able and distinguished office-bearers, and to such experts as Dr. Stevenson Macadam, Dr. Wallace, Mr. William Young, and others, who have, ever since the inception of the Association, earnestly endeavoured to build-up a structure worthy the designers. Nor should we forget to thank those who, within recent years, succeeded in remodelling the fabric and in improving and perfecting its business arrangements.

The fiftieth annual general meeting (the Jubilee meeting) of the Association is being held to-day. The occasion is unique in the history of the gas industry; and this meeting should be second to none. I have done my best to work for such a result; and I hope it may be effectual. But without your sustained attendance and active co-operation, that result is unattainable. I rely, therefore, upon your assistance. Being assured of your sympathetic and hearty support, I am optimistic enough to predict that at the close of the conference we shall be able to congratulate ourselves upon the success of the Jubilee meeting, which, we trust, may leave behind it an indelible lustre, and mark the beginning of a new era in the economics of coal-gas production and application, and also in the advancement and prosperity of the industry and the status of the profession.

Of late, there has been quite a plethora of anniversary and centenary celebrations. Never before, however, has there been a Jubilee celebration in connection with an organized Association allied to the gas industry. Lord Rosebery, who is much in demand upon such occasions, thinks the celebration business a bit overdone; and I am inclined to agree with that opinion. But upon this occasion we cannot allow the dictum of a peer, or a mere personal opinion, to deter us from celebrating the Jubilee Anniversary of this Association. At the present time, we are not to celebrate the unique event by unveiling a public monument to the memory of the originators thereof. That may come at a later date; but, meantime, if you seek their monument, look around you—look at the number and strength of the organized associations now in existence throughout the world. Compare the puny weakness of the gas industry as it existed fifty years ago with its strength and invincibility to-day, in spite of extraordinary competition, and marvel at its unparalleled success. It would require a volume to adequately review the birth and progress of the coal-gas industry, with its lighting, heating, and power developments.

But, for the present, suffice it to say that all the improvement and progress have come about in the age of organization and association; and as long as a single organized and properly constituted Association of Gas Managers exists, so long will it be a living memorial to the memory of the originators—Lowden, Mackenzie, Myers, and Proctor.

There was a time in the history of the Association when a President had an opportunity in his valedictory address of being retrospective. But in these days when everybody is a close student of the encyclopædic Technical Press, it would be highly unprofitable to weary you with a belated and incomplete retrospect. The Press, I desire to say, are entitled to all praise for providing us, week by week, with a down-to-date technical feast of the highest value; and the care and ability exercised by the Press in the furtherance of our mutual interests is something for which they are justly entitled to our most cordial thanks.

THE HISTORY OF THE ASSOCIATION.

The Association having attained its Jubilee on the 30th of July last, it is perhaps incumbent upon me to give you, especially for the information of the younger members of the Association, a short *résumé* of the history of the North British Association. I fear, therefore, I must trespass for a time upon your patience and good nature. I am fortunate, indeed, in having such a theme to discourse upon, because, without plagiarism, it is now impossible for a President not having a predominating occupation or study to find a fresh subject on which to address an assembly of practical business men.

It was in the month of January, 1862, that the four originators of the North British Association of Gas Managers accidentally met in the well-known town of Cupar-Fife. These gentlemen (now all deceased) were Mr. J. Lowden, of Leven, Mr. W. Mackenzie, of Cupar, Mr. G. Myers, of Broughty Ferry, and Mr. W. Proctor, of Forfar. Even at that time these gentlemen recognized the advantages which would accrue from intercommunication, organization, and association; and, on talking the matter over, it was agreed to ask the co-operation of all the managers in the counties of Fife, Kinross, Perth, and Forfar. The result of this chance meeting was that, on the 30th of July, 1862, the first regularized meeting took place—twenty gas managers being present, when the "Association of Gas Managers for the Four Counties of Fife, Kinross, Perth, and Forfar" was formed. The first and only business overtaken on that day was the all-important matter of framing and adopting a set of rules by which the proceedings of the new Association were to be governed; and so well did they perform their task that the rules remained in force, pretty much as originally drafted, till 1909. Thus was laid, in the words of Mackenzie, "the foundation of our Association, and a new era inaugurated in the history of gas manufacture and supply." Unfortunately, owing to the unpardonable modesty of the early members, the first records, in the shape of annual reports of proceedings, do not begin till the year 1867.

The first annual meeting of the Association was held at Cupar-Fife; and the first President was Mr. J. Lowden, of Leven. Mr. Lowden was also in the chair at the second annual meeting, which was held in Broughty Ferry in 1863. At this meeting the late Mr. Whimster, of Perth, presented and read the first technical paper submitted to the Association; the subject being "An Improvement in the Working of the Hydraulic Main." Mr. Proctor was President in 1866; and he died in 1867, while occupying the chair for the second time. Mr. Myers, I understand, could not be persuaded to take the chair; but, as one of the originators, his work on behalf of the young Association was nevertheless of much value, and some day we hope to have the pleasure of welcoming his esteemed sons to the presidential chair.

For some considerable time prior to 1862 the necessity of forming an Association of Gas Managers had been a cherished idea with Mr. Mackenzie; and there can be no doubt that we are indebted to him for its inauguration. Mr. Mackenzie, who at the time of his death was Gas Engineer and Manager at Dunfermline, was the able and much-respected Secretary and Treasurer of the Association from the date of its inception till his retirement in 1879. He was the popular President of the Association in 1882 (the year of its majority); and he died on April 11, 1893.

Shortly after the establishment of the Association several others were started in different parts of the country. In September, 1862, the "Scottish Association of Gas Managers" was formed in Edinburgh, with a membership of 22. Very soon afterwards, however, the Scottish Association lost its identity; for we read that in the year 1865 it made a proposal for its amalgamation with its Northern rival. The proposal was favourably entertained, and union took place upon Sept. 14, 1866. Thenceforward, this Association, with the name it now bears—"The North British Association of Gas Managers"—and with a membership of 54, began a more extended career of usefulness.

The managers in the West of Scotland were slow in realizing the benefits of organization; and it was not till 1872 (under the guidance of Mr. W. Key and four others) that they determined to follow the lead of the "wise men of the East," and organize an Association to be called "The West of Scotland Association of Gas Managers." Their first meeting was held in Dumbarton on the 8th of April, under the genial chairmanship of Mr. Key, who fully explained the object of the meeting. It is now interesting to note that the West of Scotland Association was formed for the benefit of managers of works where the annual manufacture of gas did not exceed 30 million cubic feet, and because of the fear

current at that time that the North British Association was about to be gobbled up by the British Association, as the premier English Association was then called. It was further argued that the annual general meetings of the North British Association did not appeal to a very large majority of managers of small works, inasmuch as the meetings being held annually, sufficient opportunity was not given to the members for meeting together and comparing notes "respecting difficulties encountered in the course of working." It was therefore proposed to meet quarterly, and each time in a different locality—an arrangement which, I believe, was soon afterwards changed to half-yearly. The West of Scotland Gas Association was responsible for introducing the incomparable William Young to the gas industry; and it continued to do excellent work for about ten years, when, by mutual consent, the members decided to sink the individuality of their Association and join forces with the North British Association. This step was taken in 1883, entirely in the interests of union and progress, and it has never been regretted.

I think the originators of our Association displayed much wisdom when they determined that it was not to be organized for the pecuniary gain of the individual, but chiefly (if not altogether) for the benefit of the industry and the gas consumer. The general public, however, were slow in realizing this—even to-day our object is imperfectly understood; but when it did dawn upon them that the chief desire was to benefit humanity, the mountain of prejudice which had so long been an obstacle to the real advancement and progress of the gas industry was soon swept away, and very soon a more healthy tone was observable in the public mind.

Prior to the advent of the pioneer Associations, engineers and managers preferred to work in secret, believing in the policy of the "closed door." But, fortunately, after their inauguration this stupid policy was speedily abandoned; and managerial aloofness and selfishness, so prevalent at that time, became a thing of the past. Undoubtedly, these Associations heralded the dawn of a new era. They were the precursors of epoch-making events; and their establishment engendered an *esprit de corps* among engineers and managers which was of the utmost value to the industry and the profession.

That this Association has been potent for good, all will acclaim; and that it is trying to fulfil its mission, none will deny. We are proud that the North British Association is the organized progenitor of the now world-wide family of gas associations; and we here record the strong sense of our indebtedness to the pioneers of the movement which has been in the past, as it will be in the future, of inestimable value to the gas industry at large.

THE ANNUAL "INFORMAL MEETINGS."

This brief, and very likely to you, tedious *résumé* of the Association's early vicissitudes would be incomplete without reference to the "Informal Meeting" of gas managers which was called into being immediately after the union of the North British and West of Scotland Associations.

After the passing of that event, certain West of Scotland men arranged matters so that they could (without opposition to the North British Association) "meet once or twice a year in an informal way for the purpose of talking over subjects concerning the industry, and to take counsel one with the other respecting difficulties encountered in the course of working." The leading spirit in this movement was the late Mr. James McGilchrist; and he convened a meeting in the spring of 1884, which was well attended by West Country gas managers. This spring meeting, which at that time perpetuated the memory of the defunct West of Scotland Association (but which has now no significance), has no organization, no committee, but only a "Convener," who undertakes the duty of convening the meeting and nominating a Chairman. At the time of its inception, this meeting was truly informal—so much so, indeed, that at the first meeting, held in 1884, a resolution was actually passed to the effect that there should be no report of the proceedings. But there is now no doubt that these meetings are much more formal than the originators ever contemplated that they should be; and to my mind the present-day Commercial Sections, if linked-up with their central organization and conducted upon broad business lines, supply more than the want felt by those who, in 1884, brought into being the "Informal Meeting" of gas managers.

At one time the Informal Meeting had a purely local or parochial significance; but now, with the lapse of time and the exigencies of the age, it has become an institution of much wider significance. That the Informal Meeting has become a highly popular institution, no one will deny. Moreover, it is perfectly evident that there is a growing necessity for a "conversational" meeting in the spring of the year. But having regard to the origination of the Informal Meeting, the growing importance of the industry, the ever-increasing necessity for consolidating our forces, the desire to improve the status of members of the profession, and the fact that the success of the Informal Meeting is largely, if not entirely, attributable to the presence of members of the North British Association, is it wise? is it in the best interests of the industry and the profession? and will it make for solidarity and progress, to continue to conduct this highly-popular meeting in an unorthodox manner?

THE NORTH BRITISH ASSOCIATION AND ITS WORK.

During the past year your Council have given much time and thought to the duties of their office; and, personally, I am much indebted to them for their invaluable assistance. The duties of

office are multifarious and ever-increasing, and yearly they become more onerous. But this is not to be wondered at, seeing that we live in a progressive age, and that the scope of the Association has been widened and strengthened. Under such circumstances, therefore, it would indeed be strange if the work of the Council did not increase in volume, if not in importance.

With a membership roll of 260, there must of necessity be divergencies of opinion on many matters; and if the efforts of your President and Council appear to some to have failed, then I am ready to assure them that it has not been through lack of endeavour. Rather would I attribute any apparent inertness on our part to the apathy and inactivity of the members generally. I am ready to admit that the inertia may be attributable to the fact that members have only an opportunity once a year of meeting to discuss the affairs of the Association, and perhaps also because they are aware of the limitations of the Association (now that it is affiliated with the Institution of Gas Engineers), or it may be because of our easy-going belief and reliance in the industry's endless power of self-development and improvement. But, however it may be, there can be no doubt that our outward contentment with the conditions of things already existing (while in private and *inter pocula* we adversely criticize the endeavours of the Council) is responsible for much of the inertia. At the present time a spirit of listlessness and self-sufficiency is rapidly diffusing through the whole of our ranks; and doubtless when you learn that not a single reply was received to the circular soliciting communications for this meeting, you will appreciate the situation, and agree with me when I say that we are not sufficiently in earnest, that there is a lack of interest in the affairs of the Association, and much indifference as to its future. I wonder what would have happened had there been no business programme to-day? Yet, notwithstanding considerable effort, personal and otherwise, this meeting was perilously near being without one. I am afraid our fifty years' experience, aided by a new constitution, has not yet taught us the value of zeal and enthusiasm, organization and association. Somehow or other, and without being pessimistic as to the future of the industry, I think we have reached a turning-point in our history as an Association, and we must at once bestir ourselves if we are not to be left far behind in the race for supremacy.

In these stirring times, we should not wait till the electrical tout has invaded our stronghold and spiked our guns before taking action; neither should it require the advent of the annual general meeting to rouse us from slumber to a sense of responsibility. But as regards many of us, at any rate, I am afraid it is only when we are hard-pressed and in need of succour that we leave the haunt of the dormouse and attempt to interest ourselves in passing events. Our interest, however, is superficial and unstable; and it wanes with the passing of the annual meeting.

Of course, it is at all times difficult to shake off the fetters of time-honoured custom and red tape. But if we desire real progress—and I believe that at heart we all do, though we may have different ideas as to how best to attain our object—we must be "off with the old and on with the new." We are sick of unreality, and weary of shadows. The business of the Association does not, as many think, begin and end with the annual general meeting. Neither does it exist for the pleasure and profit of present-day members only. Nor should it be considered the primary duty of the President to canvass for papers for the edification of the members. Such a view is, of course, fundamentally wrong; but I am afraid it is fast becoming part of our creed.

In future let us be less credulous regarding the industry's power to sustain us in perpetuity, without our individual and united assistance. Let us cease to think parochially, and let us look upon our Association as an active business organization with an object in view—a gas engineer's union of vital and ever-growing importance to the industry and the profession, and not as a mere perennial social gathering. I might also say something about the growing tendency to cabal. But suffice it to say that it would be a harbinger of much good if "out of school" criticism ceased, and, instead, we developed a *penchant* for criticism at the regularized meetings of the Association. Open, fearless criticism is always welcome and commands respect; and it would materially help to check the growth of indifference and lack of interest at present pervading our ranks.

THE SELECTION OF OFFICE-BEARERS.

Now that I have unfolded my tale of woe, permit me to atone for my daring by assuring you of my sincerity. Indeed, I hope to make amends by offering a few suggestions and friendly criticisms which might be of ultimate value to the Association. For instance, it is of growing importance that we should be discriminative in the choice of the men we wish to take charge of our business affairs. They should be earnest men; men with broad, sympathetic, and progressive views, and possessing more than an average inclination to work and act. They should not be indifferent to the interest of the industry and their *confrères*. Their aim should be the improvement of the status of members of the profession. They should not be seekers after self-aggrandisement. They should know no party, and belong to no clique.

In selecting men for office we should eliminate the personal element altogether; and, irrespective of a man's "size" or social standing, nominate him for office if he has brains. After all, it is brains that count and not brawn. It is well to remember, therefore, that capable business men with lofty aspirations are often to be found struggling against fate in lowly positions. There

not being enough "plums" to go round, we cannot all get them. Somebody must go without. But, of course, it does not necessarily follow that because one is in charge of a "big" works that he is in every other way the superior of his "little" neighbour. Promotion nowadays not being always in accordance with ability and experience, it very often happens that the fortunate "big" man is more inexperienced than the less fortunate "little" man. But somehow or other the claims of the capable "bottom dog" are invariably ignored. Of course, there are "big" men and "big" men; but those of the "and" variety are easily singled out, and they possess our full confidence and highest respect.

SUGGESTED RE-ARRANGEMENT OF MEETINGS.

It is next suggested to my mind that the present "Informal Meeting" could with much advantage become the spring or half-yearly meeting of the North British Association. I have an idea that the so-called "Informal Meeting" of gas managers would be of more utility to the profession if it were quietly coupled-up and run in unison with the organization of the North British Association. And I think all are now agreed—apart from the perivacious member and those who have more faith in the dead past than in the living future—that early steps should be taken to link it up and thus conserve and solidify our common interests. It is, I am sure, the ultimate destiny of the "Informal" to be run in unison with the "North British;" and it should hurt no one's susceptibilities to designate the "Informal Meeting of Scottish Gas Managers" the "Spring Meeting" of the North British Association, if under the guise of a new name it retained its informal characteristics, and improved its status.

The Chairman of such a meeting could be the President of the Association for the time being; and it would be his duty to wear the "Informal" chain of office while presiding over the deliberations of the meeting. There would be no address from the chair, and no set papers would be submitted to the meeting. As usual, any member would be in order in submitting for discussion topics of general interest; and special subjects upon which it might be desirable to have a specially spirited discussion could be put on the *agenda*.

Then what about the Commercial Sections? Could not these important district organizations be so utilized as to make the work of the spring meeting, and the Association generally, even more interesting than at present? Could not their business be arranged so that the Chairmen of the various sections could always take an active and leading part in the work of the suggested half-yearly meeting—the annual spring meeting of the Association? Could not, indeed, the Commercial Sections become in reality the quarterly district meetings of the Association, and thus achieve the object desiderated by Mr. Carmichael in 1906? I think so, and others think so; but meantime we are powerless to act. At all events, it does seem to me to be akin to folly to continue to allow these valuable auxiliaries to "paddle their own canoes," and gradually drift apart and sink, or else remain for ever in a position of splendid isolation and comparative uselessness.

I have found the quarterly meetings of the North-Eastern Commercial Section of considerable value; and I see no reason why our District Commercial Sections should not now be more closely linked up with the central organization—each with its own Chairman, Committee, and Honorary Secretary, regularly reporting progress to, and obtaining assistance from, the Council of the predominant Association.

Then the usefulness of the spring meeting might be extended in yet another way. Could not the local Junior Associations be made more valuable adjuncts of the Senior Association? Are they also unworthy of our special consideration? Would it not be in the best interests of the industry and the profession to recognize them officially? And if the members of the Junior Associations do not all see their way to become associate members of the Senior Association, then we should arrange, at least, for the presence of delegates at all the senior meetings—particularly at the so-called "Informal" or unconventional spring meeting, where they could let their voices be heard to some purpose. Of course, there are other ways in which these various units could be linked-up and utilized for the general good; but perhaps the suggestions thrown out are sufficient for the present.

However, no matter how modern and perfect our organization may be, and no matter how capable the Council in charge of its affairs, complete and progressive success can never be vouchsafed unless each individual member and the various local organizations to which I have referred are fully prepared, as units or links in the chain of organization, to work and act in absolute harmony, and to give the object and business of the Association their earnest attention and enthusiastic support.

Personally, I see no difficulty in organizing our Scottish interests with a view to obtaining a homogeneous and thoroughly business-like Association. But meantime the central organization and its allies are not pulling in the same boat. Through prejudice and misunderstanding, the one is entirely out of sympathy with the other. We are anxious for reform; but we procrastinate and exhibit neither uniformity of conduct nor steadiness of principle. Of course, there is sentimental humbug *in pleno*, but no real bond of union. It is only when we remove the veneer, and get well behind the showy exterior, that we discover the canker which infects our organizations and prevents real union and the fusion of collateral interests. To a casual observer, it might not appear that organizations like ours were infected by indifference, jealousy, selfishness, and the like; but it is true, nevertheless. It is at least

my humble opinion, and perhaps I am only giving timeous, if forceful and inellegant expression to thoughts that are already deep-rooted in the minds of others.

The absence of feeling or interest in our Association and in our status as members of a great profession, is to be regretted; but we are hopeful that our interest and earnestness may speedily revive, and that the indifference and neglect to which reference has been made *ad nauseam* will yield to the lash of our inner consciences.

Let us not conclude, therefore, that because the industry is flourishing, and because the constitution of the Association has been remodelled and endowed with every modern facility for advancing its objects and influencing development, that we have reached our goal, and that in future no effort is required to improve our status and ensure further success. Such a conclusion would be inimical to our best interests. It would spell ruin individually and collectively, and, of course, lead us straight into the outspread arms of the enemy—our rivals. There is no such thing as finality; and there being no end or limit to progress in any art, we must not close up the avenue to ambition. We must keep it open, and must for ever be adding something new to the superstructure. We must never be quite satisfied with our progress. What may seem perfect to-day may, perhaps, be obsolete to-morrow. So we must keep scheming and building all the while—not to-day only, but for the great future, with all its possibilities. And it is this thought of the future which is our inspiration. The present, with all its achievements, is not our goal; for we know that by picking up each fresh thread of opportunity as it occurs, we are always moving forward to better things. Every ideal, every ambition, every policy we embrace bears directly or indirectly on the future of the member, on the future of the Association. If anything, the future is more important to us than the present—to build without a thought, for it is like setting-up a house on marshy ground. Everything that we do, everything that we say, every word that we write, is creating a particular impression—an impression which will react upon us favourably or otherwise in the years to come.

THE ASSOCIATION AND THE INSTITUTION OF GAS ENGINEERS.

It is to the credit of this Association that it has opened its doors wider than any other association of gas engineers, and that, by admitting principals and managers of trading firms to extraordinary membership, we are in advance of outside opinion, though not in advance of the times. We do not say that our doors are wide open enough; as a matter of fact, they must be opened still wider. But perhaps we, as an affiliated District Association, have gone far enough in this direction. We must now leave the extension of the principle in the hands of the Institution with which we are affiliated. I think the Institution, as the central organization representing the gas profession, should without delay admit to special membership distributing engineers and inspectors of lighting, commercial managers and secretaries, chairmen of gas companies, and the chairmen or conveners of municipal gas undertakings. At the same time, a real attempt should be made to raise the status and prestige of members of the profession. At present, we are simply a heterogeneous mass of gas manufacturers; the title gas engineer being officially denied us. In the words of a writer in the Technical Press: "The present class of professional member should be increased only by qualified candidates; and the test of examination should be adopted as early as possible." With this, I entirely agree—believing that when such a principle is part of our constitution, we should not be long in obtaining official recognition.

A gas engineer and manager occupies a position of public trust and great responsibility; and, speaking on behalf of officers in charge of municipal undertakings, whose lot at times is anything but an enviable one (through no fault of their own), I venture to think the time is now opportune for legislation which will provide security of tenure and a suitable pension at an age when they are forced to retire from active service. In this respect, these highly technical and important public officials should not be inferior to Police and Post Office Officials. For an important pronouncement upon this subject, I would refer to a recent address to the Royal Sanitary Institute by Mr. P. C. Cowan, D.Sc., M.Inst.C.E., the President of the Institution of Civil Engineers in Ireland, and Chief Engineering Inspector Local Government Board for Ireland. He said:

The absence of provisions in the statutes to prevent incompetent persons from acting as engineers, architects, and surveyors is much to be regretted, and doubtless accounts to some extent for the low estimate often put upon their services. But if the Institution of Civil Engineers, and corresponding institutions [such as our Institution] and the Universities were to combine in an effort to secure proper recognition of the profession of engineering, &c., success would ere long be obtained. There is no good reason why the safeguards afforded to the practice of law and medicine should not be extended to those whose function "is the art of directing the great sources of power in Nature for the use and convenience of man."

I should like to see our leading organization—the organization with which we recently affiliated—thoroughly rejuvenated and developed upon broader lines than at present. And let me add parenthetically that the Institution could study with much profit the workings of some of the Electrical, Municipal, and other Associations. In many respects these rival Associations have got ahead of us. Therefore, if we are not to fall further behind—and at the present time the Institution shows little or no inclination to re-arrange and augment its household—the affiliated Associations must jointly endeavour to change the venue and supply and

direct the driving force. We desire a central organization and a professional status worthy our great industry. Therefore, as an affiliated Association, we are intensely interested in the regenerative proposals so recently suggested by Mr. Helps, of Croydon. The seed then sown by Mr. Helps has taken a long time to germinate; but when it does take root, we hope it will develop into a strong lusty plant, worthy our great industry and its traditions. As an affiliated Association, we expect much from the Institution of Gas Engineers; and we trust we shall not be disappointed in their treatment of this momentous question.

THE INSTITUTION PUBLICITY SCHEME.

I think it may with truth be said that we in Scotland are meantime more interested in the general question of the reorganization of the Institution from within, rather than in the question of reorganization from without; and it might have been better if this question of reorganization had been tackled and settled before launching into a great national gas publicity campaign. I believe if this had first been done, and the sympathy of municipalities obtained through membership and direct representation in the affairs of Council, there would have been a more ready response to the trumpet call of Mr. Wilson, the immediate Past-President of the Institution. Generally speaking, municipalities are not in sympathy with the endeavours of the Institution of Gas Engineers; and there is a belief that there is too much company about the Institution and too little corporation. As our Associations are at present constituted, their work is primarily in the interests of the corporations, companies, and gas consumers, and secondarily only in the interests of the member. Therefore, the duties of companies and corporations (particularly corporations) to the gas-consuming public, and also to the Technical Societies, require to be emphasized and brought home to them. How best to obtain their real sympathy and substantial support is a big question. But it will have to be tackled by the Institution if we are not to see an Association of Municipal Gas Engineers springing up in our midst. I readily admit that some of the largest corporations are sympathetic and inclined to help on the good work of the Institution and its affiliated Associations; but it must be remembered that the vast majority of corporations are never at any time disposed to help us. Knowing the demands of the Institution to be all for the good of the gas-consuming public, I have always tried to obtain the monetary support of my own Council to their schemes; but my request is always met with the remark: "No funds for such a purpose"—the Town Clerk having declared any such transaction as contrary to the Acts of Parliament by which we are governed. Now, to be met with this refusal over and over again is rather disheartening; and I verily believe many managers, not having the courage to persevere in the matter, and because of the danger of being snubbed, consign the appeals for "special purposes" funds to their already overloaded waste-paper baskets. I think the legality of such transactions is a question the Parliamentary Committee of the Institution should make a special effort to solve. It is a very important point; and perhaps a solution could best be obtained by drafting a question and arranging that it be put in the House of Commons. If the answer were that it was a legal transaction, then we would be able to quote the very highest authority when next we have to approach our Councils on behalf of the Institution's special purposes fund. But if it should be pronounced illegal, then I think it is the bounden duty of the Institution to interest our legislators in the whole question, and make a bold attempt to have such transactions legalized.

INCOME-TAX ASSESSMENT AND DEPRECIATION.

I might touch on other matters requiring attention; but time will only permit me to say that, a few months ago, when interviewing Mr. E. S. London, of Somerset House, in connection with the vexed question of income-tax assessment and depreciation allowances, I was much surprised to learn from that gentleman that his department were unaware of the existence of such a body as the Institution of Gas Engineers. We were discussing the circular recently addressed to the gas industry on the question of depreciation, &c.; and it was while twitting him upon his department's boldness in stating that the proposed scheme had received the "assent" of the various institutions representing the corporations and companies concerned that he made the above revelation. And yet the Institution prides itself upon being very much alive! Verily, a policy of publicity is urgently required.

The statement complained about, coming from such a high source, was extremely misleading, because it conveyed the impression that gas associations, representing corporations and companies, had been consulted by the Board of Inland Revenue, and that their assent to the proposed new scheme had been obtained. But, of course, our Associations were not consulted; and it was a gross mistake for Somerset House to assume that the terms formulated and agreed upon in conference with the Municipal Accountants' Association and the Tramways and Light Railways Association only would also be acceptable to the gas industry.

This subject has now been exercising the minds of the gas engineering profession for quite a long time; and to-day, I am sorry to say, we are no more in harmony with the recent famous departmental circular than when first it was issued. As you all know, the circular intimated (contrary to the Statutes) that "no depreciation should be allowed in any circumstances in respect of any portion of these [gas] undertakings." But why gas undertakings alone have been singled out for such extraordinary treatment has never yet been explained.

That the circular conveys instructions to surveyors which are entirely contrary to the Statutes dealing with the subject, is abundantly clear. These statutes are the Customs and Inland Revenue Act, 1878 (section 12), and the Finance Act, 1907 (section 26, sub-sections 1, 2, and 3). Numerous appeals have been lodged on the strength of these Statutes; and in every instance the appeal has been sustained—depreciation being allowed in accordance with the Statutes which no instructions from Somerset House can override. Other appeals are pending, because surveyors, acting upon instructions from headquarters, persist in putting the circular before the Statutes. The Department's reluctance to reconsider the validity of the circular, and to recognize facts, is an undoubted hardship to gas undertakings; and in thus forcing them to appeal, much valuable time and money are wasted.

It is of interest to note that the views and methods of surveyors differ widely; and when it comes to be a question of how much is to be allowed for depreciation, every surveyor appears to be a law unto himself—i.e., undertaking A, although similarly conditioned to undertaking B, will either obtain a higher or a lower rate of depreciation than undertaking B; and again, while undertaking C is allowed depreciation, undertaking D, only eight miles distant, is allowed none. Now, all undertakings ought to be alike, in so far as percentage allowances are concerned; but the allowances differ most unreasonably and unaccountably.

Apparently there is no fixed rule to guide surveyors in regard to depreciation rates. We may refer, however, to the practice of the Local Government Board, who fix the period allowed for the repayment of loans. Their practice, I consider, is a very good guide to the "life" of gas-works plant; but, for income-tax purposes at all events, surveyors do not appear to think so. That these two Departments go to extremes, is apparent from the fact that the Inland Revenue Department allows for the life of (say) an electric cable being five times as great as that allowed by the Local Government Board. Of course, the extremes in each case operate to the disadvantage of the undertakings concerned. If it can be shown that the average life of gas-works plant, as ascertained by the period allowed for repayment of loans, is 33 years, then, when arranging allowances for depreciation for the purpose of income-tax, full regard should be given to this or any other period, and the percentage allowances calculated accordingly. At the present time, depreciation is calculated upon the diminishing value of the plant and apparatus, and not upon the original or prime cost, as it ought to be. According to the present method, the Broughty Ferry Town Council will not recover the prime cost of their gas-works plant and apparatus in 150 years; and yet, according to the surveyor's own showing, the average life of the plant is 32.6 years! Take £100 as the original cost and a 20 years' life. A 5 per cent. rate on the diminishing value at the end of the twentieth year, leaves a balance of £37 14s. The residual value is thus about one-third, and much too high. A rebate of 10 per cent. on the original cost would exhaust the value in ten annual instalments. But a rebate of about 16½ per cent. would be required to exhaust the value in ten years if calculated on the diminishing value. There should also be allowances for unexhausted depreciation and for obsolescence, in accordance with the correspondence of 1879 between the Association of Chambers of Commerce of the United Kingdom and the Right Hon. Sir Michael Hicks Beach, Bart., M.P.

I have no doubt the circular referred to was issued with a view to obtaining uniformity of practice; but I am afraid uniformity may not be obtained unless responsible Gas Associations, acting on behalf of the gas industry, are permitted and encouraged to co-operate with the Somerset House experts. If negotiations were now opened up between these authorities, I am sure a uniform and equitable scale of depreciation allowances for all kinds of gas-works plant and apparatus could be arranged. But at the same time, we should not overlook the fact that the law relating to the valuation of gas undertakings (particularly municipal undertakings) for income-tax and local assessment purposes, is in a state of chaos and much in need of amendment. The assessor in our district, conforming to his instructions, refused to consider our claim for depreciation, with the result that we took the matter before the Local Commissioners, and they sustained our appeal, granting depreciation allowances in accordance with Appendix I. Of course, it should be borne in mind that it is not in the interests of every gas undertaking to claim annual depreciation allowances. Some prefer to continue to obtain renewal, &c., allowances; and probably this accounts for there not having been a more general outcry against the recent attempt to alter the Statutes by departmental interference. But it would certainly be much better if uniformity of practice prevailed.

The other week we had an opportunity of adjusting our local assessment valuation, and perhaps Appendix II., showing how our valuation is arrived at, may be of interest. I could not persuade the county assessor to allow as tenant's capital (1) surplus general stores in hand and (2) cooking-stoves. But I consider these stores just as essential as surplus coal and oxide stores. The assessor, however, would not admit the necessity for surplus stocks, in view of the fact that five-twelfths of the total expenditure had been allowed. Of course, we did not deem it wise to meantime press the point. Then we all know the value of cooking-stoves, and how much they are responsible for increasing the revenue, and, of course, the rateable value also, seeing the basis of our valuation is the gross profits. But until the Kirkcaldy case is reversed, we may not be able to claim cooking-stoves as tenant's capital. It might interest you to know that while gas



undertakings only obtain a 5 per cent. allowance on tenant's capital electricity undertakings obtain 10 per cent.

The recent action of the Inland Revenue authorities in trying to force us to adopt their departmental-made law is on all-fours with the methods of other Government Departments, whose dictatorial manner is being strongly resented. Not later than April last, at the annual meeting of the Convention of Scottish Burghs held in Edinburgh, much all-round displeasure was voiced at the growing intervention and interference of permanent Government officials in local affairs.

GAS-WORKS RESULTS AT BROUGHTY FERRY.

Not being able to claim anything extraordinary in the working results obtained, I must refrain from going deeply into the affairs of the department under my charge. At present we are supplying

gas of 18.58-candle power, tested by the No. 2 Metropolitan test-burner; and the calorific value, tested by the Simmance-Abady calorimeter, is 588.39 B.Th.U. net. Prior to the introduction of a retort-house governor, we had considerable trouble in keeping the quality of the gas steady; but now, thanks to this most valuable piece of retort-house apparatus, the variation in the quality from day to day is scarcely perceptible on the photometer. We find it best to work with $\frac{1}{2}$ -inch seal and 3-10ths vacuum in the hydraulic main. Our retort-house is fitted with machinery comprising coal-breaker, gravity bucket conveyor, West's manual charging and drawing machines, and a 2-feet gauge tramway, with suitable haulage gear and side-tipping waggons for handling the coke. All coal is carted from the railway sidings and tipped into a ground-floor hopper (or the coal may be first passed through the coal-breaker), and thence conveyed either to the stores or to



a series of overhead storage hoppers, from which it gravitates to the charging machine. After my appointment to Broughty Ferry, it was my first duty to have the retort-house equipment overhauled, improved, and extended; but, taking everything into consideration, I am of opinion that the Broughty Ferry Gas-Works, being too small, is not suited for the most economical use of retort-house machinery. However, the machinery having been installed, it had to be made the most of. The purification of our gas is effected entirely by oxide of iron; and the average cost of purification amounts to 0.23d. per 1000 cubic feet of gas sold. As far as possible, we accomplish revivification *in situ*; and if I judge correctly, the Burkheiser and Cheltenham processes may soon revolutionize our present methods of purification. Nowadays nearly every gas-works has sulphate of ammonia plant; and at the present price of sulphate, every works could afford to work up its liquor. We

obtain fairly good results from our plant. But, unfortunately, we cannot say the same about our coke results. Compared with others, our results are not good; but by gradually introducing a new type of furnace and regenerator, we hope ere long to improve our fuel results. We have the satisfaction, however, of knowing that we supply steam-quenched coke; and anyone who has taken the trouble to test the *aqua*-absorbing capacity of coke will appreciate the ease with which coke results can be manufactured. I think every gas undertaking, whether it produces sulphate of ammonia or not, should heartily support the good work of the Sulphate of Ammonia Committee.

I believe in keeping a tidy and orderly works, and in spending annually a good round sum on the general repair and maintenance of the plant. Even a gas-works can be made and kept a beauty spot. After much disappointment and hard work, I have trans-



THREE VIEWS OF THE BROUGHTY FERRY GAS-WORKS.

COKE PRODUCED—YEAR 1910-11.

Total coke dry (calculated from full-charge tests of all kinds of coal used)				4273 tons.
Do. Average per ton of coal used				12'28 cwt.
	Tons.	Per Ton of Coal Used.	Per 100 Lbs. Coal Used.	
Coke sold per steelyard— (allowing for stocks)	2452	= 7'05 cwt.	35'23 lbs.	
Coke used in furnaces, dry— (number of charges per annum × average weight)	1393	= 4'00 "	20'02 "	
Coke and breeze used in boilers— (number of charges per annum × average weight)	739	= 2'13 "	10'62 "	
	4584	= 13'17 cwt.	65'87 lbs.	

formed engineering and financial chaos into something like order ; and now I am satisfied with the progress made, despite the fact that the Municipality owns a competitive lighting and power business. Of course, it is an old story—the story of the milk eow and the calf; and, like many another, our gas undertaking has also had to yield of its strength to support the pet child of the burgh—the electricity department. I think it is nothing short of a national scandal that municipal gas undertakings should be compelled by law to finance and make good the intentionally created losses of their business rivals; and I can only say that the amendment of the Electric Lighting Acts is much overdue. A town of 11,000 inhabitants cannot satisfactorily support two "lighting" industries; and it being the desire of my Council to see the electricity department firmly established upon a paying basis, no attempt has been made to prevent the new lighting industry from obtaining business at the expense of the old. In large towns, a competitive policy is productive of good results; but such a policy would not do in Broughty Ferry. In pursuance of a competitive policy, we would undoubtedly regain customers, and to a larger extent prevent the migration of others; but our gains would probably become a serious menace to the credit of the sister department, and that is a phase of the question little to be desired. All things considered, I am afraid it is the fate (if not the duty) of our Gas Department to continue to mother the youngster.

THE OUTDOOR DEPARTMENT OF GAS-WORKS.

I attach great importance to the distributing department; and ever since the introduction of the Welsbach light in 1891, it has been evident that a revolution in our outdoor methods was bound to come. This revolution has even now begun; and seeing it is already possible to produce over 12,000 cubic feet of combustible gas from a ton of coal in old-fashioned retorts, the desire to further increase "makes" should be given a rest, and more atten-

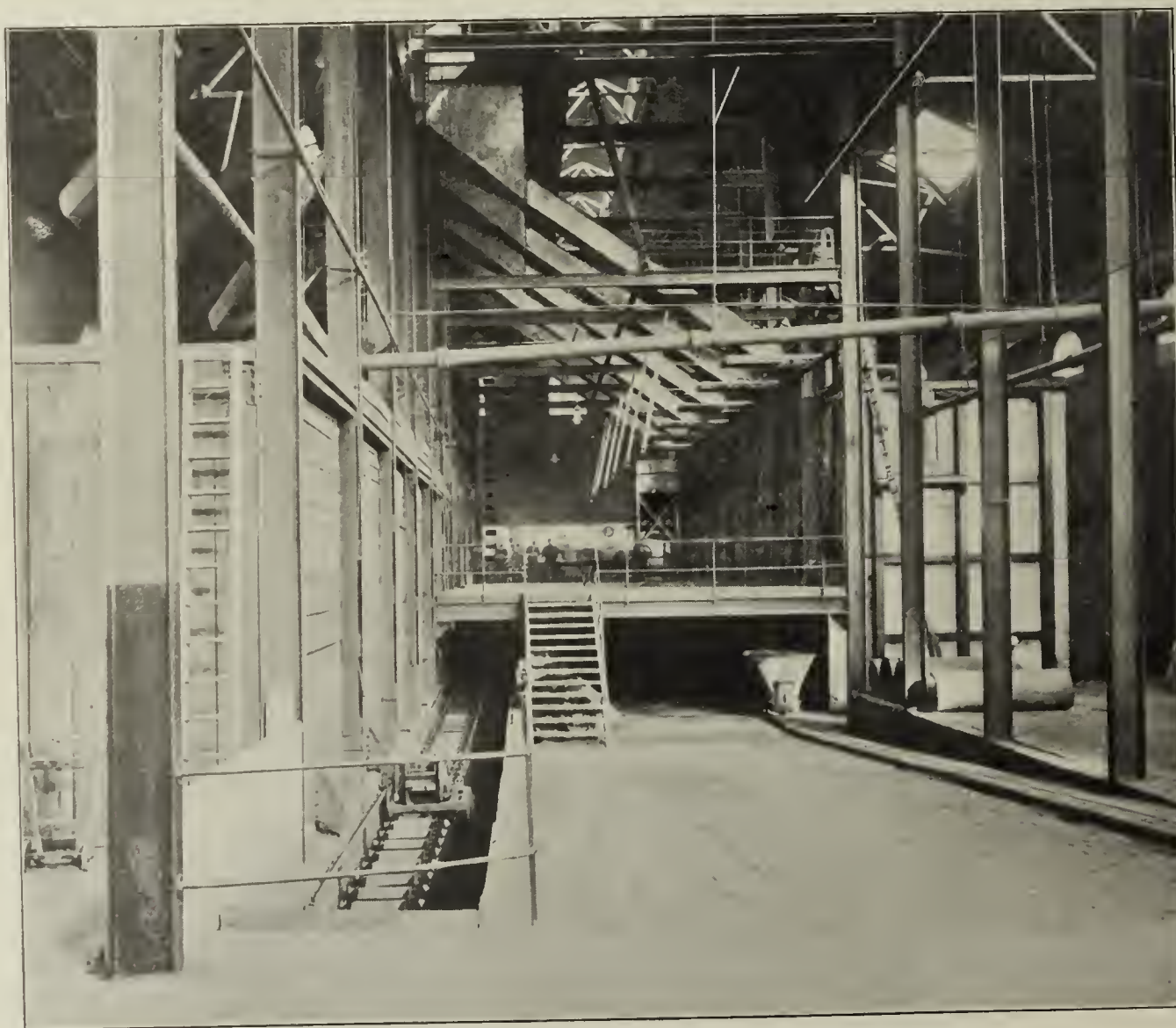
tion should be concentrated upon the question of distribution and our consumers' requirements.

There is a certain reserve power in gas-works manufacturing plant which we would gladly see brought into use during the hours of daylight, and it being our desire to distribute as much gas during the daytime as during the hours of darkness, anything



The Rotary Coal Filler.

calculated to encourage the day use of gas should be seriously considered and adopted. The question of the uses to which gas may be put during daylight hours is of paramount importance to all gas undertakings; and when we look around and see how far the largest concerns have had to go in an earnest endeavour to maintain their place as the principal purveyors of light, heat, and power, we can only marvel how some of the slow-moving concerns



Interior of the Retort-House at the Broughty Ferry Gas-Works.

have not been snuffed out long ago. The ingenuity and completeness displayed in advertising and in door-to-door interviewing, &c., command respect; and even the smallest undertaking must emulate their example. Such work is not undertaken for amusement. It is a serious attempt to foster day consumption, alike for the benefit of the undertaking and the consumer. There are municipalists who deprecate an advanced enlightened policy, and their parochial ideas clog the wheels of progress. In it, they espy the bogey of municipal trading. But there is no other road to success; and ultimately they must admit its utility. My own opinion is that a municipal gas department should always be run upon strict commercial lines, without regard to partyism, and its resources fully developed in the interest of communism.

Like other progressive undertakings, we give our customers every modern attention, and we treat them all with politeness and respect. Our services are at their disposal night and day. We provide and fix a variety of cooking-stoves free of cost, and we sell and fix gas-fires and lighting appliances at very moderate rates. Then, in the joint interest of buyer and seller, we test all meters once at least in five years. It has been suggested more than once that the Sales of Gas Act is entirely out of date, and that in view of present-day requirements and future developments in the distribution of high-pressure gas, amendment is immediately necessary. But as yet we hear of no steps being taken to bring this highly important matter under the notice of the authorities. In reform of this kind, the Institution of Gas Engineers might well follow the example of the young Canadian Gas Association.

THE INDUSTRY IN THE FUTURE.

We hailed the passing of the Standard Burner Bills with pleasure, and took it as a sign of the times. But if we could only obtain, in as simple a way as the Canadian gas engineer, the universal adoption of the No. 2 Metropolitan test burner and a level candle-power standard for the whole country, the supply of constant pressure at the consumers' meters, and uniformity in the construction of incandescent burners, what an impetus it would give to the gas industry. What a tremendous advantage it would be to have unvarying pressure night and day, and burners made to give maximum results under standard supply conditions applicable to the entire industry.

Then the potentialities of high-pressure gas are so great that in time it is bound to further revolutionize lighting and heating. Therefore, with vertical retorts in general use, with high and low pressure gas on tap, and with the principles of surface combustion applied wherever it is of service, who will predict the position of the gas industry when the Centenary Anniversary of the North British Association falls to be celebrated in 1961?

In the great and ominous fight which looms on the horizon of the rival illuminants, economy of production and distribution and low-priced gas are the main essentials to success. Therefore, build for the future, husband your resources, and let your capital expenditure be judicious and timely.

At no time in the history of the industry has a united front and perfect organization of our forces been more vital to our best interests than at present. Every worker now belongs to some Union or other; and if "Union" truly means "Strength," does it not seem strange that we, who are so continually being asked to recognize unionism in others, should so pointedly fail to recognize the necessity for unionism in our own ranks? Little wonder that the gas engineering profession and its Associations have so long failed to obtain the public and Government recognition their great services to the country warrant.

When Maurice de Guerin began a subject, his self-conceit imagined he was doing wonders; and when he had finished, he saw nothing but a wretched made-up imitation, composed of odds and ends of colour stolen from other people's palettes, and tastelessly mixed together on his own. Gentlemen, now that I have finished, I am similarly minded about my address; and I thank you for your great patience and indulgence.

APPENDIX I.

BROUGHTY FERRY GAS DEPARTMENT.

Return to the Property and Income-Tax Commissioners, 1911-12.

INCOME.				
Sale of gas	£8,249	14	9	
Residual products	2,711	7	2	
Other revenue	1	10	7	
				£10,962 12 6
EXPENDITURE.				
Manufacture of gas	£6,256	5	0	
Distribution of gas	793	2	9	
Rents, rates, and taxes (exclusive of income-tax	598	17	3	
General administration	176	12	1	
Other expenditure	161	13	5	
				7,986 10 6
	£2,976	2	0	
Deduct depreciation as undernoted	930	0	0	
				£2,046 2 0
Rateable value, 1911-12				
Valuation at May 15, 1911.				
PERCENTAGE DEDUCTIONS.				
	2½ per Cent.	3 per Cent.	5 per Cent.	Total.
Valuation at May 15, 1910	£19,847	£4,276	£6,120	£30,243
Less depreciation	496	128	306	930
	£19,351	£4,148	£5,814	£29,313

CLASSIFICATION OF DEDUCTIONS.

- At 2½ p.c.—Retort-bench, fittings, foul main, condensers, scrubber and washer, purifiers, station meter, governors, gasholders, carburettor, engine and pumps, mains and service-pipes.
 - At 3 p.c.—Consumers' meters.
 - At 5 p.c.—Charging and drawing machinery, conveyors, elevators, engines, coal breaker and fillers, coal and coke hoppers, tramway and haulage gear, waggons, steam cranes and derricks, engines and exhausters, pumps, boilers, workshop tools, &c.; sulphate plant, gas-stoves.
- SUGGESTED CLASSIFICATION OF DEDUCTIONS.
- At 3 p.c.—Retort-bench, fittings, foul main, condensers, scrubber and washer, station meter, governors, gasholders, carburettor, engine and pumps, mains and services.
 - At 4 p.c.—Consumers' meters.
 - At 5 p.c.—Charging and drawing machinery, conveyors, elevators, engines, coal-breaker, fillers, coal and coke hoppers, tramway and haulage gear, waggons, steam cranes and derricks, engines and exhausters, purifiers, pumps, boiler, workshop tools and implements, sulphate plant.
 - At 10 p.c.—Cooking-stoves and gas-fires.

APPENDIX II.

Valuation of Broughty Ferry Gas-Works for Local Assessment Purposes, Year 1911.

Total receipts	£10,963	
Total expenditure	£7,986	
Less owners' rates and feu-duty	202	
	7,784	
		£3,179
Tenant's capital—		
*Working expenses, 5-12ths of £7784	£3,243	
Six weeks' stock of coal and enriching material, calculated upon the maximum daily requirements	957	
Surplus purifying material	150	
(a) Surplus stores in hand	500	
Tools, implements, and waggons	750	
Machinery, stoking, &c.	3,000	
Office and laboratory furniture	250	
Meters in use and in stock	6,500	
(b) Stoves in use and in stock	3,500	
	£18,850	
(a) Disallowed stores in hand, as above	£500	
(b) Disallowed stoves, as above	3,500	
	£4,000	
Tenant's capital claimed	18,850	
„ „ allowed	£14,850 at 5 p.ct.	742
Valuation for year 1911		£2,437

(Accepted by the Assessor, 16 8, 11.)

* The Assessor in other cases allows half working expenses.
NOTE.—In the case of companies, an additional 20 per cent. is allowed as tenant's profits.

APPENDIX III.

Cost of Carbonization with Manual Stoking Machinery.

	FIVE YEARS' AVERAGE.				
	Per Ton of Coal Used.		Per 1000 C. Ft. of Gas Sld.		
	s.	d.	s.	d.	
Cartage of coal from waggon to elevator hopper . . . . .	..	..	0	4'80	0'55
Elevator men's wages (breaking and storing coal, and proportion of foreman's time)	0	1'90	..	..	0'21
Stokers' wages (including removal of coal to bing, furnace cleaning, pipe-jumping, and proportion of foreman's time)	1	7'18	1	9'08	2'18
(Ashes removed free of cost.)	..	..	1	9'08	2'39
Repairs and maintenance of coal plant—wages and material	0	1'23	..	..	0'14
Do. of coke plant—wages and material	0	0'51	0	1'74	0'06
Interest at 3½ per cent.	0	3'42	..	..	0'39
Sinking fund, 1-20th	0	4'88	0	8'30	0'56
	..	..	2	7'12	3'54
RESULTS DURING MAXIMUM AND MINIMUM DEMAND.					
Average of two winter months—Nov. 15 to Jan. 15.					
Stokers' wages (men nearly fully employed)	£121	3s. 10d.	1s.	5'36d.	
Coal carbonized per man per shift		68'66	..	..
Gas made do.		33,373	..	..
Average of two summer months—May 15 to July 15.					
Stokers' wages (men not fully employed)	£69	14s. 5d.	2s.	3'31d.	
Coal carbonized per man per shift		50'22	..	..
Gas made do.		23,940	..	..

Mr. S. MILNE (Aberdeen) said that the very pleasant duty fell to him to propose a vote of thanks to the President. He was

sure he voiced their thankfulness when he said that they had had that day a first-rate presidential address. It was fitting that at this, the fiftieth anniversary of the Association, meeting they should have a brief résumé of the history of the Association. The résumé presented to them by the President had been full of information of a most interesting character. They joined with the President in his tribute to the memories of the founders of the Association. They could not but be struck with the characteristic zeal and enthusiasm which pervaded the whole address. This characteristic had been exemplified in the history of Mr. Keillor's connection with the Association. In his own works, in the words of his address, he had been engaged in remodelling the fabric and improving and perfecting the arrangements he found there. No one had done more, in recent years, than Mr. Keillor had in that direction, or in improving and perfecting the arrangements of the North British Association. They were all agreed, he was sure, on this point. His address also contained words of correction and reproach; he was happy to say words, also, of encouragement. If the ideal to which the President had pointed that day, of linking together the Association, the Informal Meeting, the Junior Associations, and the Commercial Sections, could be consummated, he was sure that it would be for the good of the gas industry throughout Scotland. It was unfortunate that the President's address was not open for discussion, else they might have had some light thrown upon various subjects. He was afraid the only way in which this might take place would be in those other bodies—the Junior Associations and the Commercial Sections—applying for admission to the North British Association.

The motion was agreed to unanimously.

The PRESIDENT thanked Mr. Milne for his very kind allusion to himself, and the meeting for their overwhelming applause. He could assure them that a month ago, when he began to make some notes as to what shape his address should take, he was in "Queer Street," and particularly when they had the intimation from Dr. Colman that he could not lecture; and, in addition to this, nobody whom they had asked was willing to offer any communication. At that time he thought he would have to prepare an address which would occupy from half-past ten till four o'clock in the afternoon. He might not have been equal to the occasion. The address, he feared, was rather long; and he apologized for it on that account.

THANKS TO THE WILLIAM YOUNG MEMORIAL COMMITTEE.

Mr. W. B. M'LUSKY (Perth) proposed that they record their thanks to the William Young Memorial Committee for the work they had done in preparing the scheme of commemoration. While the President had modestly made complaint with regard to the inertness of the members of the Association, he thought that the programme before them, and the result of the President's own influence, showed that a great deal of work had been done by the Committee. The Committee had certainly completed a very important work. The William Young Memorial Fund would certainly go down to posterity as a most important item in all the work of their very capable Committee. He need not enlarge upon the work the Committee had done, because it was very well recorded in the annual report. But he would draw their attention to the broad basis upon which the whole scheme had been launched. There was no possibility, he thought, of anything arising in connection with the development of gas activity which would not be covered by the scope of the Deed of Declaration of Trust. He noticed that the scope covered the production, application, and distribution of gas, and all matters relating thereto. It also covered the production of mineral oil, the conduct of mineral oil undertakings, and all matters relating thereto. Looking into the deed, they would see that it did not cover anything in connection with the application and distribution of oil. This showed that, while the Committee had launched a scheme of the very broadest, they had been most careful to define the limits of the scheme, so that there was no possibility of a lecturer giving them a discourse demonstrating the value of paraffin oil for lighting purposes, or engaging an expert to canvass the use of oil among gas consumers. He wished to show that the Committee had been very careful to relieve their successors from any trouble in regard to the working of the William Young memorial scheme. He need not endeavour to impress upon them the value of the work done by the Young Memorial Committee. He believed that the work of commemorating the name of the great man was worth the amount which had been subscribed. The Committee had had the assistance of Mr. Yuill and Mr. Napier; the Committee had, indeed, been composed of men of a variety of gifts, and they had done their work exceedingly well.

The proposal was adopted unanimously.

Mr. J. W. NAPIER (Alloa), on behalf of the Committee specially appointed to get up a fund for commemorating the name of Mr. William Young, said he desired to thank them for their vote of thanks. They ought specially to give thanks to the North British Association, who gave fully £100 from the Research Fund of the Association, and more especially when they remembered that the Research Fund was an account which was very seldom drawn upon. The gift was all the more valuable because of the object to which it was put. The desire of the Committee in formulating the scheme was not only to bring before the members of the Association the valuable work of William Young, but rather, he thought, to perpetuate the memory of a man whose individuality was so particularly strong and so striking. The President

had that day found fault with the Association for not being sufficiently available for serving the ends of their industry; but he was strongly of opinion that no body of men could ever be looked upon as the proper or correct medium from whom benefit would accrue, either to the individual or the industry. They had a powerful example of this in the case of Mr. Young, who had benefited their industry and other industries, by the power of the individual. He hoped that the valuable appreciation of William Young by Dr. Daniell might be bound in more worthy covers, so that it might be put on the market, and members of the industry be thereby given the advantage of having it in a more permanent form. Dr. Daniell's appreciation was not only of very considerable value in itself, but it was a technical treatise which, in many respects, covered much other work which had resulted in great success, as the outcome of past labours. When William Young got his patent for a vertical retort plant, many years ago, and gifted it to the shale-oil industry, he undoubtedly gifted it to the gas industry as well; and yet it was a striking fact that all these years they had not taken advantage of it, because, so far as he was able to judge, the vertical retort of William Young's original patent was, to all intents and purposes, the vertical retort which they had to-day.

READING OF PAPERS.

The reading of papers was then proceeded with. These were taken in the following order: "Notes on the Attitude of the Air Question in Relation to Gas Manufacture, Purification, and the Reduction of Quality," by Mr. William Key, of Glasgow; "A Short Experience with Vertical Retorts at Helensburgh," by Mr. William Blair, of Helensburgh; "The Need of Publicity"—a discussion upon which was introduced by Mr. W. M. MASON, of Glasgow, and Mr. J. NAPIER MYERS, of Saltcoats.

ELECTION OF OFFICE-BEARERS.

The result of the ballot for the election of office-bearers was intimated by the President, as follows:—

President.—Mr. S. Milne, of Aberdeen.

Vice-President.—Mr. D. Vass, of Airdrie.

Members of Council.—Mr. A. Mackay, of Montrose, and Mr. J. Lang, of Alexandria.

Auditor.—Mr. D. Spalding, F.S.A.A., of Glasgow.

Mr. J. NAPIER MYERS (who had been announced as being elected on the Council), intimated that he could not accept the honour which had been offered him, on account of the terms of his appointment at Saltcoats.

The PRESIDENT said there was a tie between Mr. John Lang, of Alexandria, and Mr. A. Masterton, of Edinburgh, who were next on the list. In terms of the rules, a lot was drawn, which fell upon Mr. Lang, and he was accordingly declared elected.

Mr. MILNE thanked the members very heartily for the high honour they had conferred upon him in electing him President of so venerable an institution. He should endeavour, he said, to make it his business to maintain the traditions of the Association; and he trusted that, with the co-operation of every member, the year they were about to enter upon might not be the least successful of the fifty years which had preceded it. In a few minutes, he continued, they would be called upon to decide the place of meeting for next year. He did not know what their views might be; but he would like to take this opportunity of saying that, during the fifty years of the Association's existence, there had never been a meeting of the Association held further North than Broughty Ferry, where the Association met in 1863. Their fellow-members in the North-East of Scotland would, he was sure, take it as a very high compliment if they decided to go to Aberdeen next year. And would they allow him to say that, at a meeting the previous Monday, the Aberdeen Town Council heartily and unanimously authorized him, in their name, to invite the Association to visit their fair city—"the Silver City by the Sea"—on the occasion of their meeting next September.

PLACE OF NEXT MEETING.

The PRESIDENT proposed, and Mr. WALTER GRAFTON (Glasgow) seconded, that the annual meeting of the Association next year be held in Aberdeen.

The proposal was very cordially agreed to.

VOTES OF THANKS.

Mr. D. ROBERTSON (Dunoon) proposed a vote of thanks to the readers of papers.

This was agreed to.

Mr. W. B. M'LUSKY (Perth) moved a vote of thanks to the Aberdeen Town Council for their very kind invitation.

Mr. W. EWING (Lochgelly) seconded, and the motion was adopted with unanimity.

Mr. DANIEL MACFIE (Edinburgh) moved a vote of thanks to the Auditor and the Scrutineers.

This was seconded by Mr. A. MACKAY, and agreed to.

Mr. A. MACKENZIE (Edinburgh) moved a vote of thanks to the Hon. Secretary and Treasurer, which was also agreed to.

THE PRESIDENT'S MEDAL.

Mr. A. WADDELL (Dunfermline), as Past President, presented Mr. Keillor with the President's medal of the Association.

The PRESIDENT, in returning thanks, spoke of the pleasure he had had in serving the Association, and expressed his willingness to do all that he could for it.

The proceedings terminated at five o'clock.

ANNUAL DINNER.

In the evening the members and their friends, including many ladies, dined together in the Atholl Restaurant in the Scottish Exhibition. Mr. Keillor presided over a body of about 150. The toasts honoured were: "The Institution of Gas Engineers," proposed by Mr. A. Yuill, and responded to by Mr. R. G. Shadbolt; "The North British Association of Gas Managers," proposed by Mr. D. Macfie, and acknowledged by Mr. G. R. Hislop, of Paisley; and "The President," proposed by Mr. A. Wilson, and responded to by Mr. Keillor.

Mr. HISLOP, in the course of his remarks, said they had imposed on him the very important and onerous duty of responding to the toast of the evening, and especially upon so unique an occasion as the Jubilee of the Association. He premised this was on account of his being probably the oldest member of the Association, or that he happened to be the only member living who had been three times President. His connection with the Association went back about forty-four years; and, needless to say, very many of his friends in the gas profession had come and gone within that time, circumstances which impressed one with the evanescence of human life, and the fleetness of time. Happy associations clung to the memory, as did the friendly intercourse and discussions he had had with those long since gone to rest. He could only name a few—such as Hugh Bartholomew and William Foulis, of Glasgow; John Reid and F. T. C. Linton, of Leith; Boyd McCrae, and his son John McCrae, of Dundee; John Young and G. F. Cusiter, of Dalkeith; Alexander Smith, of Aberdeen; Thomas Whimster, of Perth; Robert Mitchell, of Edinburgh; Samuel Stewart, of Greenock; James McGilchrist, of Dumbarton; Peter Watson, of Stirling; William Mackenzie, of Dunfermline; George Malam, of Dumfries; Samuel Dalziel, of Kilmarnock; Jesse Hall, of St. Andrews; Alexander Scott, of Galashiels; and William Clazy, of Kelso. He could not omit the names of Mr. D. Bruce Peebles and Dr. Stevenson Macadam, of Edinburgh; Dr. William Wallace, of Glasgow; and Mr. Henry Aitken, of Falkirk—all of whom rendered valuable service to the Association. Among the living, besides himself, he thought that his friends Mr. Key and Mr. Macpherson (of Kirkcaldy) would be the oldest members. Pre-eminently there stood the name of the deceased William Young, of Peebles, who, as had been said, was the most valuable asset the Association ever possessed, during the long period of its existence, and regarding whom they were all greatly indebted to Dr. Daniell for his admirably written appreciation. Many a subject had passed through the refining furnace of debate during the bygone fifty years; and not a little share of the refining process fell to their dear departed friend, Mr. Young. After passing through the high-candle-power era, during which all the rich cannels and shales in the country were exhausted, necessity became the mother of invention, and Dr. Auer von Welsbach, in 1884, startled the world by his incandescent mantle, and completely revolutionized the gas industry—introducing, as it did, the present era of low-quality gas, and that at the critical moment when electricity was making a strong bid for supremacy. And now, while Dr. Auer von Welsbach had advanced electric lighting by 60 per cent., he had previously given to gas an increased lighting power of over 500 per cent., raised subsequently by high pressure to 1000 per cent., thus giving a position to gas which no rival in the world was ever likely to approach. The retrospect called for thankfulness on the part of gas engineers and shareholders alike, as it amply justified the combined efforts of this and all other like Associations in the past, in placing the gas industry in the invulnerable position in which it now stands. It was some satisfaction to reflect that the North British Association of Gas Managers was the pioneer in combining effort, by its formation, to further the magnificent success now secured for the gas industry. But however much credit might be due to the members of the Association in the past days, it was no warrant for laxity in the future. Having now placed the flag of victory on the mountain top, and within sight of the opposing forces, they must keep it intact, and hand it down to a succeeding generation, to inspire it with the spirit of progress in maintaining the supremacy of gas as a necessity of human life—for lighting, heating, and motive power. He trusted, therefore, that the Association might long maintain a vigorous existence; and that all that was good might attend it in the future.

On Friday a large party proceeded, in indifferent weather, on an excursion by rail and steamer to Arran, *via* the Kyles of Bute.

Gaseous Explosions Committee.—At the meeting of the British Association, there was submitted an interim report of the Committee (of which Sir W. H. Preece is Chairman and Mr. Dugald Clerk and Professor Bertram Hopkinson are Joint Secretaries) appointed for the "Investigation of Gaseous Explosions, with Special Reference to Temperature." It was stated that during the session 1910-11 the work of the Committee was continued; but from various circumstances—partly breakdown of apparatus, and partly pressure upon the time of various investigators—only two "Notes" have been read. Three meetings have been held, and have been excellently attended. The "Notes" presented and discussed were by Mr. Dugald Clerk; and by Professor E. G. Coker. A great deal of other work is in hand, which will be included in a full report which it is intended to give to the Association next year.

THE NEED OF PUBLICITY.

[A Discussion by the North British Association of Gas Managers, introduced by Mr. W. M. Mason, and Mr. J. Napier Myers.]

Mr. Mason, in introducing the subject, said it was with very great diffidence that he came before them, because he was not even a member. But he was a member of a body which endeavoured to impress upon its members the necessity for taking part in the work of the Association—he meant the Junior Gas Association.

One of the nation's thinkers has expressed the opinion that the lack of enterprise in much of our social and commercial life is to be traced to the deep-seated reverence Britishers have for precedent, and to the strong objections even those designating themselves "liberal" have for new methods. Perhaps in no business is this more apparent than in the gas profession; and, at the risk of "falling foul" of older and more experienced gas men, I venture to express the opinion that many of their methods, as far as the commercial side of the business is concerned, are hopelessly out of date. Some gas engineers seem to hang tenaciously to the ancient maxim that "profits are made in the retort-house," and forget that, even if the proverb is true, profits so made might easily be turned to losses if other sections of the business are not as efficiently handled.

THE PUBLICITY SCHEME.

It is a hopeful sign of the times that some gas managers are really wakening to the need for more energetic steps being taken to put the sales side of their business on better lines. The "Publicity Scheme" formulated by the Institution of Gas Engineers, and now within the realm of accomplished fact, is a distinct advance in the way of combined effort; and if for nothing else than arousing interest among gas authorities, and focussing attention on the need for united and strenuous action, the scheme would have more than justified its inauguration. I think a good motto for the new organization would be "Wake, Brethren, Wake!" with the telegraphic address, "Hustle."

The scheme, as stated in the circular sent to the various gas authorities, aims at being "primarily a campaign in favour of gas," but its essential feature is that it is a co-operative movement, and an earnest endeavour to bring the forces of progress into unity. Some of the more enterprising gas undertakings are already spending large sums in advertising, from which doubtless others have benefited; and it seems only fair—apart altogether from the importance and urgency of the question—that all interested should lend a hand, in no matter how small a degree, to help "the old chariot along." It is difficult to understand the attitude adopted by some engineers, who take exception to the scheme because of the annual subscription basis; but surely £5 per annum to a 40-million works cannot be called extravagance, and the stimulus to business is certain to be felt by the entire gas industry.

A sentence in a recent technical publication hits the nail on the head. The reference is to the old-fashioned methods of some gas companies, and is as follows:—

Neither they nor their chief officials have been trained to spend money by way of advertisement. So far as the gas engineer and manager's experience goes, it has all lain in the direction of saving money, not of lavishing it. He may be able to appraise the economy of an elevator or conveyor for his coal or coke; but he is quite at sea as regards the value of advertisement. The bare proposal to throw bread, or its equivalent, upon the waters, and look to its profitable return after many days is abhorrent to all the frugal traditions in which he has been brought up.

The editor might have added that the modern Scottish version of the wise man's proverb was "Never cast your bread upon the waters unless the tide is coming in."

ELECTRICITY ENTERPRISE.

If justification for publicity were necessary, one need only refer to the enterprise of our rivals in the electricity camp. Let us take an illustration that lies very near some of our own door-steps. I refer to the Clyde Valley Electric Company. I fancy it would be an eye-opener to us if the advertising bill for this one concern were available. Money and effort have been liberally expended, with the inevitable result that, within a comparatively short period, a very large business has been developed. The point for us is that this business is not obtained from customers who had no light or power before, but is, as a matter of fact, almost entirely the result of direct poaching on what we fondly imagined to be gas preserves. Some of the methods employed have been contemptible, and many of the statements (or mis-statements rather) regarding economy, values, &c., have been on the usual electricity lines. But fairly or not, the fact remains that gas undertakings in this district are suffering serious loss, not because of the greater merits of electricity, but simply because of the persistent manner in which it is being forced on the attention of the public, or, to put it bluntly, because the Clyde Valley Company promoters are running their business on up-to-date lines, instead of sitting still and deploring dull times.

We, of course, are firmly convinced that there is nothing like gas; that it is the cheapest, best, and most reliable, and all the rest of it. But the general public have a way of believing and

supporting men who are not ashamed to proclaim their wares, and who insist that their product is unquestionably the finest thing on earth. There is nothing dishonourable regarding the manufacture and sale of gas, and the uses for which it is now available are legion. But the great majority of people know nothing of this—many of them in fact know nothing of even its commonest and most apparent advantages; and unless they are informed, unless indeed the information is persistently forced on their notice, we cannot hope, in face of the well-organized efforts of our competitors, to even retain the business we have. A short extract from the speech of the Chairman of the Electric Supply Publicity Committee last June proves my contention. The reference was to the previous year's efforts. The statement was to the effect that—

The result had been satisfactory from every point of view; and the Committee had supplied literature throughout the United Kingdom in addition to the Colonies and abroad—the total sales during the year numbering nearly one-million-and-a-half. Further, the Committee had also done signal service in connection with the newspapers, and the various erroneous reports which had been given currency to in the Press in regard to the cause of fires. Corrections had been arranged in the Press wherever necessary, and the interests of electric supply generally upheld. Newspaper advertising had also been done to a fair extent; and there was hope that in the forthcoming year this would be carried on on a much larger and more comprehensive scale. He upheld the necessity of a strenuous and systematic publicity campaign, as preparing the way for and supplementary to personal canvassing. The universal use of electricity for lighting, power, and the various domestic uses could be attained only by continuous appeal. The supply undertaking must regard themselves as vendors of a commodity in exactly the same way as other tradesmen; and the methods of widespread advertising adopted by the latter were as indispensable to the one as to the other.

Or take this paragraph from last month's issue of one of our most popular magazines ("Chambers's Journal"):

Owing to the greater display of enterprise that is now being evinced by electricity generating corporations, in conjunction with inventive effort, the advantages of cooking by electricity are being brought more forcibly before the housewife.

NEW METHODS NEEDED.

Now there is little use criticizing the methods of our rivals, and waxing eloquent about their imaginative powers. What we want is to fight them on their own publicity grounds; and this I have good reason for knowing is the last thing they wish us to attempt. We need not fight with their weapons of misrepresentation; for the claims made on behalf of gas are usually not exaggerated, and can be easily authenticated. "Facts are chieftains that winna ding." But if these facts are kept to ourselves, they will not add much to our output.

We are well aware that those with conservative ideas excuse their lack of enterprise by saying that the best advertisement is merit. This is undoubtedly true; but, as the American says, it is mighty slow in its action. If the inventors of sewing machines and typewriters had depended on merit alone for letting the world know the results of their genius, they would not now be in the happy positions they occupy. Of course, we fully recognize the fact that advertising does not merely consist in issuing leaflets and displaying posters. Everything we do in connection with our business is an advertisement, either good or bad. Prompt attention and courtesy on the one hand, or carelessness and incivility on the other; well executed orders and satisfied customers, or badly done work; reliable and intelligent statements as to capabilities of appliances, or bad advice and still worse fitting. It all comes back to us for good or for ill, and with what "measure we meet it shall be measured to us again."

Merit is unquestionably the foundation on which good business must be built, but only "push" will raise the edifice, while "publicity" will make an extension of premises necessary. The more convenient "sit still" policy certainly saves money for a time; but it is, in shopkeeping circles, generally followed by a "giving up business" sale. It may sound a paradox, but if we stand still, we are really going back. What is wanted in the gas profession is enthusiasm. There is no more "catching" virtue; and the public always like to deal with men who believe in their own medicine. "Like master, like man;" and if the leaders in the industry do not enthuse, there is little likelihood of the rank-and-file doing the little extra bit that means so much on the road to success.

PRACTICAL SUGGESTIONS—SHOWROOMS.

And now allow me briefly to enumerate one or two practical points, which, in my opinion, are indispensable in dealing with this subject. As might naturally be expected, I would place well equipped and up-to-date showrooms well in the forefront, as a most important adjunct to the publicity side of gas business. I have no doubt the majority of my hearers agree with me as regards large places like Glasgow; but some may think that with small undertakings, the necessity is not so urgent. This is surely a grave mistake. It is a small place, indeed, that has no person who requires converting to the advantages of gas appliances for lighting, heating, or cooking; and any gas company, no matter how small, would certainly find a well-stocked showroom, where gas users could get reliable and unbiased information regarding all kinds of appliances, a most valuable asset. That this is not merely a pretty theory, is proved by the fact that in several small

places within the speaker's personal knowledge, excellent showrooms are installed which more than justify their existence.

It is desirable that such showrooms should be in a prominent place, where the public can have no excuse for not seeing them. They should be not merely shops where gas consumers can get what they want, but attractive educative centres, where people with erroneous ideas about the uses of gas may have what is always the most effective righter of wrong notions—practical demonstrations of convenience and efficiency. To this end, it is well to have some special feature as a "draw." In our principal showrooms in Glasgow, we have a permanent exhibition of completely furnished rooms equipped with gas appliances. We have also gas-fires, water-heaters, &c., in actual operation. These have aroused keen interest among many who had hitherto little idea of what gas could really do. We have also cookery demonstrations at certain stated times, which have proved not only a means of instruction to consumers who have cookers, but have helped to arouse interest in other types of gas apparatus less well known. It is desirable that, as far as possible, orders, complaints, and accounts should be dealt with in the showrooms, as customers calling about these matters can see, and be interested in, appliances of which they would otherwise have no knowledge.

If the work of providing apparatus which will give consumers the best and most economical results for the gas used, is left to private traders, it may be said at once that it will be very inadequately done. This is not intended as a reflection on traders, but is simply a plain statement of fact, as can easily be proved. If traders anywhere could give a satisfactory display of gas apparatus, and keep up-to-date stocks of the latest pattern gas-fires, water-heaters, &c., surely they would be found in industrial Glasgow, with its wealth of business talent, and splendid array of wholesale and retail trade houses provided for the supply of almost every commercial commodity. But the fact remains that there is no warehouse in our city which carries a stock of gas appliances at all comparable with the Gas Department show-rooms; and if consumers depended on private enterprise for advice or guidance as to gas apparatus, I fear it would be mainly given through the medium of catalogues. Traders, of course, at once admit that they could not possibly carry stocks like us. Indeed, they even resent the mere suggestion that they should be expected to do so, on account of the capital involved; and so, of course, our customers would inevitably suffer. If it were furniture or millinery, the public would be admirably catered for. But where gas appliances are concerned, traders do not seem to think it worth while to take even the usual business risks. So if gas authorities do not provide the necessary facilities, they are really penalizing their consumers, and at the same time neglecting a profitable source of revenue.

LITERATURE AND PRESS NOTICES.

The free distribution of literature is another important part of publicity, and will doubtless form one of the principal sections of the Institution scheme. The small or moderate sized gas undertakings cannot afford to neglect this matter; and there is no excuse for so doing, as a good selection of clever advertising leaflets is now available. One of the most effective ways of reaching gas consumers is, of course, through the medium of the gas accounts. These are usually sent out quarterly or three times a year; and pamphlets calling attention to the appliances then suitable for the season should be attached—cooking or water-heating in summer, or fires, radiators, &c., in the colder months. Direct advertising in the public prints is a costly business. But it should not be forgotten that editors are after all men of like purses as ourselves; and if gas pays good bills in the advertisement columns, they will see that it is fairly treated in the other parts of the paper. This is a most essential point, as after all, a well-written article is an excellent medium for reaching and influencing an intelligent public. An editorial or a friendly reference in a paper like the "Glasgow Herald," a paragraph in one of the popular monthlies, or a clever cartoon, exerts more influence than is dreamt of in some gas manager's philosophy.

Managers who are alive to their opportunities will also make the most of such movements as the Smoke Abatement crusade. After all, gas is the most practical solution of this problem; but the fact wants to be more strongly emphasized, not only in the Press, but by exhibitions.

EXHIBITIONS, &c.

Surely the members of the North British Association do not require to be told of the benefits to be derived from exhibitions. Those who visited the Glasgow Smoke Abatement effort in this line had nothing but praise and congratulations for the display gas made; and, apart from the number of orders for appliances actually booked, the educative influence there exerted was very great. One important aspect of this influence was the marked change of opinion which resulted as to the advantages and the hygienic qualities of gaseous fuel; and this is, of course, a permanent gain, from which greater results will inevitably follow.

What better illustration of the advantages of combined effort in effective advertising could we have than this exhibition. It was, of course, largely a combination on the manufacturers' part with the active assistance of the Corporation; but the result was a fine testimony to the principle that "union is strength." It has been repeatedly stated in public (and the statement generally seemed to meet with unanimous approval), that there was not a gas-works from Stranraer to Inverness but had profited by that

splendid effort. But cynics suggest that, while the majority of gas authorities seem only too pleased to profit by whatever benefits may be going, they are not quite as willing to bear their share of the financial burden.

Another much smaller movement might be referred to, as illustrating the importance of fostering everything that will tend to help the consumption of gas. I refer to paper bag cookery. Some superior gas engineers would doubtless sneer at the very idea that they should be asked to condescend to such matters; but the sneer would only show a false attitude of mind towards the whole aims and objects of publicity. Nothing should be too insignificant if it helps to foster the demand for gas; and nowadays dividends are got from apparent trifles.

I will only refer, in closing, to the growing favour with which such methods as the giving of free cookers, fires, &c., are being viewed. Managers are awakening to the fact that this form of losing a "sprat" in the form of hires, to gain a "mackerel" in the shape of increased make, is good business. It is only another form of publicity, which is certain to be greatly extended in the future.

The employment of lady lecturers, to visit and advise customers regarding the proper use of their appliances, is another practical form of advertising, which cannot fail to bring a good return; and I need only mention industrial appliances to at once touch the imagination of gas managers, and remind them of the enormous field lying undeveloped, and waiting ready for the hand of the diligent gas man. Gas has been applied to a thousand useful arts and crafts, and manufacturers will not be very long in adopting systems either of lighting or heating if economies can be proved; and this, to a man who knows his business, should be only a matter of detail.

A REPLY BY MR. J. NAPIER MYERS (OF SALTCOATS) TO THE PAPER ON PUBLICITY, BY MR. MASON.

Our President was keen about having my name upon this our Jubilee programme, as my father's was on the first, and suggested to me that I might be associated with Mr. Mason in the discussion about what is known among us as "The Publicity Scheme."

In a weak moment, I consented to appear as "Devil's Advocate"—i.e., to reply to Mr. Mason, and to say what I could say for the old order that is passing away. It was weak on my part to accept such a brief; for I cannot manage in debate. My charity admits so much good presented by the other side. Then I am not logical, and am apt to blow both hot and cold, and to indulge in the feminine quality of denouncing things not in the paper.

I have had the privilege and pleasure of an early perusal of Mr. Mason's paper, and find I am in agreement with much he recommends. But the spirit at the back of the whole project is distasteful to me. My natural conservatism, the circumscribed sphere of my labours, and the innocence of any other opposition to the use of coal gas than the oil-lamp and the candle, puts me at issue with the spirit of modernity that pervades the paper. I do not like the "hustler," and his bouncing advertisement. He takes me for a very simple blade, who will buy his meal or marbles because he brags of them. I do not like log-rolling and speaking disparagingly of my neighbour.

This policy of "Devil-tak-the-hinmost" is pagan and not Christian; and I have yet to learn that what is not commendable in private life can be good public policy. I have been accustomed to think that the town's gas supply stands no more in need of blazoned advertisement than one's water supply or tramways. This does not mean that gas officials should carry themselves like emperors. They should remember that they are public servants, and be always on the alert to give the public honest service. If we continue to be of real public utility in our own parish, we will thrive; but if we think to continue our existence by means of the five-foot hat advertisement, we shall have to move on, in spite of all the money we may waste in advertising.

It used to be claimed by the early co-operators that they secured profits by saving shop-front and other advertising expenses; and by this means secured their bread and meat at bed-rock prices. I wish to see our gas sold on such terms, and not have to bear the cost of advertisements (as if we were exporters), the cost of the "ironmongery-for-nothing" department, and the waste this policy entails.

We are all with Sir William Ramsay, when he said last week: "We all live in hope that the world will grow better as the years roll on."

One of the most important methods for the physical betterment of the city man's world is the use of gaseous fuel, and the suppression of the practice of burning green coal. I have a good deal of sympathy with the public opinion said to prevail in New England cities, that one may be pardoned for shooting his neighbour, but not for firing his own barn.

In order to accomplish this kind of betterment, I know there is great need for all Mr. Mason's effort to "educate, educate, educate!" I approve Mr. Mason's exhibitions, demonstrations, and lectures; but I deprecate the music and the dancing, the bribery and corruption, by which it is sought to inveigle people to buy what they do not want, and to spend money to no profit. The vicious part of Mr. Mason's paper is in the tail, where he alludes to the giving of free cookers and gas-fires.

He characterizes this as being ground bait—"sprats" to catch "mackerel." This policy of giving away ironmongery for nothing

is vicious and ephemeral, like the furnishing of houses by the consumption of tea.

It is the policy of gas conveners who hope to become popular, aided and abetted by ambitious gas managers. This is the policy that will bring about the state of things Mr. Mason deplures, where he states that private traders may be depended upon to cater for millinery and furniture, "but they resent the mere suggestion that they should carry large stocks of gas appliances."

Here I think we have cause and effect. It is the cheap sales department of the corporation that puts out the private trader. My own experience in the ironmongery business is perhaps too trivial to mention. During four or five years the Saltcoats Gas Company engaged in the hiring of gas-cooking appliances (acknowledging the need there was to teach the public to use gas for other purposes than for lighting); and during these years the local traders declined the business. When my Company abandoned the practice of hiring (owing to the waste entailed at the fitting season, through the migratory character of our population), traders began again to stock the appliances suitable to the picnicking habits of our people; and I think the private traders do this business at less cost to our town than if done by the Gas Company—that is, the direct charge to those who buy the appliances is less than if the charge was merged in the indirect taxation—if the rate for gas bore the cost of the gas appliances.

I am disposed to charge you city men with a conspiracy of silence, in regard to this gas-stove business. You never tell us here about the drawbacks of the hiring business that we hear of in private—about cookers being in families where they never indulge in baked meats, of gas-stoves being used as cupboards for saucepans, or stores for fire-lighting, and become merely stands for hot plates.

A hired thing, whether a cooker or a cab-horse, is often a neglected thing; and you ever-zealous men who are doing your best to spread these appliances broadcast (with the view to increase your sales of gas) are destroying the spirit of carefulness in our Scottish people.

I have a good deal of sympathy with the collectivist's ideals; but this cooking in the municipal box, soon to be followed by sterilizing the municipal milk in the municipal saucepan, is Socialism gone mad.

The PRESIDENT said they had had two very able contributions on this subject; and the matter was now open for discussion.

Mr. A. YUILL (Dundee) said this innovation at their fiftieth anniversary meeting would form a feature at their subsequent meetings. He did not stand as an advocate of Mr. Mason; but the lines he had put forth were worthy of consideration, because if they took the case of a company and asked what had been the origin of that company, whether it had been a philanthropic desire to supply the people in the district with gas, or whether it had been with a view to trying to make profit, they would all admit that the inception of any company was with a view to making profits, not altogether with the view of selling gas. If this were the view, those who had experienced the two sides of the question would admit that the more they advertised, the more they brought their wares before the general public, the larger the success they would meet with, and, consequently, the greater would be their profits. He was in entire sympathy with the Publicity Committee; but a difficulty arose with some of them when they appealed to their corporations. Some would be quite willing to subscribe, but an auditor stepped in and said he would not allow them to pass the account. In his case, the Town Council were the managers of both the gas and electricity departments, and they felt that they would be advertising the one department against the interests of the other, and that this would not be fair. Therefore they declined to allow advertising inside the town, and they would not spend any money to go outside. He could agree with Mr. Mason when he spoke of giving free cookers and free fires, and fixing free. They had given free cookers in Dundee since the year 1905. He did not wish to particularize as to the extra profits which they had got—suffice it to mention that they gave free cookers. The price then charged was 2s. 10d. per 1000 cubic feet; it was now 2s. 2d.—a reduction of 8d. since they introduced free cookers. Bearing these facts in mind, his Council were thoroughly impressed with the wisdom of the step they took. This year they had gone one further, and had agreed to give free fires. Another step he had taken was the appointment of lady demonstrators, who went about and educated the people in the proper uses of cooking-stoves. He found—and no doubt several of them would have experienced the same thing—that a person might get a cooking-stove installed, but was not thoroughly conversant with the working of it. He might be able to light the gas, but when he began to cook, he could not do it. So they had appointed lady demonstrators to teach consumers. What they were doing in this way was on the lines of publicity. They felt they were doing it for the benefit of the community. They were doing this work at home, and it was quite within their province; but to pay 2s. 6d. per million of their annual make was a thing which their auditors would not admit nor acknowledge. Mr. Myers deprecated gas-works fighting against each other, and said that tramways and water concerns did not do this. He must remember, however, that if there were two water companies or two tramway companies in a town, they would fight.

Mr. ALEX. WILSON (Glasgow) was afraid he was not on Mr. Myers' side. He must congratulate him on the way he managed his part; but, at the same time, he could not congratulate him on the matter. He was afraid he must take the side Mr. Yuill had

taken. Most of them would find Mr. Mason was on the right lines, and the sooner they got to understand this, the better it would be for all of them. He remembered that his old friend, Mr. McGilchrist, used to say: "It is not gas we want to sell; it is light." It was not gas they wanted to sell nowadays; it was service to the community. The real thing they had to get at was how best to serve their customers. Were they going to give them cheap gas, and nothing to use it with, or give them every facility for getting appliances, and so enable themselves to give a much better service? He was rather surprised to hear Mr. Yuill make a remark he did about the auditors. So far as Glasgow was concerned, they had not had any trouble with them; and he had no doubt that Glasgow would come into line in regard to the publicity proposals. The work would be much better done in co-operative fashion than it would be by any company or corporation singly. If the Publicity Committee were helped in the way they should be helped, he had no doubt they would show a good return for the money which was given them by subscribers. In the matter of supplying free fires—which, of course, was a question for each separate district—they would all have to settle for themselves how far they could go. He was glad to say he thought Glasgow was coming into line in the matter of free cookers. It was not yet arranged; but before the year was out, he hoped to see free cookers in Glasgow. This would be a great thing. It would mean a lot of work for the Department; but it would be work worth doing, and worth the large expenditure incurred, and on which, he was sure, there would be a good return. In all places the payment would be in proportion to the output. Mr. Myers, it was to be hoped, would fall into line, like the rest of them.

Mr. W. EWING (Lochgelly), as one of the pioneers in relation to the idea, said the day would surely come when they must supply free cookers and burners, and let the consumer maintain them. He advocated this many years ago, when at Hamilton; and he thought both the Editor of the "JOURNAL OF GAS LIGHTING" and the Editor of the "Gas World" were rather severe on him at that time for making such a proposal; but they latterly admitted, when free burners and maintenance were given, that the day had dawned for a few improvements in gas supply. He had no doubt there were many places where they were not able to give free cookers and fires, because of over-capitalization; but the tendency of the times, as had been forcibly shown, was in the direction of doing the best for their consumers.

Mr. Mason said both Mr. Myers and Mr. Yuill referred to two departments fighting one another. He thought this would be a good thing. It would be a pity if two departments in one corporation should lie down to one another. Opposition in business was the life of trade. If it were the case that in the gas department they should say that electricity could do this, and they would not bother about it, it would not do. It was better that they should do the best they could for themselves. As to the matter of free cookers and free fires, it was not so very easy, in a place like Glasgow, to do it, because it involved such a large outlay. He understood Mr. Myers had at present no opposition except from the paraffin lamp and the candle, but there was a possibility that there would be opposition from an electric source. He would ask Mr. Myers to give a paper next year, after the electric people had arrived.

Mr. MYERS thought he had better let go what he had said, without enlarging on it. The day was too short, and too far gone, for him to "let himself go" any farther. But he would ask them, in thinking about this matter, not to stand under the hill, as it were, of business, but to lift themselves above it. One's imagination palled at the thought of a municipality undertaking and offering so much service to the community as was involved in the supplying of cookers and fires free. It was the tendency that he opposed, rather than the particular items of Mr. Mason's programme. He was sorry to think there was anybody who would stand up for his way of looking at things; so he (Mr. Myers) stood as Athanasian before them, and before the whole world.

Mr. R. G. SHADBOLT, at the request of the President, then addressed the meeting. He assured them that no one present had enjoyed the debate more than he had. It was opened in an exceptionally able manner; and it was replied to in the very best of spirit. "Socialism gone mad" had been spoken of. Well, if Socialism never went madder, then they were safe still. Mr. Mason gave them a Scotchman's motto, in that particular, which he thought was very *apropos* at this particular stage—"Cast your bread upon the waters when the tide is coming in." The tide was coming in; and now was the time to cast their bread upon the waters. The Council of the Institution of Gas Engineers were appealing to members to gather round them in greater numbers than they had done hitherto, and so make an effort which would meet with the greatest possible success. His presence there that day was due to the Publicity scheme possibly as much as to anything else; and he should like—and he should think there were many members present who would like—to see the scheme much better represented among those who had undertaken to support it than it was at present. The publicity scheme was practically launched. The question now was not whether or no they should push their wares. They were agreed that the time had come when they ought to enlighten the public. The point now was, having put their hand to the plough, not to turn back, even under the persuasive powers of Mr. Myers. Mr. Yuill had raised a legal question. It did seem that there was some bogey in this. One point which could not be too often driven home was the fact that they not only wanted money, but they wanted all gas undertakings represented. It was

news to him that this idea originated with Mr. Ewing. It was so long ago, possibly, that they had all lost sight of it. But the idea at present originated among the Commercial Sections. Was the scheme likely to pay? It would not be out of place if they were to glance at what their rivals were doing. The electricity people said their Committee had been in operation for over a year, and that the result of the first year's working had been in every way satisfactory. If this were so in regard to the publicity method of their friend and rival, the electrical industry, how much more must it be in the case where they had so much better a commodity to place before the public? Let them move in a body—let them move solidly; and when they did take up this great work, let it be done thoroughly and well. What was the response from Scotland? The list made up the other day showed, he thought, only twelve undertakings willing to give support—and there were, he thought, about 260 gas undertakings. The smallest undertaking would derive some benefit from the publicity scheme. All would benefit; then why should not all assist? The amount asked for was ridiculously small; then why hesitate? The members of the Association had it in their power to influence very greatly the men under whom they worked; and he said it was their bounden duty to do their utmost, between now and October, when the meeting would be held which would form the publicity scheme, to induce the undertakings with which they were connected to throw in their lot with it. The amount asked for was so ridiculously small that one wondered why there should be any hesitation. The thing was there; so let them, with "a long pull, and a strong pull, and a pull together," show the world that they had a very great deal of useful service at their command, and let them remember that by increasing their output they were increasing their profits, and benefiting the community at large.

Mr. YUILL said that Mr. Shadbolt, as President of the Institution of Gas Engineers, might take up the matter which had been mentioned. The Institution might see if there was any way out of the difficulty which they were in.

Mr. W. B. M'LUISKY (Perth) pointed out that insidious and absurd articles in favour of cooking by electricity were published in influential papers; and he asked how these were to be met.

Mr. S. MILNE (Aberdeen) pointed out that the Corporation of Dundee contributed to the Young Memorial Fund, and that no question as to legality was raised on that occasion.

Mr. YUILL replied that that was a case of furthering the interests of the department. When the subject was before his Committee, the question of legality never entered into the matter at all, but rather the fact that they were representatives of the electricity as well as the gas department; and they did not approve of advertising one of them.

Mr. ALEX. WILSON said that this was also discussed at their Committee meeting; but it was felt to be not a question of destroying one of the undertakings—it was a question of putting the advantages of gas as clearly as possible before their consumers and the public. It was stated that they were there to further the interests of gas; and he thought this was the better way to follow the thing up. As to the difficulty of subscribing to the one thing and not to the other, he failed to see how the line could be drawn. If the Dundee gas undertaking were allowed to advertise in local newspapers, and to issue leaflets, he failed to see how they could not go a little further and spend some money on the Publicity Committee, so as to extend the advertising.

The PRESIDENT said he had endeavoured to obtain the consent of his Town Council in this matter more than once; and the ruling of the Town Clerk, which was taken as binding, was that they had no funds for such a purpose. He knew that in Scotland there were a great many corporations similarly situated. In Scotland, gas undertakings were comparatively small, and corporations did not look upon the matter in the same way as they did. Perhaps it was because they were asked to contribute 2s. 6d. per million cubic feet of gas that there was objection. If it were put in some other form (such as the purchasing of literature), they might get over it; but as long as it was a request to contribute so much, he believed that in many instances it never would be done. He said in his address that he thought the opinion of the Scottish Office should be taken as to the legality of using money in advertising.

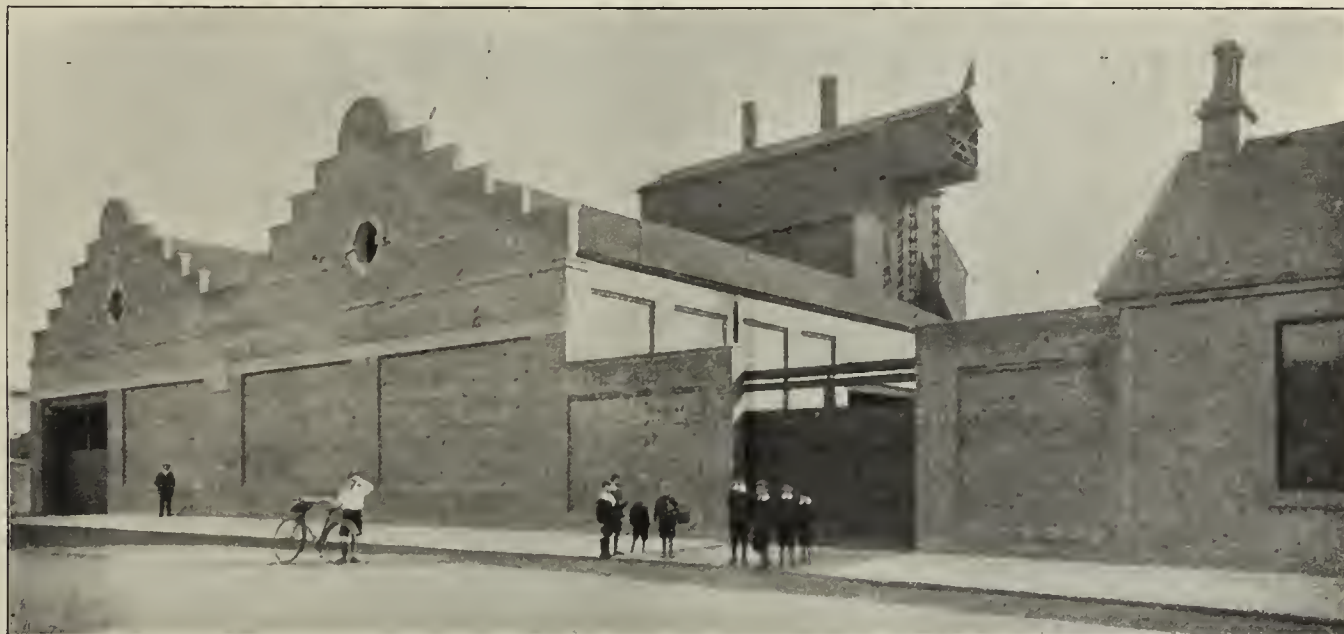
Mr. W. BLAIR said he had had the opportunity of laying the circular before his Committee; and he thought that the spending of money for the benefit of the department should be at the discretion of the department. They ought to try to push this point, and have a ruling from the Secretary for Scotland upon it.

Measurement of Water Flowing in Small Pipes.—A device designed to measure the quantity of water flowing in pipes where conditions exist which make the use of meters undesirable, consists of a simple mercury U-tube so connected as to show the drop in pressure between two points in the pipe. These two points are not to be less than 25 feet apart, according to a description of the apparatus given in "Power," and at each of them a small aperture—say $\frac{1}{8}$ -inch diameter—is made in the pipe and threaded. These apertures are connected by a line of $\frac{1}{8}$ -inch piping in which a U-tube half filled with mercury is inserted at some convenient point. When water is flowing in the main-pipe, there will be a drop in pressure between the two points, causing the mercury to be elevated in one leg of the U and depressed in the other. The pressure drop varies with the velocity of flow; and by calibrating the device the volume of water passing may be determined.

THE INSTALLATION OF GLOVER-WEST VERTICAL RETORTS AND THE EXTENSIONS AT THE HELENSBURGH CORPORATION GAS=WORKS.

By W. BLAIR.

[A Paper read before the North British Gas Association of Gas Managers, Sept. 7.]



The Helensburgh Gas-Works, showing the Position of the Vertical Retorts.

The renewal of the carbonizing plant and the provision for the increasing output of gas at the Helensburgh Corporation Gas-Works having been found necessary, the Gas Committee acquired an adjoining plot of land, measuring 126 feet by 136 feet, for the purpose of erecting new coal-stores and carbonizing plant which would permit of a railway siding into the gas-works from the adjacent goods yard.

THE GLOVER-WEST RETORT INSTALLATION.

With the object of installing the most suitable form of carbonizing plant with labour-saving machinery of the required capacity, the author made a study of the merits of the several modern methods of carbonizing in horizontal retorts with power stoking machinery, and concluded that, with an annual make of gas at Helensburgh of about 60 millions, it could not be economically introduced to produce results which would warrant the entire reconstruction of the existing plant.

The merits of the system of carbonization in inclined retorts were also considered; but when comparing the working costs and results of both the inclined and horizontal retort systems with those of either the intermittently or continuously operated vertical retorts, which have during recent years made such advance in the

progress of the science of gas manufacture, the comparisons on all points were found to be entirely in favour of the continuous system of carbonization in vertical retorts. In consequence, this latter system was eventually chosen for the extensions of the gas plant at Helensburgh.

During the course of the inspection of the several carbonizing plants where vertical retorts were installed, the author had the privilege of inspecting the Glover-West vertical retort installation on the continuous system in operation at the St. Helens Corporation Gas-Works. It was ultimately realized that, owing to the case with which the plant was operated, the absence of smoke and steam and other advantages, this system would be the best to be recommended for adoption at Helensburgh—assuming, of course, that the cost of the installation would not be excessive when taking all advantages into consideration.

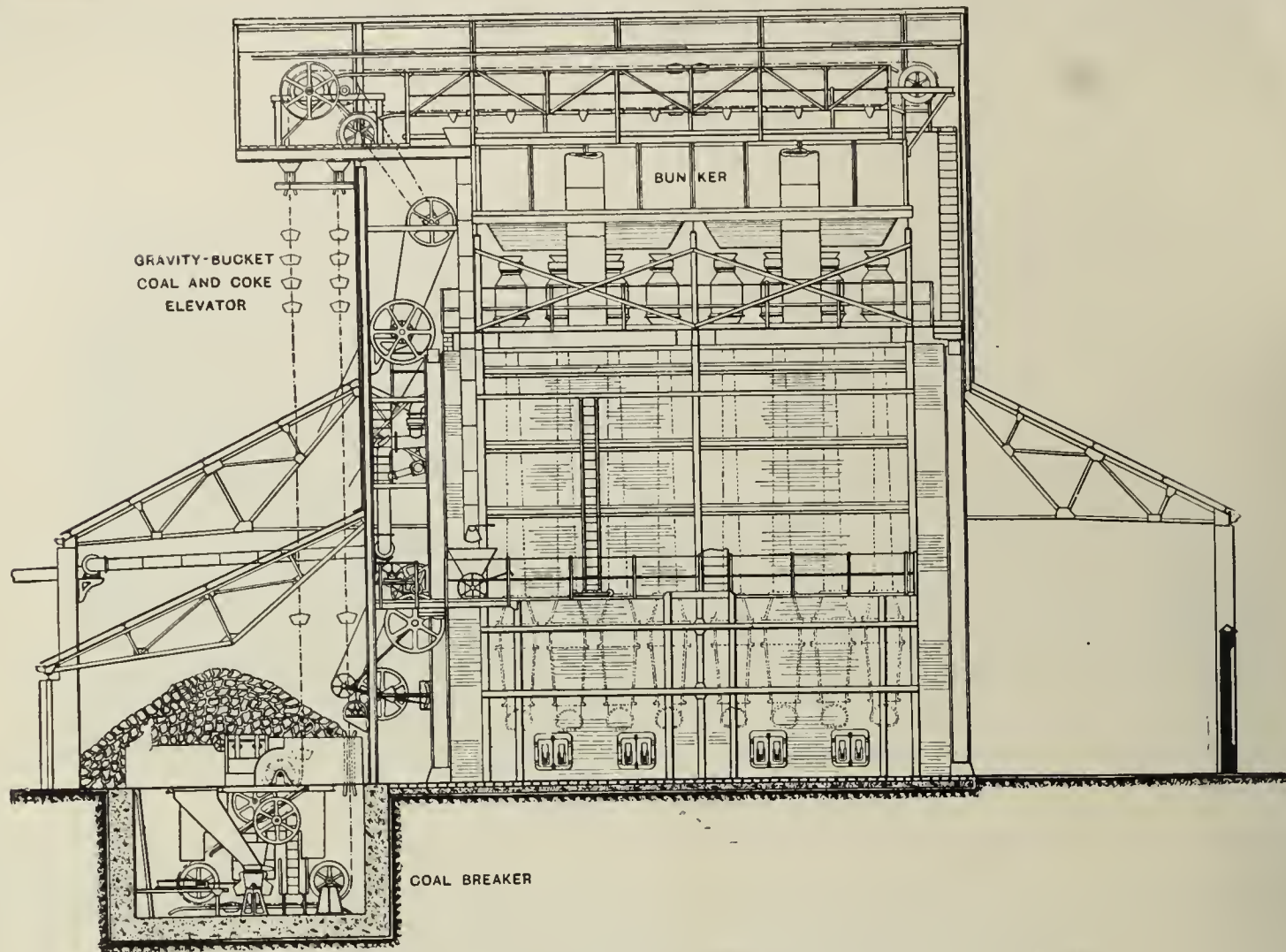
West's Gas Improvement Company, Limited, the constructors of the Glover-West vertical retort plant, were invited to submit a scheme and tender for an installation to occupy the new site on the works, and to conform to the requirements of the minimum and maximum daily make and the maximum annual make of gas, with provision for an increased output. The scheme and tender having been submitted, a careful comparison was made between it and the cost of installing other systems. The comparison being in favour of the Glover-West system, and the constructors



Coke Extractors and Chambers of the Glover-West Vertical Retorts.



Coke Chambers of the Glover-West Vertical Retorts at Helensburgh.



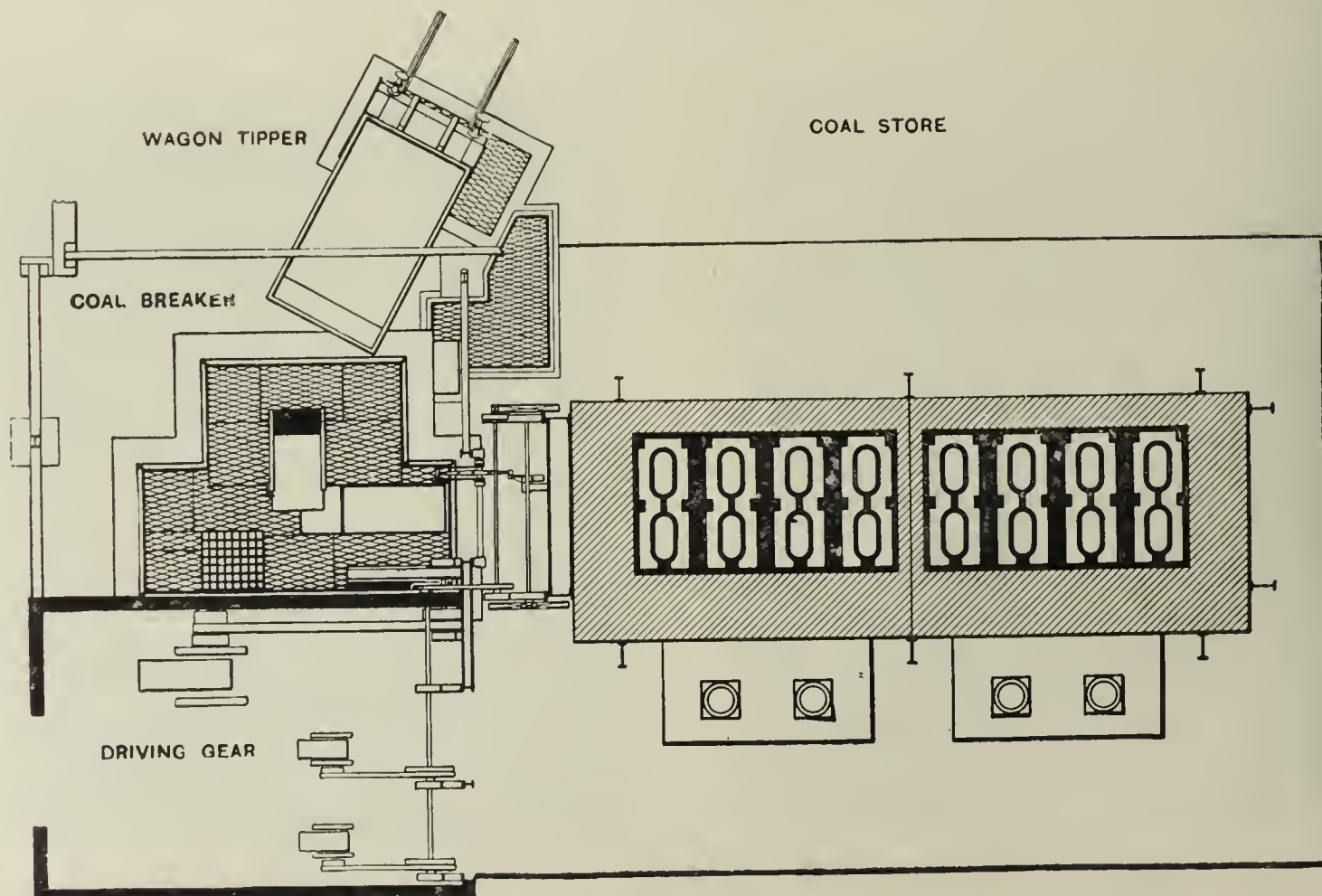
Glover-West Vertical Retort-House with Settings arranged in Units of Two Retorts each at the Helensburgh Corporation Gas-Works.

of the plant being prepared to enter into a guarantee as to its efficiency, it was arranged to test a sample of the coal used at Helensburgh in the St. Helens plant, in order to verify the statement that the local coals could be satisfactorily carbonized in vertical retorts.

The results from the tests with 56 tons of coal sent to St. Helens were so satisfactory that the author had no hesitation in recommending the Gas Committee to adopt the Glover-West system, and in doing so to accept the tests made at St. Helens as a basis of the calculations for the guarantees to be embodied in a contract for the installing of the plant.

Previous to the test referred to above, the Chairman and the

Works Committee visited the St. Helens works, and were highly pleased with all they saw. On their return to Helensburgh, they, in their report to the Council (dated July 21 last year) recommended the placing of a contract with West's Gas Improvement Company, Limited, for the construction of the work comprising coal-stores, retort-house, and an installation of Glover-West vertical retorts of a total approximate capacity of 500,000 cubic feet per day, and which, together with railway waggon tipper, railway siding, weighing machine, and the purchase of the land forming the site for the extension, in all made a total estimated cost of £14,711. To this sum a small amount was added to cover the cost of apparatus considered necessary to make the plant complete.



Plan of the Installation of Glover-West Vertical Retorts at the Helensburgh Corporation Gas-Works.

The report of the Gas Committee to the Council contains a long list of the advantages that they observed with the Glover-West system during their inspection of the plant at St. Helens; and the following is a copy of these advantages as given in their report:

- Increased make of gas per ton of coal carbonized.
- Charging by gravitation.
- Minimum mechanical operations.
- Low fuel consumption.
- Conservation of heat.
- Waste heat of coke utilized for heating secondary air.
- Coke improved and of greater value.
- Cool condition of coke when discharged.
- High calorific value of gas.
- Low percentage of inert gases.
- Increased yield of tar per ton of coal carbonized.
- Increased make of gas per retort.
- Increased production of ammonia per ton of coal carbonized.
- Largely increased make of gas on same ground space.
- Improved labour conditions and at considerably reduced cost.
- Great economy and saving in first cost of land and buildings.
- Reduced wear and tear on retorts.
- No naphthalene difficulties.
- No nuisance from dust, flame, steam, or smoke.
- Noiseless in action.



The Gable End of the Vertical Retort-House.

The coal sent to and tested in the St. Helens plant produced on an average during the test 11,625 cubic feet of gas per ton of coal of an illuminating power of 16.11 candles with the No. 2 "Metropolitan" burner, the calorific value being 576.9 B.Th.U. gross or 513.8 B.Th.U. net. This test, as already stated, formed the basis of the guarantees included in the contract. It will, however, be seen, by comparison with the tests made on the plant at Helensburgh, that with the same class of coal (Woodilea nuts) the results were better than those at St. Helens, and the guarantees are in consequence amply fulfilled.

The plant was completed and put into operation on July 4, and within eighteen hours, the horizontal retort-house was shut down completely and has remained so since—the whole of the gas being made in the Glover-West vertical retorts.

The following are the results of tests made on the plant at Helensburgh on Woodilea washed nuts—

Duration of test	Aug. 25 to 27, 1911.
Coal carbonized per retort in 24 hours	3.06 tons.
Gas made per ton of coal (N.T.P.)	12,605 cubic feet.
Illuminating power (No. 2 "Metropolitan" burner)	16.3 candles.
Fuel account	11.68 per cent.

Comparing the foregoing results with those obtained at St. Helens, and which formed the basis of the guarantees in the contract, the coal carbonized per retort per 24 hours shows an increase of 5 cwt., and the quantity of gas obtained from the coal is almost 1000 cubic feet per ton more than the guarantee.

It is estimated that the introduction of the new plant will effect a saving per annum of £1100 to £1200, and the labour costs will be at the very least 50 per cent. lower than those with the old system of working. The author hopes to have the opportunity of submitting at a future meeting full details on this point and based on twelve months' actual working.

The author, in submitting the reason which induced the Gas Committee of Helensburgh to decide upon the introduction of vertical retorts, would have preferred that a longer period should

have elapsed between the putting into operation of the plant and the reading of this paper, in order that the results could have been given for a working experience extending over the greater part of a year. He has, however, every confidence in stating, from the average results already obtained, that the favourable anticipations which prompted their decision to instal the plant, will be more than realized. In support of this statement, it may be mentioned that the average make of gas per ton for all the coal carbonized from the date when the installation was put into operation to the present time works out at 12,345 cubic feet.

Apart from the carbonizing results, one of the questions which suggests itself to be of paramount importance is that of maintenance; and on this point, although it is impossible to arrive at a definite conclusion with so short a period of working, the absence of costly mechanism, the slow speed of the mechanical operations, and the almost ideal conditions under which the retorts work, suggest a long life.

THE EXTENSIONS OF PLANT AT THE HELENSBURGH GAS-WORKS.

The following is a description of the extensions, including the coal-handling and storing plant, with vertical retort-house and installation of Glover-West vertical retorts at the Helensburgh Gas-Works.

Arrangements were made with the North British Railway Company to enable the coal waggons to run direct from the railway siding into the coal-store. The railway track is extended across the coal-store to a point where a hydraulic waggon tipper lifts one end of the waggon and discharges the coal to the mouth of a coal breaker—thus facilitating the discharge of the coal to the plant. The waggons are weighed on a weighbridge situated inside the coal-store, and there is a turntable to enable them to be diverted to lines leading to other parts of the stores and works.

The retort-house is constructed of steel stanchions of modern design, with walls of 4½-inch brickwork built in between longitudinal girders and the main principals or stanchions, except on the coal-store side and the main gable end, which are covered in by galvanized corrugated iron sheeting.

There are two settings of retorts on the Glover-West system of continuous carbonization. Each setting contains eight retorts, making a total of sixteen retorts for the complete installation. The arrangement of the retorts in the settings enables any two retorts to be in operation, and, in consequence, the output of the installation can be readily regulated to meet the requirements ranging between the minimum and maximum make of gas. To provide for economy in working when the setting is on minimum make, each setting is constructed with a twin producer.

The coal is received from railway waggons by a West's coal breaker, for breaking the large pieces of coal to the size required. From the breaker the coal is directed to a gravity-bucket type of elevator and conveyor, which raises the coal and distributes it to a bunker of a capacity of 24 hours' supply, which is placed above the retort-bench and provided with a number of outlets corresponding to the number of retorts.

Each retort is independently supplied with coal from the overhead bunker through a gas-tight coal valve to a feeding hopper, from which the coal slowly and continuously falls by gravitation to the retort, and through it to a coke-receiving chamber. The coal on passing through the retort becomes completely carbonized; and the residual coke is extracted by means of a worm extractor at the base of each retort. The speed of the worm regulates the speed at which the coal is continuously passing through the retort. The coke accumulated in the coke-receiving chamber below the retort is periodically discharged to coke barrows and transported to the coke-store.

In connection with the Glover-West system of carbonization, the heating of the retorts is an important feature, and is specially applicable to continuous carbonization in vertical retorts. The combustion chambers are arranged in tiers, each tier being separate from the other. The products of combustion, after passing around the retorts, enter a common duct which is exterior to the combustion chambers; and the waste gases then circulate through chambers situated at the top ends of the retorts before entering the chimney.

Further, in the Glover-West system of heating vertical retorts, the secondary air supply for completing the combustion of the producer gas in the several separate combustion chambers circulates around the base of the retorts, extracting the heat transmitted from the coke to the walls of the bottom section of the retorts which at the base are constructed of cast iron.

The recovery of the heat from the coke in the Glover-West system ensures very considerable economy in fuel consumption. It also enables the coke to be discharged in such a cool state that no quenching is required.

The construction of the coke extractor is another important point in connection with the Glover-West system, as the worm is constructed in two parts, to enable one part to revolve away from the other and disclose an aperture sufficiently large to readily permit the use of scurfing tools and the inspection of the retort. This extractor gear is driven by a gas-engine and driving gear having a very considerable range of speed regulation, which enables the speed of the coal passing through the retorts to be regulated according to the class of coal being carbonized. The gas-engine, which is of 4½ B.H.P., is duplicated to provide for continuous working. A safety device is fitted to each set of coke extractor gear to prevent breakage in the event of overload.

The coal plant is driven by a gas-engine; and the gravity

bucket type of coal conveyor also serves the purpose of raising the coke to the top of the retort-bench when it is required to supply coke to the retorts on starting-up the plant and after the retorts are scurfed. This conveyor also raises the coke required for the producer—the coke being delivered to a hopper shoot arranged to supply the producer filling waggon.

The gas is taken off at the top of the retorts and passes, through pipes, to the condensing mains and thence to a foul main, which is provided with a retort-house governor. The foul main extends across the works, and is connected up to the foul main of the old horizontal retort-house plant.

It is peculiarly appropriate at this meeting to state that the Glover-West system of continuous carbonization is partly of Scottish origin on account of its early association with the late Mr. William Young, the well-known inventor of the successful continuous process of carbonization in vertical retorts as applied to the shale oil industry, and which has been in operation during many years in Scotland. Mr. William Young was co-patentee with Mr. Samuel Glover, the Gas Engineer to the St. Helens Corporation, in the first patent, the subsequent development of which is due to the co-operation between Mr. Samuel Glover and Mr. John West, the pioneer of modern methods in retort-house practice, and who has probably had a longer and more intimate experience of carbonizing plants than any other gas engineer at present living.

TESTS MADE AT THE HELENSBURGH GAS-WORKS WITH GLOVER-WEST'S VERTICAL RETORTS.

From 9 a.m., Aug. 28, to 12 noon, Aug. 31—

Gas made	491,500 cubic feet [n.t.p.]
Total coal carbonized	37 tons 14 cwt.
Gas made per ton	13,037 cubic feet.
Coal carbonized per retort per 24 hours	3'02 tons.
Fuel consumed	11'7 per cent.

From 6 p.m., Sept. 2, till 6 p.m., Sept. 6 (a period of 96 hours) the gas made with four retorts was 740,800 cubic feet. The average quantity of gas made per retort per 24 hours was 46,300 cubic feet.

Discussion.

Mr. A. YUILL (Dundee) said that some of them remembered the interest which was excited years ago when inclined retorts were put in; and while they had got the vertical retort before them now, they must not imagine it was going to "lick creation," because they knew that some of their contemporaries—if not in Scotland, at least in England—were getting remarkable results from a new adaptation of their horizontal retorts, with hydraulic charging machines, which were not possible before. Each of them would require to study his own works. He (Mr. Yuill) was one who could afford to wait a little longer. He had got over 30 per cent. of spare retorts in winter; and, getting good results, he was satisfied. His position was that for him to erect a bench of verticals just now, would add considerably to his capital expenditure when it was not required for carbonizing purposes. He believed that the extra interest and sinking fund charges would absorb the savings to be got from vertical retorts in his case, compared with the best system of working horizontal retorts.

Mr. D. ROBERTSON (Dunoon), as one who, the previous Saturday, saw Mr. Blair's installation of vertical retorts, said he would like to take this opportunity of saying that he was very much impressed by the fact that the installation was compact, and everything worked so smoothly. He could not help contrasting, when the retorts were being drawn, the ease of the operation, with the operation as at present conducted with horizontal retorts, in a small or medium-sized gas-works. The man simply went forward and pulled a lever, and there dropped out a big barrowful of comparatively cold coke. There was no quenching of the coke with water, and there was no steam. He failed to see why this system of charging retorts, or of gas making, could not be introduced into even smaller gas-works than those at Helensburgh. They knew that it was possible to work with two of the Glover-West retorts, as a minimum. Two retorts would, from Mr. Blair's figures, make from 76,000 to 80,000 cubic feet of gas during 24 hours. This came down to a small gas-works; and one man could do the work. He (Mr. Robertson) thought that a considerable saving could be effected in most gas-works which were in a position to adopt the vertical retort system. Another advantage, he thought, could be worked into this. It struck him, when he was watching the operation, that if anything went wrong with the coal-elevating plant, there would require to be some plan for elevating coal by hand; but he was thinking that if a gas-works were situated on the side of a hill, an installation might be placed so that the retorts could be charged by hand, which would be a distinct saving.

Mr. BLAIR thanked the members for the hearty reception they had given to the figures he had laid before them. If he had been in Mr. Yuill's position, of having 30 per cent. excess of horizontal retorts beside him, he would never have gone in for verticals. It was a question of policy with him. He cast his lot in favour of verticals; and he found that he would not be disappointed. He thanked Mr. Robertson for the remarks he had made. He might say that he had considered all the possibilities of a breakdown, even in the extracting gear; and arrangements had been made for a temporary service if needed. Everyone who went in for mechanism must make up his mind for a breakdown occasionally. He could see how the temporary work could be done; and the plant was already in the works for the doing of it.

SUCTION GAS-ENGINES AND PRODUCERS AND THE DIESEL OIL-ENGINE.

In a paper which he submitted to the Engineering Section of the British Association at Portsmouth last week, Mr. W. A. TOOKEY furnished a comparison of test performances of suction gas engines and producers, with results obtained in daily operation, and notes upon working costs for fuel, oil, labour, &c. The contribution was a lengthy one, and embraced a number of tables and charts. Mr. C. DAY also communicated a paper on the Diesel oil-engine.

SUCTION GAS-ENGINES AND PRODUCERS.

The following are portions of Mr. Tookey's paper.

It has so long been customary to state that the consumption of coal (anthracite) by suction gas engines and producers is about 1 lb. per brake horse-power per hour, that it is rarely borne in mind that such a statement is made by makers merely for the purpose of stipulating a safe figure in contract guarantees, well knowing that this leaves a margin for contingencies which enables them to comply with specified duties without the risk of incurring penalties which are sometimes insisted upon by purchasers or by consulting engineers on their behalf. It will come as a surprise to many, therefore, that in the majority of the tests the actual consumption of a combined set of engine and producer, working with anthracite, irrespective of size, but, naturally, dependent somewhat upon design and date of manufacture, is between 0.7 and 0.85 lb. per B.H.P. hour. When allowances are made for the

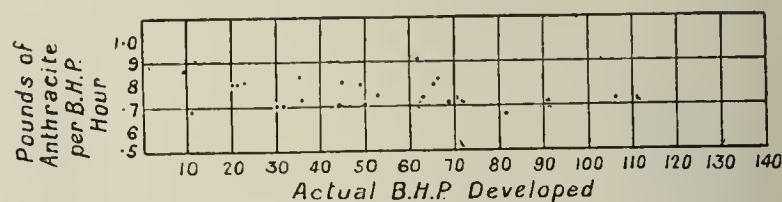


Fig. 1.—Chart Showing the Fuel Consumption in B.H.P. Tests.

different conditions under which the respective tests were conducted, the varying qualities of fuel, and the diversities in rate of fuel consumption in producers of different designs, the figures for the coal consumption on the B.H.P. hour basis are remarkably uniform for engines loaded more or less up to the full outputs for which they are severally capable. It cannot then be doubted that suction gas engines and producers of moderate power and modern construction do, in fact, give far better results as regards thermal efficiency than any other apparatus using solid fuel for the purposes of power generation. From figures which refer to the consumption of fuel of gas engines and producers when working at about half-load, it would appear that the B.H.P. hour can still be obtained from less than 1 lb. of anthracite under average conditions of tests. It is usually stated that the efficiency of gas-power plants falls off very considerably when the output is low; but this does not seem to be borne out by facts.

But while the performances of suction gas power plants are shown to be astonishingly low under test conditions, inasmuch as those conditions can never be maintained in everyday factory service, it is desirable to know how they are affected. No account is taken of the wastage of coal in consequence of the producer being put in the charge of men more or less acquainted with their duties, and, therefore, more or less careful to obtain those conditions which will result in economical working. The factory owner also desires to know what he can expect the average consumption of a gas engine and producer to be when the engine is working throughout the day under loads that are ever varying according to the work passing through the driven machines. He wishes to know how far the test figures will be affected by the unavoidable losses due to the continued slow combustion of the fuel during stand-by hours. He also requires information as to probable total fuel consumption when desiring to fix upon the maximum capacity of an engine he is about to purchase, as though he wishes to provide plenty of margin to cope with future extensions, or to minimize the effect of the development of a fault in either the gas producer or the engine, which may temporarily restrict the amount of power available per explosion, yet he does not want to put down a larger engine than is necessary, if that larger engine will result in a greatly increased bill for fuel. It is impossible, in the majority of cases, to compute, other than approximately, the average load upon the ordinary factory engine hour after hour under working conditions. It is possible to take account of the coal consumed over a period, and obtain the figures that give the average hourly consumption of fuel—figures which will include the stand-by losses as if they were part and parcel of the fuel consumption during working hours. What are believed by the author to be reliable figures in this connection have been compiled mainly from reports forwarded to the makers of the engines and producers by the users, while a number refer to installations working under his own personal supervision.

In order to show clearly the relation of rated H.P. to hourly consumption of fuel, the accompanying chart has been prepared. It will be observed that, notwithstanding the great divergence that

must exist in the different conditions that apply in individual installations, the results, as plotted, are more uniform than one would expect to be possible. Only in one or two cases do the performances nearly approach the figure that would be reached if the fuel consumed amounted to 1 lb. per rated B.H.P. hour, even when, as in all the cases, stand-by and all other losses are included. It appears that practice, as represented by such figures, well bears out the claims advanced by the makers of suction gas engines and plants. Speaking generally, it would appear that the average consumption of fuel of suction gas plants is at the rate of 0.6 lb. of fuel per rated B.H.P. per hour, inclusive of all losses.

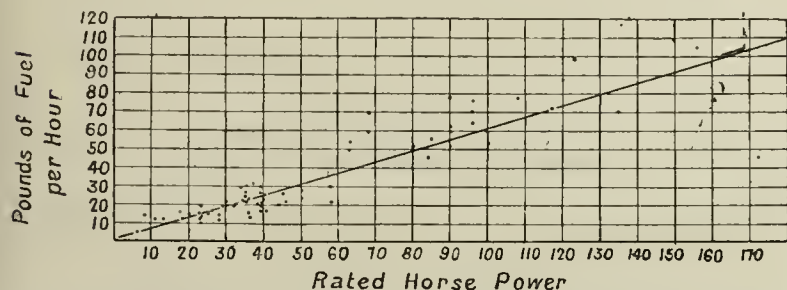


Fig. 2.—Actual Hourly Consumption of Fuel, including Variations due to Different Grades of Fuel, Load Fluctuations, Different Load Factors, Length of Stand-by Periods, Ability of Attendants, Rate of Combustion in Producer, &c.

The more one ponders over the results as set forth in the chart, the more one wonders that so much power can be procured for so little fuel. Take the group of engines between 30 and 50 B.H.P. In a score or more of engines, all working with different kinds of fuel, in different districts, in charge of men of different ability, driving machinery at work for a different number of hours per day, and with a different load-factor, and with a constantly differing rate of output, involving, apart from differences in size and style of producers, different rates of fuel combustion per unit of fire area, it is to be noted that a difference of 10 lbs. of fuel per hour, or thereabouts, represents the higher and lower limits of fuel consumption. This is a record that stands unrivalled by any other form of prime mover in units of equal size. Can any steam-engine enthusiast imagine any boiler-house where the stoker is expected to fire not more than 20 to 30 lbs. of coal within an hour, to feed an engine taking steam to generate a maximum of 40 rated H.P.? Even with improvements in steam-engine practice made in recent years, no type exists that, with an efficient boiler, can be sold at a price and run for such a cost as will successfully compete with the gas-power plant. Some figures are given which, emanating from actual users, show beyond doubt that for moderate powers suction gas engines and plants are preferable to steam-engines, even when the fuel required for the latter can be purchased at a fraction of the cost of anthracite.

But, apart from the questions of comparisons already mentioned, it must be remembered that, to obtain the best results from a gas-power plant, it is not only the production of good gas that matters, but also the admixture of the gas with a suitable quantity of air to form an explosive mixture within the walls of the engine cylinder. Upon the efficacy of such proportioning of the mixture on the part of the attendant, depends the amount of energy to be obtained per working stroke; and thereby the power and economy of the engine is at once affected. That such low hourly consumptions can be so universally obtained with suction gas-plants, proves that the attendant is powerless to affect economy to any appreciable extent, and, conversely, that the necessary manipulation is so readily learned that the factory owner can safely rely upon uniformly economical working.

In many cases, owing to carelessness or neglect, the stand-by losses are permitted to approach 10 lbs. per stand-by hour, instead of from 4 to 5 lbs., as is the usual figure in practical working. The lowest stand-by consumption known to the author is one of 1 lb. per hour. But this is rarely obtained; it being necessary, in order to ensure the fire being in a fairly active state for ready quickening in the morning to the gas-making temperature, to allow rather more air to pass through the furnace than is there implied. A change in the direction or intensity of the wind may result in letting the fire die out if combustion is too slow; and it is therefore deemed to be more prudent to ensure a prompt start in the morning than to cut down the stand-by losses to the uttermost.

From the point of view of the power user, no saving, even though it might be a large one as regards fuel consumption, would be of practical service if the working of a suction gas engine were to be unreliable or constantly subject to sudden interruptions from derangements of a temporary character. Much has been stated at various times with respect to the lack of strength, or "sensitiveness," of some portions of the mechanism of a gas engine, which makes it unreliable. But, after all, the question of reliability is largely dependent upon the ability of the attendant. If the driver fails to detect the development of a defect, and omits the "stitch in time," it is indisputable that a gas-power plant is more liable to sudden interruptions than steam. This does not infer that it is necessary for the attendant to stand by the engine during the whole period of working. Occasional inspection only is called for; but this should be given carefully, thoughtfully, and systematically. Experience soon shows the parts most likely to give trouble; and once these are kept under watchful care, long-

continued operation is secured. Throughout the world there could no doubt be mentioned many instances in which long-continued non-stop runs have been made. Information given with regard to several installations, collected almost at random, must emphasize the fact that there is not really much to choose between steam and gas engines with regard to reliability. In fact, a statement made by, or on behalf of, the Workington Bridge and Boiler Company, well summarizes the matter in question: "As regards reliability, there is practically nothing in it between the two; possibly the steam plant has the advantage, if anything, as regards actual stoppage." This is the opinion of the firm in question, after making a change from steam power, comprising a compound, horizontal, enclosed type of engine, with forced lubrication, supplied with steam at 80 lbs. pressure from a Lancashire boiler. This almost equal reliability has been obtained simultaneously with a reduction in working costs from 1.195d. to 0.452d. per unit, including fuel, labour, oil, water, repairs, &c. From the examples he quotes, the author does not intend to infer that in every conceivable case gas power would be preferable to steam. Circumstances arise in individual cases where the claims of each have to be closely considered; and in a number of instances, he has felt it his duty to advise his clients to adopt steam power rather than gas.

Recent improvements in design have done much to increase the elasticity of the gas-engine. The old comparatively slow-speed engine with "hit-and-miss" governing is still looked upon by many engineers as being the most economical type. But, in the author's experience, the most ardent adherents to this opinion are the commercial representatives of engineering firms who exclusively offer engines governed on the "hit-and-miss" system. He has noticed more than once a somewhat sudden abandonment of such opinions by these gentlemen, when the firms they represent put an engine with throttle-governing mechanism upon the market. At the present time, most British makers are offering engines of both types of speed regulation; but there can be little doubt that if no question of price came into consideration, and if no choice were to be submitted, users generally would accept the throttle-governed engine, and admit its great advantages. It is not the fractional saving of coal of one method of governing over the other that matters, even if this were positively in favour of either; but it is the greater smoothness of running, the graduated force derived from consecutive explosions instead of a greater or less number of explosions of full intensity, that make for so distinct an improvement, while the diminution of working stresses in the more important working parts gives consequent longer life. But there is another improvement that has synchronized with the development of the throttle-governed engine, and which has been somewhat overlooked, or, at all events, not properly appreciated; and that is the increased rotative speed of the latter types of gas-engines. It has frequently been contended that a quick-running engine must of necessity be inferior to one that makes but a comparatively few revolutions per minute. It is unnecessary for the author to discuss this question—facts speak louder than words. In the author's opinion, the increase in the rate of power generation per unit of time, and consequent greater ability to deal with sudden increases of load, without the slowing of the engine, is a very decided improvement.

Engineers being accustomed to refer to the brake horse-power (foot-pounds-minute rating) of an engine, are apt to regard this as being the sole consideration when selecting sizes. But it should be remembered that it does not necessarily follow that a slow-speed engine would be equally as satisfactory as a quick-revolution engine of equal horse power under all circumstances. For any engine to be successful under working conditions, it is necessary that the rate of generation of power shall be equal to the rate of absorption of power. Machinery of some descriptions demands an output of power, for perhaps but a few seconds, much greater than that required over a longer period. Every gas-engine expert knows that, under ordinary factory conditions, when the load is variable, the sequence of explosions occurring is far from uniform. In a "hit-and-miss" governed engine, for example, there may be as many as twenty or more consecutive explosions during a count lasting one minute, while for the remainder of the count only three or four in sequence are required by the load. During the whole minute, the rate of power generation may be well within the capacity of the engine on the horse-power-minute basis, yet during the time of greater stress the rate of power absorption might be more than that of generation, and, involving reduced speed, as a consequence still further limits the ability of the gas-engine to deal with the momentarily excessive load. It will be apparent from this that if the engine were to be no larger with regard to ultimate output capacity, but of quicker revolutions, the rate of power generation would be able to cope more successfully with momentary overloads. The higher speed of revolution that is now common practice, coupled with the improved method of throttle-governing, undoubtedly brings the gas-engine into a more favourable position to withstand the criticism of lack of overload capacity that has so frequently been levelled against it.

The next matter referred to by Mr. Tookey is the considerable improvement that has recently been effected in connection with methods of lubrication. In the latest types of gas-engines, there appears to be a fair degree of uniformity in oil consumption, to some extent independent of size. In all the records that the author has been able to collect, there are very few reliable figures which indicate the consumption of water for washing the gas, for generating water vapour in the producer, and for cooling the

engine cylinder. The reason for this is that the water service is taken from the mains supplying the other portions of the factory; and the only meter readings available are those which refer to the water consumption for the factories as a whole. The quantity of water used greatly depends upon the men in charge. Some evidently find it advisable to run a fairly copious supply through the coke-scrubber, in order to obtain cool gas, probably when the connections are short, and little atmospheric cooling is possible. In other instances, there is no doubt that more water is used than is absolutely necessary. Depending upon the situation of the engine-room with regard to the factory as a whole, and also upon the class of work undertaken, so does the cost of attendance vary. For example, in water-works the cost of attendance is higher than in the case of ordinary factories, where it is possible for the driver to fill up time not required for the operation of the plant by doing useful work elsewhere. But even in such cases, it should be remembered that the attendant is required to keep the pumping machinery, as well as the engines, in good order. Again, in many systems of works' cost keeping, the time spent in making repairs is included; while in others expenses of this nature are treated separately, all repairs being effected by some outside contractor. Whether an engine be small or large, the wages of the attendant varies only with the standard rate for such work in the various districts. In some instances, the wages cover all the working hours of factory operation; but in others, day and night shifts are employed, with occasional relief men. The reputed costs for attendance for a number of installations vary from 2d. to 14.6d. per working hour of the engine, based upon the wages actually paid. But in some cases repairs are included, while in others allowances have been made for the time that is spent on work outside the actual attendance upon the engine and producer. It can be claimed, without fear of contradiction, that suction gas engines and producers enable users of power to obtain the means of driving their factories at extremely low cost; and in these days of keen commercial competition the facts suggest that they may well consider whether it would not be economical to instal gas power in preference to existing methods of power generation, which, though probably adequate as regards power, and reliable in everyday work, are inferior to gas-power installations in respect to the whole of the working expenses attached to them.

Low cost of operation, however, would not in itself be a sufficient basis for comparison. Consideration must also be given to the amount of repairs necessary and the expense attached to renewals. Information collected shows that for periods varying from one to seven years the expense for upkeep of the gas-power plant is practically negligible. The author's experience in this matter extends over many years of working of individual installations; and, with but one or two exceptions, he can confirm the statements made by the users of the engines. Naturally, much depends upon the attendant; and if compensation for wear and tear be neglected, and if the "stitch in time" is not given, the engine will continue to operate until "something happens." But then either a big bill has to be faced for an expensive overhaul, or a smaller amount is spent in making as good a job as possible for the money. The chief items of expense occur in the renewal of piston rings, refacing and, perhaps, renewal of exhaust valve, and reboring or renewal of cylinder liner. The bearings require occasional refitting, but rarely need relining. As far as the piston rings are concerned, the usual rate of renewal is at the rate of one a year. The exhaust-valve may need to be replaced about every four or five years; while the life of a liner and piston can be taken as an average at about seven years. Of course, these periods vary according to the actual number of hours worked during the periods referred to, and according to the attention given to minor matters—such as rebushing of levers, and replacement of worn pins and spindles, which, if neglected, may cause excessive deterioration of other working parts. As far as the producer is concerned, the fire-bricks lining the generator require to be renewed about every two years, for which the material costs little; but the time occupied in dismantling and re-erecting runs into about three days. Generators made with sheet-steel casing will usually require patching around the portion exposed to the action of the heated moist gases within the ashpit after about five years of work, and perhaps renewal of this portion about every seven years. Cast iron is preferable for this portion of the apparatus, but is only used for the smaller powers on account of first cost. Fire-bars will be wanted about every two years, or at longer periods, unless the fire is worked at a high temperature, arising from an insufficiency of steam, which causes burning out. The cost of these renewals and repairs, which from their recital would appear to be somewhat high, is not actually more than would be required to cover the cost of similar work in connection with steam-plants, including the cost of cleaning, scaling, and preparing boilers for inspection, repairs to feed pumps, and other auxiliary apparatus. Indeed, one firm with an engine and producer of 120-H.P. capacity, estimate to save £7 per annum over the charges incurred for the upkeep of the steam plant previously in use.

For the purpose of computing the average cost of installing gas-engines and suction gas producers, the author has decided not to take into account any approximate figure for the cost of space occupied, or for any special buildings erected for their special housing, owing to the very few instances that occur in practice when it becomes necessary to do otherwise than fit them up in some corner of a factory already in existence. The prices indicated in the accompanying chart include the cost of the engine, producer, pulley, water-circulating tanks, piping (to what

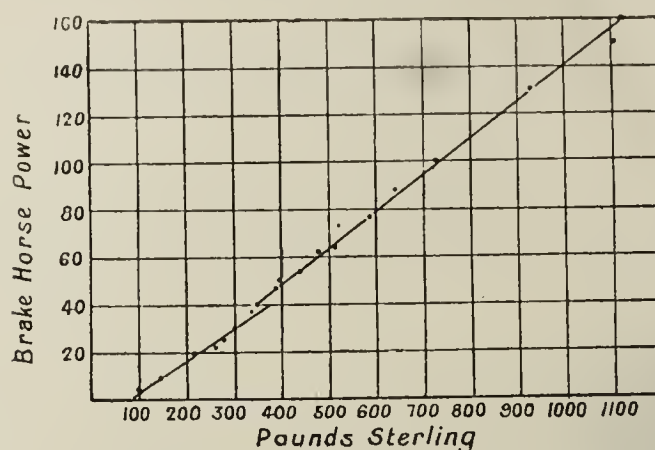


Fig. 3.—Capital Outlay, including Engine, Producer Pipes, and Accessories, Foundations, and Erection.

gas-engine makers call "standard arrangement"—that is, when the component parts are disposed within about 20 feet from one central point), foundation and builders' work, and labour in erection. As a basis, the ruling prices listed by two different makers have been plotted; additions being made for the builders' work and for labour, according to the author's experience of what may be considered average "fixings." These prices are probably on the high side, but will be quite sufficiently correct for rough estimating purposes. It will be seen that from 150 to 50 B.H.P. the total cost is at the rate of about £7.5 to £8 per B.H.P. From 40 B.H.P. downwards the rate per B.H.P. increases; ranging from about £9 to £11.5 in the smallest sizes.

One of the most successful engines that have been brought to a high degree of efficiency and reliability of late years is the internal combustion engine using heavy liquid fuel, and operating upon the Diesel principle. Now that the early patents have expired, quite a number of engineering firms, both in this country and on the Continent, are taking up their construction; and the future seems to promise some keen competition between the two types in the industrial world. There is no doubt the Diesel engine, as made by firms possessing wide experience in its design and operation, permits a nearer approach to the ideal efficiency with regard to the conversion of heat-units available into work than any other motor yet produced. Repeated tests have shown that as much as 42 per cent. of the total heat value of the fuel is represented by the work performed upon the piston of the engine, as recorded by the indicator; whereas the equivalent of a consumption of 0.7 lb. of anthracite per B.H.P. with a combination of gas-engine and suction gas producer, would represent a thermal efficiency on the I.H.P. basis of but 31 per cent. The consumption of liquid fuel per B.H.P. with a Diesel engine is usually at the rate of 0.45 lb. per hour. The price of the oil fluctuates according to the ruling market prices, and for the present purposes can be fixed at 50s. per ton. At this rate, the cost per B.H.P. hour is about 0.12d.

Upon the basis of 0.7 lb. of anthracite per B.H.P. hour at 30s. per ton, the cost of fuel for the suction gas plant is 0.1125d. It will be seen, therefore, that, as far as fuel cost alone is concerned, there is not very much to choose between the Diesel and suction gas engines; and the decision to instal the one or the other must rest upon other considerations. One very serious consideration, to the disadvantage of the Diesel engine, is the matter of capital outlay, involving, as this does, not only increased annual standing charges for interest on the sums expended beyond the relative cost of a suction gas installation of equal power, but also the allowance for depreciation must be increased in proportion. In some instances, when the engines are of considerable capacity, and are working long hours with sufficient load to enable full advantage to be taken of the low consumption, and where local conditions are least favourable to the gas-power plant, the balance inclines to the use of the Diesel engine. But even then, the gas-power plant, calling, as it does, for attention of a less skilled nature, can frequently be run at a lower rate for attendance, while the consumption of lubricating oil is usually lower. It will be recognized from these remarks that there is no warrant for a general assumption of superiority, as far as total costs of running are concerned, in favour of either one or the other motor; but for factories in which a skilled engineer is not required by the type of industrial machinery, it will not be seriously challenged that there is no room for a Diesel engine. Even in factories where the daily supervision can be given by an engineer, and not an engine-driver, it must be admitted that, whether the superior thermal efficiency of the Diesel engine is likely to be actually shown on the balance-sheet or not, is a matter that cannot be settled merely by reading a magazine article and by giving a nod or a shake of the head to arguments for and against incompletely stated there.

Semi-stationary steam-engines combined with a high-pressure boiler with superheater, jet condenser, with two-stage or compound expansion, have come to the front during recent years. From test results, it has been found that, under full loads, the consumption of fuel per B.H.P. hour has been brought to the low figure of approximately 1 lb. of coal; and, this being so, the steam-engine has been able to show to much better advantage than ever before in competition with the suction gas engine. From the circumstances inseparable from steam generation, however, this remark-

ably low consumption cannot be maintained in actual operation with the same continuity as has been proved to be existent with the gas-power plant. It has been said that every stroke made by the steam-engine costs more to make than its predecessor. This is not so much due to the effects of wear and tear as the gradual formation of scale within the boiler, the sooting-up of the super-heating tubes by the flue gases, and general lessening of efficiency, only to be restored by frequent periodical cleaning and overhaul. In the latest designs of semi-stationary engines, special attention has been given to accessibility of the boiler tubes and to the superheater, to enable the necessary cleaning to be carried out with thoroughness and despatch; but from the point of view of the gas-engine builder, this only accentuates the inherent defects of the steam plant. With a gas-engine, there is no excessive temperature or high pressure in any part of the apparatus other than within the engine cylinder, and then only for but a fraction of a second. This, in itself, is no slight recommendation, as the absence of a pent-up mass of working fluid possessing latent powers of destruction, and requiring all kinds of safety devices to avert or to give warning of the near approach to disaster, is a matter deserving of consideration, and clearly favours the gas-power plant.

A further advantage in favour of the suction gas-engine and producer is that with the latter the attendant can be engaged in other work throughout the factory, and need give only occasional inspection when fuel-charging at long intervals. With the steam plant, a man has to be constantly in attendance to keep the fire going; while it is well known that the manner in which the stoking is carried out frequently affects the fuel consumption by as much as 15 to 20 per cent. When it is remembered that for the best results to be maintained, it is advisable to adopt some system of water softening and purification, and that the cost of the whole equipment is thereby increased far beyond the cost of the gas-power plant, it will be recognized that the advantages of the latter are still further emphasized. Especially is this so when the engine is required to deal with a load much above or below the rated power of the plant, or for unsteady and widely-varying outputs. In the one case, the economical limits of condensing steam-engines are sharply defined; while the liability of sudden fluctuation of load must involve some waste of fuel from the blowing-off of the excess steam from the safety-valves, due to the natural anxiety of the stoker to have his plant ready for any emergency.

The author is strongly of the opinion that, in the near future, as in the years that have just passed, there is bound to be a great demand for the suction gas engine and producer. He has dealt only, in the present paper, with those installations in which the fuel has to be purchased from outside sources, and has not referred to the recent developments in the utilization of material that is a waste product of industrial processes—such as wood chips and sawdust, &c., from sawmills and joinery works, from cotton seeds, and similar refuse. Neither has he referred to the suction gas plants that are now available for the utilization of bituminous coal in place of anthracite. Sufficient has been said, it is hoped, to enable the actual working results obtained in practice to be appreciated at their true value.

THE DIESEL OIL-ENGINE.

Below is the official abstract of Mr. Day's contribution.

The paper opened with arguments against the selection of an engine being made on makers' guarantees of fuel consumption, as such guarantees cannot possibly cover all working conditions, making it quite possible for the engine which gives the best results on tests to give inferior results over a long period in normal service, when items such as wages, repairs, and maintenance are included. It was urged that the judgment must be based on records of actual working results, which include all items of expenditure; and it was pointed out that, owing to the power costs of electricity supply-stations being kept on a uniform basis, and to the great majority of them being published or obtainable, these form the best available data on which to judge the working results secured with different types of plant.

The author agreed that the conditions of working in certain factories differ considerably from those of an electricity supply-station, but claimed that loss of efficiency is largely brought about by causes which are common to all places, and that consequently deductions from electricity-station figures are applicable to the great majority of power cases.

Stations having a plant capacity exceeding (say) 1000 kw.—i.e., 1500 H.P.—were excluded from the main comparisons for reasons stated in the paper. The following table gives a comparison of results of the different types of plant in stations where the plant capacity does not exceed 1000 kw.

TABLE I.—Average Cost per B.T.U. Sold.

Type of Engine.	Fuel.	Lubricating Oil Waste, Stores, and Water.	Wages.	Repairs & Maintenance.	Total Works Cost.	Load Factor.
Steam . . .	0·45	0·06	0·25	0·26	1·02	14·7
Gas. . . .	0·43	0·09	0·28	0·24	1·04	15·3
Diesel . . .	0·23	0·04	0·19	0·07	0·53	14·3

The great saving shown by these figures has been repeatedly confirmed by the experience of the writer, even in cases where the

guarantee figures with Diesel plant have not equalled figures guaranteed and obtained on test with the previous plants.

A table was given showing the average results obtained from steam-stations of various sizes; these averages, like those given in Table I., being deduced from the tables published in the "Electrical Times," combined with information obtained direct from station engineers.

TABLE II.—Average Works Costs per B.T.U. Sold, on Steam-Stations of Different Sizes.

Capacity of Station not Exceeding	Fuel.	Lubricating Oil, Waste, Water, and Stores.	Wages.	Repairs and Maintenance.	Total.	Load Factor.
k.w.						
250	0·63	0·09	0·35	0·36	1·43	13·2
500	0·56	0·06	0·27	0·29	1·18	13·3
750	0·43	0·05	0·23	0·24	0·95	15·4
1,000	0·40	0·05	0·23	0·21	0·89	16·8
1,500	0·42	0·04	0·17	0·18	0·81	16·9
2,000	0·37	0·04	0·16	0·21	0·78	17·7
3,000	0·33	0·04	0·15	0·17	0·69	17·4
4,000	0·40	0·03	0·14	0·20	0·77	18·8
5,000	0·34	0·03	0·11	0·16	0·64	18·7
7,000	0·36	0·04	0·13	0·20	0·73	17·9
10,000	0·26	0·03	0·09	0·13	0·51	22·6
20,000	0·30	0·03	0·11	0·16	0·60	19·6
50,000	0·23	0·02	0·10	0·11	0·46	20·56

Constructional features were then dealt with, and reasons given in favour of the multi-crank vertical engine, particularly for dynamo driving. For high-speed engines, forced lubrication and very complete enclosing were strongly advised.

The development of the Diesel cycle from the Carnot cycle was then briefly traced; and the following fuel consumptions given as every-day consumptions for Diesel engines of moderate size:—

At full load	0·44 lb. per B.H.P. per hour.
At three-quarter "	0·45 " " "
At half "	0·47 " " "
At quarter "	0·62 " " "

The further advantages resulting with Diesel engines were then briefly stated as: No sparking apparatus, lamp, or burner; no carburettor or vaporizer; no back-firing or pre-ignition; no warming up required before starting; very smooth running owing to no explosion or sudden rise of pressure; cheap crude oils used; very little water used; no ashes or offensive effluents.

In regard to the question of continuous running, a case was quoted where during four years the average running time works out at 23¼ hours out of each 24, or about 1½ hours' stoppage per week.

Discussion.

The following is an abstract of the various speakers' remarks, as far as they specially related to gas and Diesel engines.

Captain H. RIAL SANKEY raised the question of the rating of the various types of engines dealt with in the papers. Mr. Tookey referred to "rated load," but did not say what he meant by it. This was a very difficult matter, because most people bought their engines at so much per H.P.; and if the rated load was taken as the maximum load the engine could stand (say) for 15 minutes, as he believed was often done with gas-engines, or if it were taken as the economical load of the engine, as was usually the case with steam-engines, which would stand 25 or even 30 per cent. overload for considerable periods, it was obvious the buyer was not purchasing the same thing. For this reason, the question of the "rated load" was of extreme importance. In the case of the gas-engine, the Engineering Standards Committee made a rule as to what the rated H.P. should be; but it was never published. This was that the rated H.P. for gas-engines should be 85 per cent. of what the engine could possibly do. This was in reference to gas-engines governing by missing explosions. He did not know how the rated H.P. of the Diesel engine was reckoned; but it would be important to get some expressions of opinion upon the rated H.P. of these various prime movers. He agreed that it was a simple question to put, and a difficult one to answer.

Mr. W. J. LEWIS expressed the opinion that the Diesel engine would carry the day in the end, though for factory work it was against considerable competition from steam-engines in cases where large quantities of steam were required for heating purposes. He wished to know whether there was any possibility of making use of the exhaust heat from Diesel engines. If this was so, it would be placed in a much better position in regard to this class of competition.

Mr. E. KILBURN SCOTT spoke strongly in favour of the Diesel engine, concerning the fuel economy of which there could be no question. It required less space and less foundations than steam or gas engines; and though it was common knowledge that the Diesel engine was more expensive than it need be, on account of patent rights and the small number of firms making it, this would be rectified in time, and the engine would be much cheaper than it was now. For any problem which the Diesel engine could tackle, he would prefer it in every instance to gas or steam. They had not to go far for an instance. At Chichester, there was a fine little Diesel engine electric power station, where there had been no troubles at all; and the only complaint of the man in charge was that there was nothing for him to do. He was completely against the extension of small steam plants, and strongly advocated the use of Diesel or gas engines. He hoped the Diesel

people would increase their factories and carry out the researches necessary to put up big plants as soon as possible.

Mr. H. E. WIMPERIS said that the gas and Diesel engines were bound to develop more than steam-engines. In this connection, it appeared to him that they would have to drop the use of the words "gas-engine," if the steam-engine was going to be a superheated engine, because it would then really be a gas-engine itself. Superheated steam was a gas, and one of the very best gases to use, because it had the inestimable advantage that it could be got rid of, though they could not get rid of the gaseous products of gas-engines. Thus in the future the real distinction would be between external combustion and internal combustion engines. This might lead to the triumph of steam in the end, although not as an external combustion engine, but as a kind of combined victory. If the internal combustion was to proceed at all on the lines of the development of the external combustion engine, starting with the reciprocating engine gradually getting more and more perfect, and finally end with the introduction of the turbine, which would be even more economical, it would be absolutely essential to work with some other medium than was employed at present. There were other liquids which could be turned into vapours. But steam or water was the simplest and the cheapest; and something of this sort of development, which would allow the use of superheated steam obtained by an internal combustion process in a turbine, seemed to him to be the outcome of the struggle, rather than a continuation of competition between the steam-engine as the steam-engine, the gas-engine as the gas-engine, and the Diesel engine as the Diesel engine. With regard to the latter, he had recently been over the works of a manufacturer, and could not help remarking upon the enormously strong frames and bolts; but he could not get any information as to the reason for this. The possible solution was that there was some difficulty, owing to the very high pressure at which the fuel was injected into the cylinder, in keeping the valve tight. For instance, when the piston was on the up-stroke compressing the air to 500 lbs. per square inch, when it was near the top, if the fuel-valve was leaking, there would be a very bad pre-ignition; and this seemed to him a possible reason why the cylinder had to be so enormously strengthened. If this was so, he did not see how an economical Diesel engine could be built, unless it was very expensive. He sometimes found himself in the position of having to advise in connection with the use of Diesel engines in the Crown colonies, and some of the undeveloped portions of the Empire; but he had hitherto not felt justified in recommending the Diesel engine, as it seemed to him to require expert attendance, and in the places referred to native labour only was available.

Captain SANKEY, speaking with regard to Mr. Wimperis's suggestion of using steam and gas in an internal combustion engine, said that he had a proposition before him at the present moment based on this suggestion.

Mr. H. S. RUSSELL said the question of the low fuel cost which could be obtained with Diesel engines, especially in an electric light station, depended upon the load-factor; and the figures given by Mr. Day—namely, some 15 per cent.—were about the average they usually obtained in power stations of the size in question. Probably the reason the fuel cost in a Diesel engine was so much lower than with gas or steam, was due, in the first place, to the very much higher thermal efficiency of the engine; and, in the second place, there were no stand-by losses. It was easy for makers of gas-engines and steam-engines to say that when a producer or a boiler was standing idle it only used a small amount of fuel. Mr. Tookey had given some extremely low figures; but how they were obtained he did not say. He had a lot of figures of the results obtained in actual working with gas-engines; but they did not come anywhere near those that were mentioned by Mr. Tookey. He knew a factory which was recently running with Dowson gas producers, and with gas-engines working on the pressure system, where the total fuel costs for a 500-H.P. plant for the year were 0.7d. per unit. Owing to troubles with repairs in the gas-engines, the people got tired of constantly having the works shut down, and replaced the plant by Diesel engines, which had now been running for nearly a year for a fuel cost of 0.03d. The two plants were working under precisely similar conditions. He thought this change of plant had been largely due to the stand-by losses. The Diesel plant could be shut down for the dinner-hour, and started up in half-a-minute; whereas this could not be done with gas plant. As to making use of the exhaust heat from Diesel engines, by the use of a properly constructed boiler it was possible to heat a large amount of water. He had got 20 lbs. of water to 50° or 60°. With regard to Mr. Day's emphasis upon taking practical figures, and not test figures, he said that two or three years ago an investigation was made over a large number of stations on the Continent, in order to obtain a comparison between stations using overtype superheated steam-engines and those employing Diesel engines; and it was found that in actual practice the average costs obtained with a Diesel engine were only some 13 per cent. in excess of the makers' guaranteed figures, whereas with the steam-engine the figures amounted to no less than 140 per cent. Mr. Marshall had suggested that users of Diesel engines had to put up with unreliability; but he could mention an instance of a Diesel engine in an electric light works which had run for four years for 23½ hours per day, and there could not be much room for cost of repairs or unreliability there. In another case, a Diesel engine had run on a battleship for 800 hours on one journey without a single stop.

Comparing wages, the speaker said with a gas plant there must be separate men in the producer-house and in the boiler-house of the steam-station. With the Diesel engine, all this was done away with; so that on the average the wages could not be more than half of either suction gas or steam plants working under similar conditions.

Mr. MARSHALL said he had no figures of the cost of producing electricity when using superheated steam engines; but he complained of the figures given by Mr. Day. No explanation was given as to the type of gas or steam plant used; and under these conditions his comparison was absolutely valueless. Referring to Mr. Tookey's paper, 75 per cent. of the examples were burning anthracite coal, which showed that this was the most common fuel. He thought internal combustion engine manufacturers did not make their case good by taking examples of this sort.

Mr. TOOKEY, in reply, said he felt rather diffident in taking part in this discussion. He was only a consulting engineer, and had tried to give figures without any trade bias whatever. They had come to him through the ordinary course of compilation. Dealing with the question of the rated H.P., he said there was a certain amount of unanimity among gas-engine makers which did not seem to exist among the makers of other types of engine. The rated H.P. of gas-engines had been settled from commercial considerations; and it was going over old history to discuss the question. When gas-engines first came in, they were known as nominal H.P., based more or less on what a low-pressure steam-engine would give; but it was found that this rating was no good, and some other was necessary. Then makers began to speak of the B.H.P. the engines would develop; and they left a margin of 10 or 15 per cent. to cover themselves, so as to say that their engines would stand a limit of overload. Other makers then came along, who were anxious to get orders if they could, by hook or by crook; and they put the power under a magnifying glass so to speak. Therefore they had to realize that, as far as gas-engine practice was concerned, the rated H.P. referred almost universally to the maximum power that could be hoped for from an engine after a test of 15, 30, or 60 minutes. As a matter of practice, however, he did not believe in the makers' rated B.H.P.; and he calculated it upon the basis of taking the piston displacement of the engines multiplied by half the number of revolutions, which gave the number of impulses per minute, and divided that by four. This represented the B.H.P. of the engine in terms of 4 cubic feet of piston displacement. This was an ordinary figure for suction gas engines; but for town gas engines they could reckon upon 3½ cubic feet. The makers' figures usually coincided with this calculation within 10 per cent.

Mr. DAY said that he endeavoured to rate his engines at the load at which they were suitable to work continuously; and he had many engines in actual service continuously working at the rated loads. They could even go to 10 per cent. above it for two or three hours. Mr. Scott was quite behind the times when he spoke about patents and the small number of makers of Diesel engines. The master patents expired some years ago; and as to the number of firms, he really could not count them. He believed thirty new firms had started within the last three years in Germany alone; and how many there were throughout the world, he did not know. Last year he had gone to Hungary with a view to opening up new business, but had found five firms in one town already. He could not give Mr. Wimperis any reason for the very strong frames and bolts to which he had referred.

Sixth Meeting of the American Gas Institute.

The sixth annual meeting of the American Gas Institute will be held at St. Louis, Mo., on Oct. 18 to 20, when the following papers will be read:—

- "Intensive Scrubbing and Condensing of Gas," by L. E. Worthing, of Detroit.
- "The Manufacture of Illuminating Gas in Bye-Product Ovens in the United States," by W. S. Blauvelt, of the Semet-Solvay Company, Detroit.
- "Report on Verticals at Providence, R.I.," by Carroll Miller, of Providence.
- "Report on Verticals at Manchester, N.H.," by W. G. Africa, of Manchester.
- "Turbo-Blower," by an Engineer with the General Electric Company.
- "Production and Market for Sulphate of Ammonia," by an Engineer with the New England Gas and Coke Company, of Boston.
- "Tar Distillation and Market for its Bye-Products," by Alan D. Whittaker, of Atlanta.
- "Actual Leakage in Unaccounted-for Gas," by J. D. von Maur, of St. Louis.
- "District Holders and their Place in a Distribution System," by R. M. Griswold, of Denver.
- "Flow of Gas in Mains," by J. W. Battin, of Detroit.
- "U.S. Government Report on Electrolysis," by S. W. Stratton, of the Bureau of Standards, Washington.
- "Pacific Coast Conditions," by John A. Britton, of San Francisco.
- "Photometric Work," by C. O. Bond, of Philadelphia.
- "Cost and Results Obtained from Automobile Delivery," by L. R. Dutton, of Wyncote.
- "Valuation of Public Utilities," by H. C. Abell, of New York City.

There will also be some Committee reports, and the report of the Editors of the Wrinkle Department and Bureau of Information. It is possible that arrangements may be made for a lecture on "Some Recent Developments in Gaseous Combustion."

REGISTER OF PATENTS.

Incandescent Gas Lighting and Heating.

Cuss, C. T., of Swindon.

No. 13,284; June 1, 1910. No. 16,677; July 13, 1910.

This combined invention relates to a system of incandescent gas lighting and heating, especially applicable to train lighting.

In incandescent gas lighting which at present obtains, the patentee says, numerous difficulties are met with—among others, the gas-nipples, which are of exceedingly small diameter, frequently require cleaning, while a high efficiency cannot be obtained with small units of light. The object of the invention therefore is to greatly increase and maintain the illuminating efficiency obtainable from coal, oil, or other gas, or mixed gases, and also to render unnecessary or modify all the parts of former appliances which have given most trouble, while at the same time providing the desirable small units of light, without sacrificing efficiency.

To accomplish this, high-pressure combustible or air is used to draw air or combustible respectively through a regulator and injector, and thus to supply a service to distributed points of consumption. The igniting system is so arranged that before ignition a rich mixture or neat gas is admitted to the main lighting service in proximity to the injector in order to displace the air from the whole system, and provide a rich mixture to the burners; while the supply of combustible is thereafter reduced to the normal supply.

Treatment and Purification of Ammoniacal Liquors.

LowE, F. R., and ELY, B., of Pye Bridge, Derby.

No. 19,074; Aug. 13, 1910.

Primal ammoniacal liquors as produced during the distillation or carbonization of coal, &c., either before or after treatment for the extraction of ammonia, are (the patentees mention) extremely difficult to purify, in order to render them fit for discharge into rivers or water courses—a difficulty almost entirely due to the presence of tar oils and phenoloid bodies. It has hitherto been proposed to improve the condition of such liquors by deodorizing them by bringing them into sufficiently long and extensive contact, at effective temperatures, with charcoal. This is effected by employing several vats, each provided with a false bottom and a false head, both pierced with numerous small holes, and between which charcoal is enclosed. The vats are arranged in series and connected together, the liquor ascending in each vat in succession.

The present invention relates to means for overcoming the difficulty referred to, by a combination of filtering, absorption, chemical, and bacteriological processes, in the following manner: The primal ammoniacal liquors, or the waste liquors resulting therefrom, are first allowed to flow through tanks containing beds of various grades of coke, coke breeze, and the like filtering media, in order to remove all suspended matter, which, if allowed to remain, would act as a carrying medium for the tar oils and the phenoloid bodies. The liquor, after being so filtered, is then passed into a tank, where it is intimately mixed with a quantity of animal charcoal. The liquor and the animal charcoal then pass into settling tanks, where, in the absence of suspended matter other than that due to particles of charcoal, chemical and bacteriological action takes place, with the result that the animal charcoal takes up any free ammonia present and the whole of the tar oils and phenoloid bodies.

The chemical and bacteriological action is, they point out, due to mould developing on the charcoal, and which development of moulds hastens the absorption of oxygen from the atmosphere and the decomposition of thiosulphate into sulphuric acid and free sulphur. The decomposition is represented as follows: $\text{Ca}_2\text{S}_2\text{O}_3 + \text{O} = \text{Ca}_2\text{SO}_4 + \text{S}$. At the outlet of the settling tanks the effluent, or waste liquor, is said to be sufficiently pure to permit of its being discharged into rivers or streams. Any fixed ammonia which may be present in the outflowing liquors can be extracted by any of the well-known processes.

From the charcoal used in the process, any free ammonia present (together with the tar oils and phenoloid bodies) may be recovered by distillation, or the charcoal can be subjected to the action of heated air, and the ammonia, tar oils, and phenoloid bodies allowed to evaporate. The charcoal can then be used over again in the process.

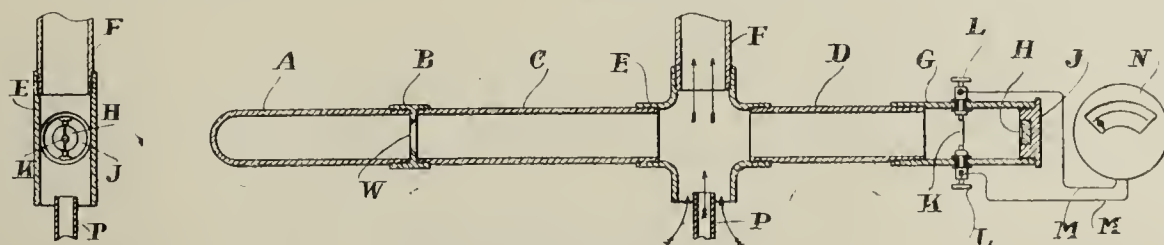
Inverted Incandescent Burners.

COVENTRY, W., of Pendleton.

No. 19,292; Aug. 17, 1910.

This invention relates to burners for use with incandescent mantles—more particularly for lighting with petrol carburetted air, though applicable also for use with ordinary coal gas.

The customary construction of such burners with regulators for the inlet of the vapour and air, or for the inlet of the gas and air separately, is found by the patentee not to be so effective as to adjust the flow of gas from the nozzle of the burner and at right angles to the direction of flow thereof or to the longitudinal axis of the burner, which adds "greatly to the efficient working of the burner."



Foster's Radiation Pyrometer.

As applied to a burner in which petrol vapour and air are fully mixed in the proper proportions before reaching the burner, the burner is constructed with an inlet nozzle or valve, through which the gaseous mixture is delivered at right angles into a passage controlled by a tapering spindle or valve, and an expansion chamber of suitable diameter into which the gaseous mixture flows from the valve. At its lower end, the expansion chamber is fitted with a tube and outlet nozzle, which latter is sealed at its lower end. Outlet apertures are formed in the sides to cause the gaseous mixture to flow laterally; and these apertures are covered by a perforated sleeve, which can be rotated or raised and lowered so as to increase or decrease the operative size of the outlet apertures, and thereby control and regulate the outflow of the gas.

As applied to coal-gas burners an air inlet chamber is substituted for the expansion chamber; but in other respects the burner is practically as described.

Retort-Furnaces.

WESTPHAL, C., of Berlin.

No. 24,018; Oct. 17, 1910.

This invention relates to vertical retort-furnaces particularly intended for burning limestone for the purpose of obtaining carbonic acid gas, and relates to that type of furnace in which the retort proper is constructed independent of the outer masonry, and in which the heating gases are admitted between the retort and the outer masonry, the retort being supported in position by means of retaining blocks built into the outer masonry.

Radiation Pyrometers.

FOSTER, C. E., of Letchworth.

No. 29,097; Dec. 15, 1910.

This invention relates more particularly to radiation pyrometers—that is, pyrometers in which the measuring portion sensitive to heat is not subjected to the actual temperature to be measured, but is, instead, only affected by a part of the radiant heat emitted by a body at that temperature. The object of this invention is to provide a self-contained pyrometer of the radiation type, adapted to measure the temperature of the interior of furnaces, &c.

The pyrometer, according to this invention, may be considered as comprising two main parts—the heat-transmitting part, being the tube whose closed end is raised to the temperature to be measured; and the heat-sensitive part, which is subjected only to the heat radiated from the heat-transmitting part, and by means of which the actual measurement is made. These two parts are connected so that their relative positions remain always the same as when the instrument is calibrated. Means are provided for preventing gases from passing from the heat-transmitting to the heat-sensitive part; and arrangements are made so that the heat-transmitting part may be exchanged or re-placed in case of damage. Ventilation is provided for the pyrometer structure, so that gases passing out of the heat-transmitting part may be carried away before they can reach the heat-sensitive part. This ventilation may be natural—due to the tendency of heated air to rise—or it may be forced, as by bringing an air supply to the pyrometer. If the latter, the air supply may pass between the heat-transmitting and the heat-sensitive parts in a direction more or less transverse to the line connecting the two parts or may be in a direction from the heat-sensitive toward the heat-transmitting part. Alternatively, a screen of some material, more or less transparent to heat radiation, may be interposed between the two parts of the pyrometer—for instance, a thin sheet of mica. Adjacent to this screen, and on the side remote from the heat-sensitive part, is an opening for the escape of gases in case of rupture of the heat-transmitting part while in use.

A longitudinal section of the pyrometer and a transverse section are shown, in which A is the heat-transmitting part of the instrument, consisting of a closed-end tube, attached to the body tube C by a socket B. D is a continuation of the body tube, and between C and D is the ventilating device, which in this case consists of a cross tube E. The heat-sensitive part of the pyrometer is contained in the receiving tube G and comprises a concave mirror H in the cell J. The mirror is arranged to receive radiant heat from the closed end of the tube A, and concentrates it upon the junction of a small thermo-electric couple, provided with a small heat-receiving disc K. The circuit of the thermo-electric couple is completed through the insulated terminals L, the leads M, and the millivoltmeter N. By suitable calibration, the indications of the millivoltmeter N show directly the temperature of the closed end of the tube A.

If the ventilation between A and G is to be natural, it will depend on the tendency of heated air to rise, setting up a transverse current in the direction of the arrows in fig. 1. This effect will be accentuated if the cross tube E is fitted with a vertical extension F. On the other hand, if forced ventilation is desired an air-jet may be used as shown at P.

The mirror H may be arranged so that it throws on K a focussed image of the closed end of the tube A. Alternatively, a sharp-edged opening W may be arranged in the socket B; and the mirror may throw a focussed image of W on the receiving disc K. This construction will be in accordance with patent No. 30,478 of 1909. It is a construction said to be generally preferable, because the operation of the instrument is then more easily made independent of the exact length of the tube A which is raised to the desired temperature.

Gas-Heated Smelting Furnaces.

DELLWIK-FLEISCHER WASSERGAS G.M.B. H., of Frankfurt-on-the-Main.
No. 30,295; Dec. 30, 1910. Dated claimed under International Convention, Dec. 30, 1909.

This invention relates to water-gas-heated smelting furnaces provided with flues for heating the air and for the escape of the products of combustion and with valves serving to exchange the paths of the products of combustion and of the air. The flues are placed side by side, so that the incoming air is heated both by conduction of heat from the neighbouring flues through which the products of combustion pass, and by the heat stored in the walls of the flue by the passage through them of a previous current of combustion products.

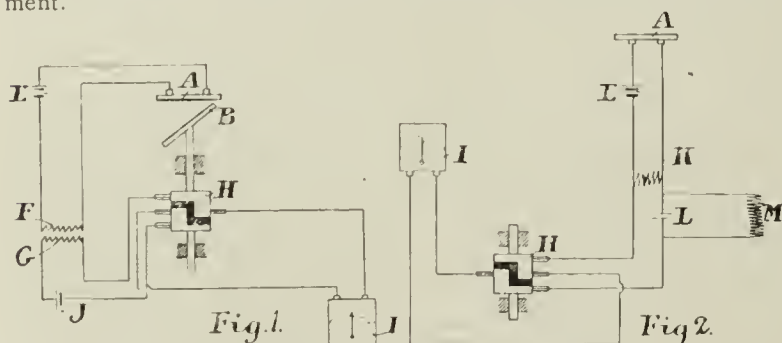
Furnaces of this kind consist of a pair of concurrently working main combustion chambers connected by a passage of reduced area. The air and gas inlets debouch in small combustion chambers placed at one side of the first main combustion chamber and close to the intermediary passage; and the exhaust gases leave the second main combustion chamber through outlets placed at the side of the chamber. The air and gas meet, mix, and ignite in the small combustion chambers before passing over the hearths. The object of introducing small quantities of air and gas at an intermediate point of the combustion chambers is said to be to compensate for the heat lost by the products of combustion during their passage through the first combustion chamber.

In a furnace constructed in accordance with the invention, the two main combustion chambers are placed in axial alignment; and the air and gas are admitted directly to the furnace through the outer end of the first combustion chamber and pass out through outlets situated at the outer end of the second chamber. In order to allow the use of only a single combustion chamber, a gas inlet and an aperture, alternately serving as an inlet of the hot air and as an outlet for the exhaust gases, are provided at a point intermediate of the two combustion chambers; while to allow the incoming air to be highly heated during its passage through the flues, which are maintained at a high temperature by the heat of the gases passing through the adjacent flues through which the products of combustion are passing, the adjacent air and exhaust gas flues of the recuperator are interdigitated so as to provide large heat-absorbing and heat-radiating surfaces.

Photometers.

KUMMERER, W., and the GESELLSCHAFT FÜR ELEKTROTECHNISCHE INDUSTRIE MIT BESCHRÄNKTER HAFTUNG, of Berlin.
No. 11,111; May 8, 1911.

Selenium photometers are, as the patentees point out, already known in which the selenium cell used can be rapidly and alternately brought out of the range of a known source of light into the range of the source of light to be measured; and the subject of their invention is a selenium photometer in which all disturbing influences are avoided, and which therefore "allows a very exact measurement of the sources of light." The cell used is supplied with direct current which is altered into pulsating direct current; and this current (which may be regarded as compounded of direct current and alternating current components) is first wholly or largely separated from its direct current component and then commutated and passed through a measuring instrument. The errors arising in the commutation are thus diminished to (say) the thousandth part; "so that they do not seriously influence the measurement."



A German Modified Selenium Photometer.

Fig. 1 shows diagrammatically such a photometer. A is the selenium cell which, by the aid of the rotating mirror B, is illuminated alternately by the sources of light C and D. E is a source of direct current from which the selenium cell is supplied in series with the primary winding F of a transformer. To the secondary winding G of the transformer there is connected, through the commutator H upon the spindle of the mirror, the measuring instrument I. This latter may, for example, be an ordinary moving coil instrument "of almost any desired sensibility." In the secondary circuit, there may be connected a small source of direct current J.

The same result as is obtained by the transformer F G can also be secured by the use of a condenser or other known means. Fig. 2 shows a simple example of a connection of this kind, in which the revolving mirror and the sources of light are omitted. The selenium cell A is in this case connected with a source of current E across an ohmic or inductive resistance K. In parallel with the latter is a condenser L, in the circuit of which is the commutator H and the measuring instrument I. The direct current flowing through the cell A passes in this case through the ohmic or inductive resistance K, while the variations in current produced in the cell by the alternations of illumination flow in the main through the condenser L and, after their commutation, operate on the measuring instrument I in the circuit. In this case also a small direct current can be superposed upon the commutated current—e.g., by connecting in parallel with the condenser a large ohmic resistance M.

This photometer may be used not only for the comparison of sources of light, but also for all other purposes in which a comparison of magnitudes of illumination can be applied—for example, to measure the transparency of substances, and so on.

MISCELLANEOUS NEWS.

SHEFFIELD GAS WORKERS.

Increase in Wages.

A meeting of Sheffield gas workers was held on Sunday, in the Burngreave Hall, to consider the Gas Company's reply to the request of the employees for an increase of wages, and for "recognition" of the Union leaders. The latter condition was granted, as a preliminary to personal negotiations through a deputation headed by Mr. Charles Blackburn, the District Secretary of the National Union of Gas Workers and General Labourers. Now that a settlement has been arrived at, says the "Sheffield Independent," its terms are "far more generous than the most sanguine dared anticipate. The Gas Company have done the thing handsomely; and Mr. Blackburn merits the warmest congratulation on a triumph of sagacious leadership. It means an increase in wages of £3000 a year." That the men should be pleased, is evident from remarks made by Mr. Blackburn himself at the meeting. He said: "We have not got all we asked for; but what we have got exceeds my anticipations. It is splendid. Let us treat the Company with the same honest respect that Mr. Hanbury Thomas treated your representatives with. While that feeling exists, I am sure we can go on having conditions materially improved. That is the spirit to cultivate."

The terms of the agreement signed by Mr. Hanbury Thomas, as Managing-Director of the Company, include, as already stated, the recognition of the men's Union. As to wages, the Directors express the desire that their workmen should be liberally paid, and intimate their willingness to grant an advance of 3d. per shift to all classes of eight-hour shift men, and 1s. per week to all able-bodied men in their employ except those specially dealt with. The classes exceptionally treated were then mentioned. It was added that any workman having a grievance must see the Works Superintendent first. If the grievance is not satisfactorily dealt with, the Union Secretary may write the Engineer, who will go into the matter, and, if necessary, discuss the grievance with him personally. Mr. Hanbury Thomas's letter concluded: "In communicating their decision, the Board request me to point out to you that their ability to reduce the price of gas is due to causes wholly unconnected with labour. As a body, our workmen are paid as high wages as any gas workers outside London; and as regards the general labourers, the rate is considerably above that paid by the large works in the city, and they have in addition a week's holiday per annum, with pay." Attention was also directed to the fact that the lowering of the price of gas benefited the workers generally throughout the city, not only in regard to their personal saving, but by enabling the industrial concerns to compete on better terms with their rivals in other towns—thus increasing employment for Sheffield men.

In explaining the terms, Mr. Blackburn particularly emphasized the point that the management of the Gas Company made it clear at the beginning that no man need fear victimization for acting on the deputation. They said they would never dream of such a thing as penalizing a man because he was an official of his Union. A satisfactory feature of the clauses relating to blacksmiths and fitters was that the Company had recognized the fair-wages standard of the City Council; and some of the individual advances were as much as 4s. per week. As regarded the youths, some of whom had done men's work, the advances were, in numerous cases, as much as from 3s. to 7s. per week. The "bullers" had four hours knocked off, and received 9d. per day advance on former rates. The joint makers, some of whom had been suspended for not being at home when called for, although they received no pay for "hanging on," would now receive a retaining fee of 2s. per shift for stopping at home on call. While he agreed that the labourers' wages of 25s. per week were the high-water mark in Sheffield, he recalled that not more than 40 miles away there were gas-works labourers receiving the same pay for an eight-hours shift.

The terms of the agreement were received with acclamation by the men; and the proceedings closed with votes of thanks to Mr. Blackburn and to the Gas Company.

AUSTRALIAN GASLIGHT COMPANY.

The Annual Meeting of this Company was held on Thursday, July 27, under the presidency of Mr. G. J. COHEN.

The SECRETARY (Mr. R. J. Lukey) having read the notice convening the meeting, the report of the Directors for the past six months was taken as read. It stated that the profits for the half year to June 30, after making provision for bad and doubtful debts, deducting interest on borrowed money, repairs and renewals, depreciation of plant, working expenses, and all other charges, amounted (with the balance brought forward) to £71,155; and the Directors recommended the payment of a dividend of 9s. per share, which would absorb £63,750 and leave a balance to be carried forward to the next account of £7405.

The CHAIRMAN, moving the adoption of the report and accounts, said it was difficult to compare the balance-sheet with the corresponding half of 1910, as that showed disastrous results to the Company owing to the unfortunate coal strike, which not only paralyzed the business of the city at the commencement of last year, but necessitated the Company purchasing coal at unprecedented prices to keep up the supply of gas, which involved them in very considerable loss, as the whole of the extra cost was met by the Company rather than that the consumers should suffer inconvenience or loss. With regard to the sale of gas, he was pleased to say that last half year showed a good increase. Naturally, the extensions now going forward in the suburbs, both new and old alike, were responsible for this satisfactory state of things; but the city itself contributed a considerable portion of the extra consumption. The quantity of gas sold during the six months was equal to an increase of 11 per cent.—a fact gratifying to the Directors, more particularly as the increase was being maintained uniformly, both as regards day and night consumption.

Continuing his speech, he said: The intimation of the Government's intention to resume the site of the works and offices at the head station, for wharfage accommodation, has not come as a surprise to your Directors, who have watched for some years past the steady increase in the extension of the wharves by the Harbour Trust Commissioners to meet the shipping requirements in Darling Harbour. Your Directors regret the contemplated action of the Government, but are prepared to negotiate for a fair settlement of the Company's claim, at the same time they trust they will not be made to suffer thereby. The Company's works have been located on this site for nearly 74 years; it is most centrally situated, and meets all the requirements of a gas-works; and it will take some considerable time to erect similar works at Mortlake, which, however, must be done before the severance from Kent Street can be effected.

The Glebe Municipal Council, who had given notice of their intention to discontinue gas lighting for public purposes in that Municipality at the end of this year, have, I am pleased to say, entered into a new agreement with the Company for a supply of lamps with inverted incandescent burners of 100-candle power in the majority of the streets of the borough, in lieu of those already in use—the installation taking effect from the 1st of January next. It having been so often demonstrated that gas is much superior to electricity as regards light and cheapness, I am at a loss to understand why councils should desire to light their municipalities with electricity, it being inimical to the interests of the ratepayers so to do. Taking the Glebe Council for an example, the Company are supplying the new lights at £4 10s. per annum, lighted every night in the year, as against £6 per lamp, the price quoted for electricity—a saving in this instance of from £500 to £600 per annum, according to the number of lights required, besides giving in every way a much better light. In this connection, I may say the Company are about to introduce the Horstmann controller; so that the lamps will be automatically lighted and extinguished.

The question of lighting the public lamps all the year round is one in which the Company fully sympathizes; but the municipal councils ought not to expect this special service, involving as it does 65 extra lighting nights, without any additional charge. The Company are always mindful of the public interests in this respect, and whenever opportunities occur reduce the price, as was the case six months ago. The present rates, owing to the lamplighting and maintenance expenses principally, are carried out without profit; and until other means can be devised to reduce these charges, I cannot hold out any hope of being able to meet the councils in the direction desired.

The Gas-Works Employees Wages Board is at present considering a new industrial agreement, in lieu of the one which expired on the 31st of May last. Some delay and misapprehension arose in connection with the preliminary proceedings. The trouble, however, has now been overcome; and I am hopeful that no further friction will arise, but that the terms of agreement will be amicably settled.

The Commonwealth land-tax is an additional and unexpected charge to bear—amounting in the Company's case to about £5000 per annum. These additional burdens tend to delay for a time any consideration for further reducing the price of gas, which is much to be regretted.

The Company have issued the whole of their authorized capital; and your Directors intend at an early date to apply to Parliament for power to increase same. The business of the Company has reached large proportions, and is growing rapidly. The complaints of an inadequate gas supply made in the early part of the winter were sincerely regretted by the Board, particularly as ample arrangements were made to cope with the anticipated increase in the consumption of gas. But our calculations were upset in the first place by the non-delivery of the new machinery within the specified time; and, secondly, owing to the delay in the erection of it, in consequence of a scarcity of skilled labour. As soon as the new machinery was in working order, however, immediate relief was obtained, and an ample supply of gas secured. In proof of the Directors' earnest desire to do all that is possible to meet their consumers' requirements of gas, I would like to say that mains costing about £30,000 have been ordered, and will be laid immediately on arrival; so that I hope there may be no question of shortage of gas again for many years to come.

The business of the Company is one of expansion. With regard to the lamps, while I greatly regret the lessened number, I would like to point out that it is a department which, unfortunately, admits (of late years in particular) of practically no profit to the Company. Still, with the example now being set by the Glebe Council, I hope the Company will have the consideration it deserves before other councils take the final step to discontinue gas as an illuminant for the public streets. I am pleased to say that the number of lights now in use is about 11,000, and that additions are still being made from time to time. The popularity of gas-cookers has greatly increased of late. During the past six months, the Company alone have sold 1346 stoves; making the total number disposed of to date 22,610. The day consumption of gas equals 46 per cent. of the whole sales. The gas consumers now number 98,649—being an increase of 2921 during the past half year. Fifty-eight miles of mains and service-pipes have been laid during the same period, making the total length to date 2570 miles.

The motion was seconded by the Deputy-Chairman (the Hon. Henry Moses), and carried unanimously.

There being no opposition, the Chairman declared the re-election of the retiring Directors and Auditors for the ensuing year; and a unanimous vote of thanks was accorded the Directors and officers—from the Engineer (Mr. Thomas J. Bush) downwards—for their efficient management of the Company's business.

Gas Explosion at Clay Cross Hall.—On Monday night of last week, there was a serious gas explosion at Clay Cross Hall, the residence of Colonel Jackson; but though the damage to property was extensive, fortunately no personal injury was caused. It appears that the family were away from home, and the schoolroom, where the explosion occurred, had not lately been used. It is stated that in the centre of the room is a chandelier fitted with incandescent burners and a by-pass; and the presumption is that the water evaporated from the chandelier, thereby causing an escape of gas, which ultimately became ignited by the by-pass.

HIGH-PRESSURE LIGHTING AT MANCHESTER.

Another Extension.

The installation of high-pressure gas-lighting for street illumination in Manchester has proved so successful that at Friday's meeting of the Gas Committee a further extension of the system was decided upon, while applications from tradesmen in the centre of the city for high-pressure lighting outside their premises for the purpose of window illumination were considered.

It was in October of last year that the first installation of high-pressure lighting was inaugurated in Manchester, when Alderman Gibson, the Chairman of the Gas Committee, turned on a 3000-candle power Keith patent inverted arc lamp on Piccadilly; 20 other lamps of half this candle power placed around that thoroughfare being lit up the same evening. Later on, the City Council, when considering the rival claims of gas and electricity for street lighting, decided that the Electricity Committee should arrange for the lighting of Portland Street; while Mosley Street, in the matter of lighting, was to be under the charge of the Gas Committee. The second installation was inaugurated last July; and so successful has this proved that the system is to be extended to Oldham Street at the request of tradesmen in that fashionable shopping thoroughfare. Tradesmen in Mosley Street applying for high-pressure lighting outside their business premises are having such schemes carried out in conjunction with the Gas Committee.

At present, the Manchester Gas Department have 60 high-pressure lamps of 1500-candle power in use in Piccadilly, Mosley Street, and St. Peter's Square; and the existing plant can deal with 400 lamps of the same power.

STOCKPORT GAS UNDERTAKING.

Most Successful Year on Record.

The annual report of Mr. S. Meunier, the Gas Engineer to the Stockport Corporation, was brought before the members of the Town Council at last Wednesday's meeting for adoption. On the working of the department for the twelve months there was a net profit of £26,192—an increase of £4862 on the previous year; and out of this, £19,000 had been handed over in relief of the rates.

Alderman FERNLEY, the Chairman of the Gas Committee, moving the adoption of the report, said that the year under review was the most successful one in the history of the department. There had been a steady increase in the net profit during the last six years, as follows:—

1906—£10,158	1909—£21,490
1907—£17,412	1910—£21,054
1908—£19,070	1911—£26,192

It would be remembered that quite recently a reduction was made in the price charged to consumers by automatic meter, bringing the rate—having regard to the extra cost—rather below that paid by ordinary consumers; and there had also been a reduction for large consumers. It was gratifying to find that the rental had increased by some £3690—notwithstanding the very energetic exertions of the Electricity Committee to obtain a large load, almost at any price. From the sale of coke, they had an increase of £1805; and other residuals had also realized better prices than usual. On the expenditure side, coal showed an advance of £708, which was more than counter-balanced by the less cost of carriage and cartage—namely, £930—which showed what an important matter the question of carriage was when arriving at the value of coal to the undertaking. It proved that the policy adopted by the Committee in taking this item up was a correct one, and that the charge made some time ago against the Committee by Mr. Noden—that the method of arriving at the value of coal when delivered at the works was wrong, but that it ought to be taken at the pit price—was incorrect and absurd. Dealing with the suggestion which had been made by certain members of the Council, that, in view of the prosperous condition of the gas undertaking, there should be a reduction in the price of gas, Alderman Fernley said it must not be forgotten that this was one of the Corporation's ventures which was successful. If all the undertakings of the Corporation were of this character, then one would have no hesitation in making a reduction; but they must take a broader outlook, and have regard to the responsibilities of the ratepayers, which were constantly becoming more onerous. He might point out that the cost of education, already a serious item, was likely to increase further; and then there was the outlay on the Kinder water scheme, for which they had to provide large and increasing sums, to commence next year. The Gas Committee, in not suggesting a reduction in price, did remember their obligations to the ratepayers; and they were aware of the fact that the charge for gas in the town was a reasonable one. They had regard also to the uncertainty of the coal and the residual markets. He trusted, therefore, that the Council would not, at present at any rate, listen to any suggestions for a reduction in price—suggestions that were sometimes made without due regard to the responsibilities of the Council.

Mr. BREWSTER complained that the employees at the gas-works were not on the same footing in regard to conditions and wages as similar workers elsewhere. Deputations were constantly waiting upon the Gas Committee asking them to fall into line with other employers of labour. This not only applied to the unskilled labourers, but also to the skilled workmen. As soon as a skilled man entered the gas-works, he did not know what he was. A plumber was no longer a plumber, a joiner a joiner, or a bricksetter a bricksetter—he became a kind of superior unskilled labourer. If consumers were treated fairly and the workpeople were dealt with in a proper way, the Committee would not have such a large profit to show.

Mr. HOLLIS submitted that, with regard to the employees, the Gas Committee were seeking trouble, and they would get it unless they fell into line with other employers.

Alderman ALLCOCK referred to the large leakage of gas that took

place, and said it was more than the whole amount consumed in the streets. As to the profits, he remarked that in 1905 the price of gas was 2s. 5d. per 1000 cubic feet, less 2d. Now it was 2s. 6d., less 2d. The extra 1d. made a difference of £3411. In addition, the gas now sent out was of a lower candle power. Power consumers paid 1s. 3d. per 1000 cubic feet; while the smaller and poorer consumers—the people who used the slot-meters—paid 2s. 6d. Then the General Purposes Committee took 69,850,000 cubic feet of gas per year, and paid the Gas Committee 2s. per 1000 feet and 10d. for maintenance. This was how the profit was made up. In his opinion, the ratepayers were being charged twice over for the gas they used; and he considered there ought to be a reduction to the ordinary consumer.

Alderman FERNLEY, in his reply, said it was incorrect to state that numerous deputations of the employees had waited upon the Gas Committee. Only two had done so during the last twelve months.

The report was then adopted.

ABERDEEN CORPORATION GAS SUPPLY.

Favourable Position of the Undertaking.

In the Corporation of Aberdeen last week, Mr. J. A. Sangster, the Convener of the Gas Committee, in presenting the accounts of the department for the year—a notice of which appeared in the "Notes from Scotland" a week ago—said he was able to announce a most successful year, with every appearance that past prosperity would be maintained.

In regard to the capital account, the amount expended thereon stood at £446,220. Of this sum, £79,381 was written off in 1897, when the new valuation was made, and the remainder had been reduced yearly until now the gas undertaking had a liability of only £132,920. The amount received for gas was £96,124—an increase of £3679 over last year. This included an increase on prepayment meters of £1800. The revenue from coke was £14,627, being less than last year by £870; but tar had brought in £11,967, an increase of £1424 over last year, or an increase on both of £554. These, with the other items, had brought in a total revenue of £125,467, as against £121,049 last year, showing an increase of revenue of £4618. Coal had cost £53,564, the material for carburetted water gas £5142, purifying material £1088, wages £11,559, and repairs £4895, in all £78,442 as against £79,679—a decrease of £1237. Distribution of gas, in which was included a sum of £1848, the original value of old meters broken up, had cost £5112, an increase of £202 over last year. Gas-stoves, including depreciation at 7½ per cent., had cost £1932; rents, feu-duties, and taxes, £6728; management, £1919; general charges, £921; discounts, &c., £4023. These were all about normal, considering the increased make of gas. The balance on the account was £25,639 (£2666 more than last year), and was carried to the net revenue account, out of which were paid the standing charges as follows: Annuities £4041, interest £3580, sinking fund £9621, redemption of annuities £1367, reserve fund £300, and renewal fund £3000; leaving a balance of £3728, which, with similar balances from former years, made up the sum of £7775 carried to next year's account. The contingent fund for the redemption of gas annuities now stood at £76,865, the sinking fund for the repayment of loans at £137,947, the reserve and fire insurance fund at £38,975, and the renewal fund at £11,228.

The increase in the make of gas this year over last was 23,294,000 cubic feet, or 3 per cent. The total quantity manufactured for the year was over 817 millions, as compared with 366 millions in 1891, 259 millions in 1881, and 146 millions in 1872—the first year of the Council's ownership—or over five times as great as the last-mentioned year. The prices charged per 1000 cubic feet for these years respectively were 2s. 6d., 3s. 8d., 4s. 1d., and 5s. Estimates had been prepared for the year just commenced, in which it was recommended that the price be again reduced to 2s. 3d. for ordinary consumers, and 1s. 11d. for power purposes—prepayment consumers to remain the same as last year, owing to the substantial reduction made two years ago, and the expense of altering the meters. To power users, the price was to be reduced 4d. per 1000 cubic feet. This was with a view to competing with suction gas, which had to some extent taken the place of the town gas supply; and he was hopeful that the substantial reduction proposed would enable users to again return to the town supply, and so considerably increase their output. The number of consumers using gas by ordinary meters was 31,742, and by prepayment meters 10,150—a total of 41,892, as compared with 33,222 ten years ago. It was proposed to abolish rentals for gas-cooking appliances as from Whitsunday last, and allowance had been made for this in the estimates for the current year. This was a policy which was gaining favour throughout the country; and wherever it had been adopted, increased outputs had been the result, particularly in the summer months, when the demand for gas for lighting was at its lowest. He would like to take the opportunity of complimenting the Gas Engineer on the very favourable result of the year's working, which had in large measure been due to the able and efficient manner in which the department was conducted by him and his staff. If cookers were used generally, it would mean extra labour; but he did not think they would require further plant for a considerable time.

The minute was adopted unanimously.

Stretford Gas Company.—The report and accounts adopted at the half-yearly meeting of the Stretford Gas Company showed a profit of £4521. Adding to this the balance from the last accounts, there was a disposable amount of £5836. Dividends were recommended at the rates of 10, 7½, 7, and 5 per cent. on the different classes of shares, which would absorb £4910, and leave £926 to be carried forward. It was announced that Mr. W. L. Galloway had, on the ground of advancing years, resigned the position of Chairman; Mr. W. A. Nicholls being elected to succeed him. For close on thirty years Mr. Galloway has been a Director of the Company; and for fourteen years he has occupied the position of Chairman.

MANCHESTER CORPORATION AND GAS-FIRES.

A proposal on the part of the Manchester Gas Committee to supply and fix on simple hire, or on the three years' hire-purchase system, gas-fires and other gas-consuming devices to consumers of gas within their supply area, gave rise to considerable discussion at the City Council meeting on Wednesday last.

Alderman Gibson, the Chairman of the Gas Committee, in moving the adoption of the Committee's minutes, said that if the Council really wished to do something to mitigate the smoke nuisance in the city they would approve of the action of the Committee. There was to be a smoke abatement exhibition held in Manchester in November, and with a view to supporting the exhibition, and abating to some extent, at any rate, the smoke nuisance, the Gas Committee had decided that, after Sept. 29, they would supply and fix gas-fires free for consumers.

The opposition to the proposal was led by Alderman Wilson, who moved an amendment to the effect that the minute be referred back. He agreed that the policy of the Gas Committee in the hiring-out of gas-stoves had proved a very good thing; but it had destroyed the business of the ironmongers and plumbers in this particular line, for now the Corporation supplied and fixed stoves free, nobody bought them from tradesmen. Serious objection could not be taken to the action of the Gas Committee in this matter, because poor people could not afford to pay £6 or £8 for a gas-stove; but the present proposal of the Gas Committee, if agreed to, would mean a very large extension in municipal trading. The scheme would enable the Committee to hire out any device from a simple gas-burner, and that would be an unwarrantable interference with the private traders' business—ironmongers and plumbers. "Other gas-consuming devices" might, he added, mean anything; and being engaged in the particular business in which the Gas Committee proposed to enter, he objected to the scheme.

Alderman Frowde, who seconded the amendment, admitted that he was engaged in the same business as the mover. He argued that municipal trading had its limits; that the private individual could do some things very much better and cheaper than the municipality; and that the failure to recognize the latter was the explanation of one of the greatest leakages in municipal revenue.

Other opponents of the proposal said that if the Gas Department were able to make concessions, it ought to be in the direction of cheapening the gas to consumers, and bringing the price nearer to that charged in such places as Sheffield.

Councillor Kay, the Deputy Chairman of the Gas Committee, replied that Manchester could make gas as cheaply as Sheffield, but pointed out that so long as the Council and the people's representatives demanded a contribution of £60,000 from the Gas Department yearly in aid of rates, so long would consumers have to pay for their gas not at cost price, or anything near it.

Replying on the debate, Alderman Gibson said at the outset that it was rather unfortunate the mover and seconder of the amendment should both be in the trade likely to be affected by the Gas Committee's proposal. He (Alderman Gibson) desired to disabuse their minds, however, as to the effect it would have on ironmongers and plumbers. It was his opinion that when the system was adopted, it would add materially to the takings of both plumbers and ironmongers. It might be put this way. The Gas Committee would become travellers for the gentlemen engaged in those trades; they would be advertising their business and pushing it for them. Alderman Gibson went on to say that no one was more opposed than he was to any interference with private enterprise on the part of the municipality; but from inquiries he had made, it was clear that the business of the wholesale dealers in gas appliances was almost wholly with the gas undertakings—so far, at any rate, as the supply of gas-fires and heating-stoves was concerned. In one case, it amounted to 93 per cent. of business with the gas undertaking and 7 per cent. with ironmongers and private traders. In another case, the figures were 85 per cent., as compared with 15 per cent.; and in a third instance, the proportion was 80 per cent. to 90 per cent. of the total trade done. He asked, in the face of these figures, how the Gas Committee could be accused of injuring private enterprise in the step they proposed to take? Their best interests were represented by the letting out of gas-fires anywhere and everywhere. All the Committee asked was to be allowed to run their business in the way they thought best suited to the needs of the community.

The amendment was defeated on a vote being taken, and the proposal of the Committee approved.

Gas Superintendent's Views.

Mr. F. Price, Superintendent of the Gas Department, discussing the subject with a Press representative, said that the Gas Committee had in mind not only the development of the gas undertaking, but hoped to bring about a considerable abatement of the smoke nuisance. "We must not lose sight of the fact," he added, "that though manufacturers have almost wholly to stand the blame for the smoke nuisance, the domestic fires are the worst offenders. Anyone entering Manchester by train in a morning—coming into London Road station, say—can test for himself the truth of this assertion. We hope to do something to check this nuisance, which is a very grave one in the city. As to the question of cost, I do not find the gas-fires in my own house dearer than coal-fires; and there is a great saving in labour, and much more cleanliness, by their use. Economically managed, there may be a monetary saving as well. We believe the policy embarked upon will encourage people in the direction desired; for it is stated that since the recent gas exhibition in Glasgow over 5000 gas-fires have been installed. Of course, many are found in the homes of Manchester people to-day; but the initial cost has probably been a barrier against their more extended use. The charge for the hire of a fire will amount to 1s. per quarter, and at the present price of gas, 2s. 3d. per 1000 cubic feet, a 40-hours' fire can be secured for this sum. Our energies will be devoted at the outset to equipping city offices, and afterwards attention will be devoted to the houses."

It is calculated that the gas-fires to be supplied by the Gas Department will burn 26 cubic feet of gas per hour. The gas-fires will be of an approved pattern, and will, as stated above, be supplied by the

department either on simple hire or on the three years' hire-purchase system. At the forthcoming Smoke Abatement Exhibition, which is to be held at the City Exhibition Hall in November, a prominent feature will be that showing the possibilities of using gas in the elimination of the smoke evil, including different models of gas-fires.

It is believed by supporters of the smoke abatement campaign in the city that the introduction of gas-fires will help to lessen the nuisance, and will be a great boon both in city offices and in private houses. These fires will save all the trouble with coal, cinders, and ashes, and in this respect bring about a great saving in labour, apart from the questions of laying fires and of general cleanliness.

An Advocate of Smokeless Fuel and its Production.

In the opinion of Mr. J. W. Graham, the Principal of Dalton Hall, Manchester, and an authority upon smoke prevention, the only solution of the domestic smoke nuisance problem is the production at gas-works of a smokeless fuel. This means fuel out of which part of the gas has been taken and part left in. "Clearly the only people who can make it profitably," he says, "are those who can sell the gas—the one main product of this mild combustion—the Gas Committee of the Corporation, who have the domestic smoke of the city in their hands. If they would be willing to care for something a little wider than the production of gas, and would establish an improved smokeless fuel plant, they would begin a new era in the city. I don't think that anything but inertia blocks the way. They have the market in their hands, and could sell the fuel at whatever price it costs. The gas made is of a very high quality, and the tar is a very superior product to that made now by heating the coal until there is nothing left but coke. I feel sure this smokeless fuel could be sold as cheaply as coal. A serious purpose and an enterprising committee are all that is needed. The sale of smokeless fuel, even under many disadvantages, shows there is a demand for this kind of thing."

Mr. Graham added that the only way in which smokeless fuel would affect the coal famine predicted by Sir W. Ramsay, at the meeting of the British Association, would be that more of the energy of the coal would be utilized by turning it into smokeless fuel, gas, sulphate of ammonia, and tar, the total value of which was about four times that of the coal from which they were made. He understood that a private company was at present endeavouring to undertake a business on a small scale to sell an improved smokeless fuel in Manchester, but in his opinion nobody except a gas committee could do it properly.

At Friday's meeting of the Gas Committee, a Sub-Committee were appointed for the purpose of drawing up regulations in respect of the hiring of gas-fires, the scheme for which will come into operation at the end of the month.

SOUTHPORT GAS UNDERTAKING.

The Past Year's Working.

The minutes of the Southport Corporation Gas Committee to be submitted for approval at the monthly meeting of the Town Council to-night (Tuesday) include the report of Mr. J. Bond, the Engineer, on the working for the past financial year.

He records with pardonable satisfaction that there was an increase of gas sold amounting to 2,052,000 cubic feet, which was 4 per cent. more than shown in the previous year. The net increase from the sale of residuals was £3670. The sale of gas by prepayment meter was 11.53 per cent. of the whole consumption, and showed an increase of 9.88 per cent. on the previous year's consumption. Of the total gas supplied through ordinary meters, the Southport consumption was 330,940,800 cubic feet, equivalent to 80.42 per cent.; the Birkdale consumption 70,739,000 cubic feet, representing 17.19 per cent. of the total consumption; and the remaining 9,832,800 cubic feet, or 2.39 per cent., was consumed in the districts of Ainsdale, Banks, and Scarisbrick.

The following figures show the capital employed and the capital outstanding: Total capital expended per 1000 cubic feet of gas sold—1910, 11s. 6d.; 1911, 11s. 7d. Capital outstanding—1910, 7s. 8d.; 1911, 7s. 6d. The net profit for the year amounted to £13,400, as against £13,112. The Committee are able to pay £13,000 towards the relief of the rates, and carry forward a balance of £400. The capital account (total amount expended) now stands at £300,020, and the gas-works debt (after deducting payments through sinking fund) at £193,525.

The maximum and minimum makes of gas during 24 hours were 2,296,000 cubic feet and 991,000 cubic feet. The gas-making material used was: Coal, 47,619 tons; oil, 332 tons; coke, 844 tons. The gas made was 545,412,000 cubic feet. The quantity sold to private consumers was 474,365,200 cubic feet; gas used at works and offices, 6,280,000 cubic feet; free gas, 488,600 cubic feet. The unaccounted-for gas was 3.83 per cent.

Mr. Bond summarizes the financial statement thus: Income: Gas sold, net, £68,812, increase £501; residuals, £17,638, increase £3670; rents, £939, increase £2; cookers, £1991, decrease £37; sundries, £957, increase £628; and shop lamps, £635, decrease £25. The gross profit was £30,096, and the net profit £13,401. The gas-cookers in use at the end of the year numbered 8342, compared with 7961; while 542 new meters were fixed during the twelve months, bringing the total number in use at the end of the year up to 19,407.

Electric Light Failure during an Operation.—The "Nursing Mirror" says: From Yorkshire, we hear of a very regrettable incident, due to the most culpable lack of foresight. While an operation was being performed in the night, the electric light failed. Neither lamp nor candle was available; and before either could be obtained, the patient died, though the operation itself was not of a very serious nature. The correspondent who sends us this information does not indicate the kind of institution in which the tragedy occurred, but asks us to make it known, "as a warning to nurses and others." It is impossible to conceive such a ghastly failure to provide against an obvious contingency in any well-ordered establishment.

STOKE-ON-TRENT GAS UNDERTAKING.

The Annual Accounts.

The accounts of the Gas Department of the County Borough of Stoke-on-Trent, for the year ended March 31 last have been issued. It will be remembered that the undertaking now embraces the Burslem, Stoke, Fenton, and Longton works; but in the accounts the results for each are set out separately. The principal figures are as follows: Burslem—Gas made, 235,465,000 cubic feet; per ton of coal carbonized, 12,135 feet; increased quantity of gas sold over previous year, 13.16 per cent.; gas unaccounted for, 6.72 per cent.; gross profit, £10,510; and net profit, £5036. Stoke—Gas made, 150,458,000 cubic feet; per ton of coal carbonized, 12,434 feet; increased quantity of gas sold, 4.71 per cent.; gas unaccounted for, 6.34 per cent.; gross profit, £4060; and interest, &c., charges amounted to £4184. Fenton—Gas made, 109,996,000 cubic feet; per ton of coal carbonized, 12,228 feet; increased quantity of gas sold, 9.07 per cent.; gas unaccounted for, 8.68 per cent.; gross profit, £3512; and net profit, £547. Longton—Gas made, 166,693,000 cubic feet (including 11,082,000 cubic feet of water gas); per ton of coal carbonized, 12,953 feet; increased quantity of gas sold, 7.11 per cent.; gas unaccounted for, 4.89 per cent.; gross profit, £10,043; and net profit, £3073.

GAS FOR DOMESTIC HOT WATER SUPPLY.

In the "JOURNAL" last week (p. 584) reference was made to an article that had appeared in the Engineering Supplement of "The Times" by Mr. R. Herzfeld. The article, in our opinion, did not go far enough, in properly picturing the claim that gas has to-day in being considered an economical agent in furnishing hot water for household purposes. Mr. Frederick Dye has rectified the omission in a letter to our contemporary, of which the following is the main portion.

The chief point that your contributor calls attention to is the fact that cooking by gas is growing in favour—becoming almost universal for summer requirements; and as this leaves the range fire unlighted, we are deprived of the great convenience of having hot water in bulk for warm baths and pantry use. It is to meet this want that the co-operative principle is suggested, while no mention is made of that very practical means of heating water, the gas-boiler. This kind of boiler is not in its experimental stage, but is an established useful and economical heater, of which thousands are doing excellent service; and there is every promise—certainty, in fact—of it becoming the companion of the gas-cooker. It is only a question of becoming known; but already its use is increasing at about the same rate as that of the gas-cooker in its early days.

With gas at (say) 3s. per 1000 cubic feet, the gas-boiler can (or should) heat some 20 gallons of water from cold to bath temperature (100° Fahr.) for 3d. in summer, and 1d. in winter—this being the cost of a single bath. Baths successive to the first cost a little less. Water for scullery or pantry use, at 150° Fahr., costs 1d. to 1½d. for 10 gallons. These are established figures; so that for economically heating water the gas-boiler may be used without fear of excessive gas consumption or disappointment. But it must be seen that losses or unnecessary consumption do not occur between the times of heating the water; for should this happen condemnation of the boiler may follow.

Although water can be heated by gas cheaply, it takes but little waste to make this service dear; and to prevent waste, and ensure economy, it is recognized that every gas-boiler used for domestic hot water supply should have a "thermostat." This is a device which causes the gas consumption to be controlled by the heat of the water, automatically. It has been thought, and sometimes claimed, that a gas-boiler is suited for emergency uses only—to heat water when required, the gas then to be turned out; but this would never admit of the gas-boiler being a practical companion to the gas-cooker. A gas-boiler must be capable of all-day service economically (and all night if desired); and while this must be considered as impossible with hand control, it is not only possible, but positive, by the aid of a reliable thermostat.

Unfortunately, the several types of thermostat which exist vary (to say the least) in efficacy. Some work doubtfully in governing the gas supply; but where serious failure is experienced is when the controlling device admits of wasteful gas consumption during the many hours in a day when the boiler is idle—the slack hours when the demand for hot water ceases. Unless the thermostat is reliable in this, there may be a greater, or as great a, gas consumption during the slack hours than during the busy ones. (In many houses the busy hours, for hot water, are four, the slack hours ten, per day.)

A good thermostat will shut off the gas promptly when the water reaches the temperature the device is set to operate at, and it will immediately turn up the gas when hot water is drawn and cold water flows in to the apparatus. When the water is heated, the shut-down consumption should be as low as 2½ to 5 cubic feet of gas per hour; this consumption serving to keep the heated water hot—to prevent it cooling—so that there is hot water at demand at any hour all day, and, as stated, all night and very early morning, if desired.

The very low gas consumption obtained with a reliable thermostat, when it is shut down—2½ to 5 cubic feet per hour—costs about 3d. to 1½d. per day (for the whole of the slack hours); so that the actual total cost of all-day duty of an efficient gas-boiler with an efficient thermostat is that of heating the bath water and the pantry water at the price already given, plus about 1d. per day for keeping the water hot between the times of its being heated and being drawn.

The foregoing is practical, actual, and should be guaranteed; but much depends on the thermostat.

"Coalexid" is being used at some half-dozen of the stands in the Bakers' Exhibition at the Agricultural Hall, Islington.

HARROW AND STANMORE GAS COMPANY.

Adoption of Co-Partnership.

The Half-Yearly Meeting of this Company was held on Monday last week, at the Holborn Restaurant—Mr. ALFRED H. BAYNES, J.P., in the chair.

The SECRETARY (Mr. J. L. Chapman) read the notice convening the meeting; and the report of the Directors and the statement of accounts were taken as read.

The CHAIRMAN remarked that the progress which he anticipated when he spoke at the last meeting was, he thought, abundantly evident in the report and balance-sheet for the half year just closed. Gas companies generally had had a good time lately, with increases in the demand for gas and higher prices for all residuals. He was glad to say that their own undertaking had not come behind—showing, as it did, satisfactory results in all departments. The gas-rental for the half year to June 30 amounted to £18,962, which was an increase over the corresponding period of the previous year of £1730, notwithstanding a reduction in price of 2d. per 1000 cubic feet during the six months. The sale of gas had remarkably increased; and this was greatly due to the use of cooking-stoves, which had now been brought to a high state of perfection, whereby the output of gas was often more during daylight hours than at night-time. The quantity of gas sold during the half year was 114,935,000 cubic feet, which was an increase over the same period of 1910 of 15,388,000 cubic feet, or 15.45 per cent. This condition of affairs was, he was glad to say, being maintained, and bid fair to continue. There was no doubt that, whereas in the Company's early days the increases were very small, it had now become one of the most important Suburban Gas Companies near London; and railway stations were still being opened, and new districts developed. In the period under review, fittings, meter, and stove rentals had increased by £249. The Directors had thought it wise to fully write-down the value of meters, stoves, and fittings. A considerable proportion of the increase in gas consumption was certainly due to the hire of cooking-stoves, in which a big amount of capital was invested. The increase in the receipts from residuals was £1017, as compared with the corresponding half of the preceding year; and it was interesting to note that, comparing these extra receipts for residuals with the extra cost of coal, oil, and coke for the carburetted water gas, there was a decreased cost of materials for the production of the increased quantity of gas sold of £186. The increases in the value of residuals separately were: Coke and breeze, £623; tar, £231; sulphate of ammonia, £163. Considerable lengths of mains had been altered and relaid, which supplied the reason for the larger amount spent on main repairs. It might here be noticed that the "rents receivable" had disappeared from the balance-sheet. There were five cottages on the land lately purchased. The new railway passed close to them; and the only way into the main road was over the railway. Therefore the Directors thought it better to close the cottages, rather than run the chances of an accident. They would soon have to be removed, however, to make room for new works. The foreman's cottage had been pulled down, and the value taken off the capital account. Referring to the capital account, he might say that during the past few years land had been purchased, for which a large price had to be given; and the new gasholder and tank had cost a big sum. The new railway approach, which was 770 yards in length, and carried some distance on a high bank, was somewhat costly; and a new well had also been sunk. The Directors considered that they would not for some time have a specially large expenditure; and they were looking forward to economies so that the cost per ton of coal of capital expenditure would soon be reduced. For the present half year this was considerably lower than in the previous period. The Directors felt that to the staff and workmen of the Company there was due a large meed of praise for the present efficiency and increase of the business; and they proposed to show their appreciation by recommending to the proprietors that they be admitted to become co-partners in the concern under the scheme introduced by the late Sir George Livesey, by which, through a bonus upon their ordinary salaries and wages, they would be made shareholders. All the regular staff, with the exception of the Engineer and Secretary, would be included in the benefits. It was proposed to give $\frac{1}{2}$ per cent. bonus for every 1d. reduction in the price of gas below the standard price of 4s. The price being now 3s. 4d. per 1000 cubic feet, the bonus for the present year would be at the rate of 4 per cent. A resolution to agree to this would be presented to the shareholders before the meeting closed. In the matter of expenditure, an additional 910 tons of coal had been carbonized during the half year; and the cost was more by £805 than in the corresponding period. The total receipts for the six months came to £25,545, which was an increase of £2912 over the corresponding period; while the total expenditure was £18,476, or £2823 more. The total profits were £7069, or an increase of £88 over the previous year. Debenture stock and loan interest required £934, and the dividends recommended would absorb £5610, leaving a balance of £525. He moved the adoption of the report and accounts.

Mr. SAMUEL CUTLER seconded the resolution; and it was at once carried unanimously.

On the proposition of the CHAIRMAN, seconded by Mr. CUTLER, dividends were declared for the half year at the rates per annum of 10 $\frac{1}{2}$ per cent. on the original "A" capital, £7 7s. per cent. on the additional "C" capital, and 7 per cent. on the additional "B" capital and guaranteed shares—all less income-tax.

Mr. F. R. SMITH then moved—"That this meeting, having heard the statement of the Chairman, expresses its hearty approval of the scheme of profit-sharing proposed to be adopted, and wishes it great success." He said it afforded him much pleasure to do so, because he believed it was a step altogether in the right direction. Many labour difficulties had lately arisen all over the country; and it seemed to him that the true solution was to make the employees partners in the concern for which they worked. He remembered Mr. Chapman once saying, at the time when the question of amalgamations was in the air, that if anybody wished to absorb this undertaking, he would have to consider, not only the shareholders, but the members of the staff and workmen. This was what Mr. Chapman always did. He (the speaker) did not

think the Company would lose anything by adopting the co-partnership system, because every man would feel himself interested.

Mr. F. PILLEY, who seconded, also expressed the opinion that the Directors were doing absolutely the right thing. Co-partnership made the men much more contented, and induced them to put their whole heart and soul into the work they had to do.

The resolution was agreed to.

Mr. A. F. PHILLIPS moved a vote of thanks to Mr. Chapman and the staff who had worked so loyally under him. He remarked that owing to the large increase in the business which was continually taking place, Mr. Chapman's hands were always full of extensions; and at the present time he was occupied in building an additional retort-house. The Directors were fully aware that these extensions kept increasing the capital, and they were always impressing upon Mr. Chapman the fact that they considered the capital too large, and were exceedingly anxious to reduce it. He was certain Mr. Chapman was using his best endeavours to this end. They had had to carry out works which, though they would be of great benefit to the Company, had been exceedingly costly. The acquisition of the land to connect the works with the railway was the cause of considerable outlay of capital. This had been supplemented by the cost of the railway siding; then by the large gasholder; and now there was the erection of the new retort-house. But he did believe that when these works were completed, if the consumption of gas continued to develop in the future as it had done in the past, the shareholders would see the relation between the capital and the coal carbonized materially changed. As Mr. Smith had pointed out, Mr. Chapman was always considering what he could do to benefit the staff and men working under him; and he no doubt obtained from them thoroughly loyal and faithful service.

Mr. J. CASH, in seconding, said he thought Mr. Chapman's returns for the past half year were the best he had seen; and then, of course, the frequent extensions threw a great deal of responsibility upon his shoulders. The Engineer and all the staff must have worked hard to attain the excellent results now placed before the shareholders.

The resolution having been heartily agreed to,

Mr. CHAPMAN returned thanks for himself and the staff, and said it had always been strongly in his mind—but especially of later days—that the consumer was the man to be satisfied. If the consumer was pleased, the shareholder must be benefited. He had trained his staff on these lines. There had been a great vindication of the action of the Board in going forward with the Standard Burner Bill. Since the Act was passed, the price of gas had been reduced, and it seemed to have balanced the price of coal in regard to cooking, because the output of gas cooking-stoves had been very great. To his mind, it was wonderful that reasonable men—as many of the councillors were—should have taken such steps as had been taken to prevent the consumers from getting the very best results the Company could give them. This seemed to be the only object the Councils could have secured if they had succeeded in getting the Bill thrown out. The consumer now saw he was getting the benefit of the Act.

The proceedings concluded with a vote of thanks to the Chairman and Directors, which was accorded on the proposition of Mr. W. RICHARDS, seconded by Mr. F. J. BANCROFT.

SHREWSBURY GAS COMPANY.

The Annual General Meeting of this Company was held on the 1st inst.—Mr. T. P. POOLE (the Chairman) presiding.

In the report presented by the Directors it was stated that the profit on the working in the year to June 30 amounted to £8831. An interim dividend of 2 $\frac{1}{2}$ per cent. was paid in March last, and £1000 had been set aside to meet a deficiency in the reserve fund caused by the great depreciation of Consols. The Directors recommended that a final dividend of 3 per cent. (making 5 $\frac{1}{2}$ per cent. for the year) should be declared, leaving a balance of £2207. The reserve fund amounted to £11,578, and was fully invested. There had been an increase of more than 5 million cubic feet in the consumption of gas during the year; and the Directors expressed their pleasure at having been able to announce a reduction of 1d. per 1000 cubic feet, taking effect from June 30. The number of stoves on hire at that date was 3252; and there were 3870 prepayment meters in use. Under the supervision of Mr. William Belton, the Engineer and Secretary, 18,407 tons of coal and 486 tons of cannel were carbonized during the year; the make of gas being 207,569,000 cubic feet, of which 183,500,000 cubic feet were sold by meter and 6,871,000 cubic feet for public lighting.

The CHAIRMAN, in moving the adoption of the report, said it was one of the best the Directors had had the pleasure of presenting; and the Company were to be congratulated upon the evidences of vitality and prosperity which it revealed. Naturally the first point of interest would be the profit on the year's working, which amounted to the satisfactory sum of £8831 odd; and, after paying a full dividend of 5 $\frac{1}{2}$ per cent. for the year, as well as interest on the mortgage bonds, they were able to set aside £1000 to meet the deplorable and continued depreciation in the value of Consols, in which most of their reserve fund was invested. The balance on the profit and loss account to carry forward was £2207, or about £346 less than last year. The Directors had been pleased to be able to reduce the price of gas as from June 30 last. He hoped and thought it was now beginning to be recognized that gas vendors of to-day had no monopoly of the supply of light, and therefore, in their own interests, had to consider the best interests of their customers. Thus nearly three-fourths of the benefit went to the consumer, and a little more than one-fourth only to the shareholder. Other important interests of the consumer were concerned with the purity and illuminating power of the gas; and here he might say that no one need suppose that they were going to damage the Company's interests by offering to the consumer that which would tend to diminish their sales of gas instead of increasing them. The quantity of gas sold during the year had been upwards of 5 million cubic feet in excess of the previous year; for which they had received £700 more; and residual products had yielded £795 more. Against these higher receipts, they must put an extra cost of £866 for

coal, a further £73 for rates and taxes, and other small increases, due principally to the larger volume of business done, for some of which the slot-meter system was accountable. To turn for a moment to other matters, they had not, fortunately, been seriously inconvenienced by the recent deplorable strikes. But in every branch of industry the labour troubles caused anxiety as to the future; and it was to be hoped that some truly statesmanlike and satisfactory plan would be devised to render such frequent and disastrous upheavals impossible. The principle of State insurance had the Directors' approval. In conclusion, he was glad to say they had been able to make more favourable coal contracts for the current year; that customers were increasing—more stoves and slot-meters going into use; and that the present outlook was such that they confidently expected to meet the shareholders next year with a report as satisfactory as the one now submitted. In the meantime, all their property was being kept in good and efficient condition, and some extension of mains was being made and contemplated, which they expected would bring them a further increased consumption.

Mr. G. EVANS seconded the motion; and it was carried.

The dividend recommended having been declared, the retiring Directors and Auditor were re-elected.

The CHAIRMAN, in acknowledging a vote of thanks accorded to himself and his colleagues on the Board, said their thanks were due in a special manner to Mr. Belton, for his able management of the affairs of the Company. The fact that the balance-sheet was so satisfactory was the result to a great extent of the indefatigable and watchful care which he was ever ready to bestow in their interests; and he (the Chairman) congratulated him on being able to produce such a report. He proposed a vote of thanks to Mr. Belton, and coupled with it the staff, who were, he observed, thoroughly loyal to the Company.

The motion having been carried,

Mr. BELTON, in acknowledgment, said the whole staff, as well as he himself, were anxious to do whatever they could to promote the interests of the Company. Referring to the coal strike which appeared to be looming just then, he remarked that he had in stock sufficient coal to last longer than such a strike was likely to do.

ILFORD GAS COMPANY.

The Ordinary Half-Yearly General Meeting of the Company was held last Tuesday—Mr. WILLIAM ASHMOLE presiding.

The CHAIRMAN, in the course of his address, said the half year ending June had furnished them with a balance-sheet which was highly satisfactory; the results of the working further proving the sound condition and prosperous nature of the undertaking. Notwithstanding the slow growth of Ilford compared with what had been experienced in past years, the sale of gas continued to show considerable increase. The quantity sold during the past half year was 193,567,000 cubic feet, as against 178,765,000 cubic feet for the corresponding half of 1910. This increase represented 14,802,000 cubic feet, or 8.28 per cent.; and when they considered that 1 per cent. increase on the present gas output represented double the amount of gas when compared with the output of eight or nine years ago (when 18, 19, and 20 per cent. increases were common), they would readily see that the Company were progressing at a pace quite consistent with the general conditions of things at the present day, and which compared very favourably with past years. The total number of consumers on the Company's books at the end of the half year was 13,793, being an increase of 195 since December. The increase in the number of consumers did not altogether account for the increase in the gas consumption. The fact was that the consumption per consumer was greater, which was brought about by the larger use of gas apparatus for lighting, heating, cooking, and other domestic purposes. Gas-fires, owing to present-day high efficiencies and cheapness, had become almost indispensable—so much so that in many instances where a gas-fire had been fitted for a consumer it had proved so useful that other fires had been fitted in the same house. Gas-irons, gas-coppers, water-heaters, geysers, &c., had also now reached a high state of efficiency; and the Company gave the consumers full inducement to have these special appliances fitted, having found from general experience that when once a geyser, copper, or other apparatus had been fitted, it was rarely discarded—proving that gas was becoming more and more a household necessity. The revenue received by the sale of gas was £27,385, as against £25,952, showing an increase of £1,433. Considering that the gas was reduced in price at the end of last year, this increase was one on which they might congratulate themselves. Rental of meters, stoves, and fittings had brought in an increased revenue of £195; and residual products showed an increase of £552. These three items make a total increase in revenue of £2180. On the debit side of the revenue account, the items under manufacture of gas, distribution, &c., also compared very favourably with the corresponding half-year's accounts. The total expenditure under revenue account amounted to £28,169. Last year this figure was £27,941, the increase in expenditure amounting to £228. These figures proved that the work during the past half year had been done in an efficient and proper manner. Some of the plant was large enough to undertake double the amount of work it was doing at the present time. This was very necessary in a district such as this, where building extensions might come along rapidly at any moment. They were ready to meet a larger output at very little extra expense. It was proposed to pay the full statutory dividend of 7½ per cent. per annum on the "A" and "C" stocks, and 6 per cent. per annum on the "B" stock, less income-tax. These increased dividends were due to the fact that the gas was reduced by 1d. per 1000 feet last December. A further reduction of 1d. would take place from Christmas quarter next. This would bring the price down to 2s. 9d. per 1000 cubic feet; and the Board were hopeful that further reductions might be possible at some future time. The stockholders had read, no doubt with great regret, that Mr. H. W. Ashmole, who had been seriously unwell for about a year, had been compelled with great reluctance to retire from the office of Secretary to the Company, acting under the advice of his medical man. Mr. Gerald H. S. Iorns, who had been appointed Secretary in the place of Mr. Ashmole, had been in the service of the

Company for the last twelve years. He had lately held the position of Chief Clerk and Accountant; and the Directors had made the appointment because they recognized the care and ability with which he had always carried out his duties.

The report and accounts were adopted, and the dividends declared. The meeting then proceeded to grant an annuity to Mr. Ashmole on his retirement from the office of Secretary, and to fix the remuneration of Mr. Iorns as Secretary.

Votes of thanks to the Directors, the Engineer and Manager (Mr. W. B. Farquhar), officers, staff, and workmen, and the Chairman for presiding, brought the proceedings to a close.

ENFIELD GAS COMPANY.

The Half-Yearly General Meeting of the Company was held recently, under the presidency of Colonel Sir A. P. SOMERSET, K.C.B.

The CHAIRMAN, in moving the adoption of the report and balance-sheet, said the Bill introduced by the Company into Parliament in the present session had become law. Its progress for the greater part of its course through the Committees was opposed by the Middlesex County Council, whose aggressive terms the Company could not agree to. The result justified this refusal, as the House of Lords Committee and the Court of Referees, after hearing Counsel and witnesses for both sides, upheld the position taken up by the Company, so that subsequently the Council withdrew their opposition, and the Bill came before the Committee of the Second House unopposed. The Directors were satisfied that it was a very useful and valuable measure. He also referred to the constant growth of the business; and in mentioning the result of the issue of additional capital last April, he said that it gave solid proof of the increasing value the investing public set upon the Company's stocks, as well as upon gas stocks in general.

Mr. A. L. FORD seconded the motion, and enlarged upon the various details of the operations and the items of the balance-sheet. He stated that the total number of consumers was 10,095, and of the users of gas-cookers 6972—showing a growth during the past year of 475 consumers and of 344 users of gas-cookers. The gas made had averaged 11,617 cubic feet per ton of coal; the candle power being 15½ candles as tested under the old conditions. Satisfactory progress had been effected in the unaccounted-for gas, as there had been a decrease, not only in the percentage, but in the actual quantity. The percentage had fallen from 4.28 to 3.04, and the quantity from 4,769,000 feet to 3,647,000 feet. The price of gas was 2d. per 1000 cubic feet less throughout the half year than in the corresponding period of 1910. The increase of 9,794,000 feet (or some 9¼ per cent.) in the quantity of gas sold, had made up for the reduction, and had added £606 to the rental. Meters, cookers, fires, and fittings had brought in an additional £346; while the return from residuals had improved by £1000. On the expenditure side, it would be seen that coal had cost more by £876, due entirely to the extra tonnage carbonized. Substantial additions had been made to the special purposes fund and to the reserve fund—£750 in the first case, and £950 in the latter—and a small remainder after providing for the dividends recommended, would bring the unappropriated profit up to £11,461.

Dividends at the rate of 5 per cent. per annum on the consolidated preference stock and at the rate of 5½ per cent. per annum on the consolidated ordinary stock were declared; and the meeting closed with votes of thanks to the Chairman and Directors and to the General Manager and staff, which were respectively replied to by Sir ALFRED SOMERSET and Mr. C. W. OFFORD.

MUNICIPAL WORKERS AND NON-UNIONISTS.

A Threatening Circular.

The officials of the Municipal Employees' Association are actively engaged in an effort to convert those who are at present outside the ranks of that organization. The circular sent out by them to non-unionists in the employ of corporations, however, is something in the nature of a threat, as may be gathered from the following extract: "This is a warning. The sands are running out; and our patience is exhausted. The time has come when we neither can nor will tolerate your apathy and indifference. After this, if you still choose to go your own way, careless of the well-being of yourselves and your fellows, then on your own head must rest the consequences of whatever action we, as Trade Unionists, may be compelled to take. One thing is clear, we must cease to regard you as fit fellow-workers, and must act accordingly." As reported in last week's "JOURNAL," a meeting of representatives of branches of the Municipal Employees' Association, held in Manchester, decided not to put into force a resolution previously passed to cease to work with non-unionists, but to endeavour to secure redress of alleged grievances by "other means."

Mr. R. DAVIES, General Secretary of the Municipal Employees' Association, replying to criticisms passed upon that combination by other Trade Unions, denies that it has endeavoured to recruit its membership from other organized bodies of workers. "This," he adds, "has been attempted at our expense by the very anxious Unions that have accused us." The Municipal Employees' Association, he says, is a properly registered and bona-fide Trade Union, and, embracing as it does all sections of municipal workers, has secured benefits which membership with other organizations could not have obtained. Alderman JACKSON, General Secretary of the Amalgamated Association of Tramway and Vehicle Workers, denies that the members of his Union agreed with the Municipal Employees' Association not to work with non-unionists after Aug. 31. "Further, I wish it to be known," he adds, "that we have refused to enter into any arrangements with the Municipal Employees' Association, owing to the fact that they are not recognized as a Trade Union by the Trade Union Joint Committee, nor by other labour bodies. Of course, it is easy to see why the Municipal Employees' Association desire to drag us into the matter. We can deal the biggest blow at the public, and our support would very largely strengthen their position."

THE GAS PUBLICITY SCHEME.

Stockport Town Council's Decision.

At last Wednesday's meeting of the Stockport Town Council, reference was made to the Publicity Scheme of the Institution of Gas Engineers, and the recommendation of the Gas Committee that Stockport should contribute to the fund on the basis of 2s. 6d. per million cubic feet of gas made, subject to certain conditions.

When the Gas Committee last met, Mr. S. Meunier, the Engineer, presented further particulars as to the scheme, and reported that the Manchester and Salford Corporations had decided to contribute on the 2s. 6d. basis. After hearing the report of the Engineer, the Committee decided that Stockport should contribute on the same basis, subject to satisfactory representation on the Executive Committee, and to the whole question being reconsidered at the end of three years.

On the proceedings of the Gas Committee containing this minute being brought before the Council for confirmation, Alderman Allcock described the scheme as a new method of bolstering up private gas undertakings. The Stockport Gas Committee, he said, had only a limited area in which they could supply gas; and it was not likely the readers of such journals as the "Gentlewoman," the "Sketch," "Black and White," the "Woman at Home," the "Strand Magazine," and "Fashions for All" would leave their palatial residences and go to live in Stockport to participate in the special benefits of Stockport gas. He considered this an unnecessary expenditure.

Alderman Fernley, the Chairman of the Gas Committee, replying, said he did not know before that Alderman Allcock was a humorist. The advertising of gas in the periodicals mentioned was not confined to Stockport gas—it was a systematic system of "advertising gas" for cooking and other purposes. Everyone knew the severe competition which electricity was causing to gas; and it had been felt in various parts of the country that it was necessary for gas undertakings to protect themselves against growing competition. The only way to do so was to advertise the advantages of gas over electricity in many ways.

Mr. Noden and others supported the Committee's proposal; and the minute was ultimately confirmed.

LONDON'S WATER AND LIGHT SUPPLY.

On Monday of last week, the "Evening Standard" published the following remarks on the subject of police precautions to ensure the maintenance, in troublous times, of the water and light supply of London.

Arising out of the recent labour upheaval in the Metropolis, an important step has been taken to safeguard the public interests in the matter of water, gas, electrical supplies, and food stuffs. The enrolment of a large body of special constables necessitated the formation of a headquarters staff, the members of which were engaged in various forms of organizing work when the order was given for the disbanding of the men. It was thought desirable that some of the inquiries on which the staff were employed should be continued, in order that, in the event of another emergency arising, the department might have information which it was essential to possess.

Four members of the headquarter staff were accordingly retained; and they have been visiting various parts of London to note the location of electric power houses, coal depôts, and water and food storage. The utmost importance is attached to safeguarding the lighting of the city, as with the streets in darkness millions of pounds worth of property would be at stake. Emphasis is laid upon the fact that it is not a question of mapping out London for military purposes; the authorities are merely collecting information in order that the lighting of the streets may be ensured, and that the supplies of water and food may receive adequate protection in the event of troublous times occurring.

GAS POISONING CASE AT MOSSLEY.

By a leakage of gas from a pipe in the cellar of the house they occupy in Berry Street, Mossley, a family named Redford have lost one member by gas poisoning, and two others nearly shared the same fate. Early in the morning, neighbours noticed there was a strong smell of gas issuing from the dwelling-place of the Redfords; and no answer being obtainable to repeated knockings, the door was forced open. Mr. John Redford, the head of the house, was discovered lying behind the kitchen door in an unconscious condition; while Mrs. Redford and her daughter Clara were found in bed, also in an unconscious condition. The place was full of gas; and it was deemed advisable by the doctors called in, after artificial respiration had been applied, to have the sufferers removed to the Ashton-under-Lyne Infirmary. Mrs. Redford did not rally, and died the next morning; but the other two patients are reported to be recovering satisfactorily. The Redfords had only returned to their home the previous night, on the conclusion of their holidays; and an examination of the place after the tragedy showed there was a fracture in a branch-pipe close to the meter in the cellar, from which gas had escaped in considerable volume.

At the inquest, John Redford, the husband of the deceased, said he was a meter inspector. He described how, on awakening in the morning, he found his wife gasping for breath; and on going for his daughter, who was in an adjoining room, he could not rouse her. The strange thing about it was that he could not smell gas, though he felt numb. He managed to get downstairs, but did not remember anything more until he found himself in the infirmary. In reply to the Coroner, witness said he knew the pipe in the cellar was defective, and had used white lead to stop the escape of gas.

Mr. James Taylor, Manager of the Mossley Corporation Gas-Works, said that, on going into the cellar of the house occupied by the Redfords, he found a branch-pipe, which at one time had been used to

supply a gas-cooker, was completely severed, and was lying on the meter. The branch joint was a perfectly good one; but a portion of the pipe had been slightly weakened by the process of making the joint. The back of the disused branch-pipe—about 3 feet—was quite unsupported; and in his opinion the weight of it had broken the pipe near the joint.

The House Surgeon at the infirmary having stated that death was due to coal-gas poisoning, the Jury returned a verdict of "Death from misadventure."

NOTES FROM SCOTLAND.

From Our Own Correspondent.

Saturday.

We have this week celebrated the Jubilee of the North British Association of Gas Managers—that is, the Association and its friends have celebrated the entry into the jubilee year. Had it not been for the aid which was derived from the birthday feeling which was thrown into the proceedings, it is to be feared that the meeting would have been one of those which would not have been remembered. The bill of fare presented was very slender, for which the Committee are not on any account, nor to any degree, to be found fault with. They are to be sympathized with; and, indeed, they court the sympathy which they are now receiving, because in their annual report they bewail the apathy of the members in the matter of contributing papers at the meeting. They deserve double commiseration, for if they had been able to fulfil their intention to inaugurate the William Young Memorial Lectureship, there would have been a glory about the meeting which few of the past gatherings have possessed. But this cup was dashed from their lips at a time when it was too late to make substitute arrangements. Those who make it their boast that they live the simple life, which surely must be in hibernation, because we never meet with any specimens of simple livers walking abroad, make their hearers almost hold their breath at the wondrous tales of how to live upon next to nothing. In this matter everything depends upon the spirit in which the step is taken. So it was on Thursday, the meeting were in jubilee, not to say jubilant, spirit; and they made a very presentable dish indeed with the small fish which they had caught. Than Mr. G. Keillor's presidential address it would be difficult to imagine anything better suited to the occasion. He not only gave abundance of material for consideration; but the form of giving it was such as to make the address positively interesting. The technical matter discussed at the meeting was not striking, neither was much time taken up with it. There was a very fair discussion upon the "Need of Publicity," which was appropriate before an Association who do not seem to be very enthusiastic over the proposals of the Institution of Gas Engineers. The need for publicity is admitted; but the payment for it is not. However, the publicity given to the discussion may be the means of opening the mind's-eyes of some who are at present hesitating to support the movement. It is to be hoped so. The Association are to be congratulated upon the election of Mr. S. Milne, of Aberdeen, to be President. Mr. Milne is in charge of a works the capital account of which has been written down so severely that the burden is much lighter than it is in any of the other large gas undertakings in Scotland. Then, under his fostering management, the Corporation have this week resolved to issue gas cookers and fires free of hire. This includes fixing. It is a boon which the community of Aberdeen ought to appreciate. The step is one which could not be taken with the same fulness in almost any other large city, because of the capital indebtedness. Taken in Aberdeen, it will be watched with interest. It is estimated, I understand, that the effect of the free use of appliances will be to lead to an increased output of gas in the course of three years to the amount of 120 million cubic feet. The fortunes of this great venture will give zest to the next meeting of the North British Association, which is to be held in Mr. Milne's own city.

The Gas Committee of the Glasgow Town Council on Thursday came forward with a request for renewed powers in connection with their proposal that a commercial superintendent should be appointed. The recommendation to this effect was made by the Committee on July 28, but was re-committed by the Council on Aug. 10. Mr. P. G. Stewart, at whose instance the subject was re-committed, on Thursday moved that it be again sent back to the Committee. Bailie Paxton, the Convener of the Committee, explained that they had, in addition to the gas-works, huge buildings which were let to outsiders, and he was of opinion that they should manage all these matters themselves. All they asked for at present was power to inquire. They would come back to the Council with a report; and then the subject could be discussed. The whole matter was instituted at the instance of the Lord Provost, who spoke to him six months ago, and urged him to do something, believing that the salary to be paid would be repaid ten times over in one year. Mr. Stewart, in view of this explanation, allowed the subject to go again before the Committee.

The Peterhead Town Council on Monday again had the subject of over-valuations of gas-works stock brought before them by Mr. Gordon. The over-valuations had been rectified, and it was believed that no loss had been sustained by the Corporation in consequence of them. Mr. Gordon wished to have the subject discussed; but the attitude of the Gas Committee was that they should wait till a communication upon the subject be received from the Scotch Office. Provost Leach supported this view, and Mr. Gordon was prevented from going into the matter in the meantime, but was told that when they heard from the Scotch Office he would be allowed to discuss it at will.

The Dumfries Town Council on Thursday considered the report of the Gas Manager, Mr. S. Dickie, for the past year—a summary of which was given in these "Notes" a week or two ago—and, on the recommendation of the Gas Committee, the Council unanimously agreed to reduce the prices of gas to all consumers by 2d. per 1000 cubic feet, making the charges: To ordinary consumers, 2s. 7d.; to prepayment meter consumers, 3s. 1d.; for public lighting, 2s. 7d.; and for power purposes, 2s. 4d. In moving adoption of the recommendations of the Committee, Judge Thomson, the Convener, said that the Gas Manager's report was the best they had had for many years.

A year ago, the Town Council of Carnoustie acquired the undertaking of the Carnoustie Gaslight Company. The Company went into liquidation, and the Liquidator—Mr. David Kidd—has issued a circular, in which he states that, after great delay, the Inland Revenue Officials have at last intimated that they have no claim against the Company for increment value duty under the Finance (1909-10) Act, 1910, in respect of the sale of the Company's property. The balance of money in hand, amounting to £1185, can now therefore be divided. The Directors recommend the division of the sum as follows: In payment of a final dividend of 1s. 6d. per share to stockholders, £300; remuneration to the Liquidator, and compensation to him for loss of office as Clerk and Treasurer to the Company, £400; remuneration to the Directors for loss of office, £360; to the auditors for loss of office, £40; and to the employees at the gas-works, £80. There remains a sum of over £5 to meet the cost of final winding-up. The shares in the Company numbered 4000, and were of the amount of £1 10s. each. The return to shareholders has been at the rate of £4 1s. 6d. per share.

The Fraserburgh Town Council on Thursday agreed to borrow £30,000, to pay the price fixed by arbitration of the undertaking of the Fraserburgh Gas Company. The price fixed by the Oversman—Mr. A. Yuill, of Dundee—was £26,960. In addition to this, the Council have to provide for interest at 4 per cent. from May 1 to Aug. 31, £372; for the expenses of the arbitration, estimated at £820; the expenses of conveyance, inclusive of stamp duty, £500; the expenses of the loan, £350; stocks, &c. £997. They have succeeded in borrowing the amount they sought at a rate of £3 12s. 6d. per cent.; the principal to be repaid in eighty half-yearly instalments of £375 each.

The Dysart Gas Company, Limited, have reduced the price of gas from 3s. 11½d. to 3s. 9d. per 1000 cubic feet.

It was reported to the Dunoon Town Council last week that there was a balance of £1719 in the net revenue account of the Gas Department at the end of the financial year. The total expenditure in the department during the year was £6376, and the total revenue £8095. The quantity of gas made was 39,391,600 cubic feet—an increase over the preceding year of 130,600 cubic feet, and of 1,828,300 cubic feet over the make two years ago. The revenue from gas sold during the past year was £6099.

In the Inverness Town Council on Monday, Treasurer Duncan Macpherson said that they estimated a revenue in the Gas Department of £17,841, and an expenditure of £16,492—leaving a surplus of £1349.

In the Town Council of Ellon on Thursday, the Convener of the Gas Committee reported that a considerable saving had been effected in the manufacture of gas. They had a very satisfactory profit for the past year, which would enable the Council to suspend levying the contingent guarantee rate, which last year was fixed at ¼d. per £1, and is payable by occupiers only.

The Dundee Gas Commissioners have engaged the services of Miss E. E. Mitchell, of Edinburgh (late Domestic Economy Instructress to the London County Council, Education Department), as Lady Cookery Demonstrator, to advise their consumers as to the best and most economical method of using gas appliances.

CURRENT SALES OF GAS PRODUCTS.

[For Table of "Tar Products Prices," see p. 700.]

Sulphate of Ammonia.

LIVERPOOL, Sept. 9.

In the absence of support from either consumers or dealers, the market for sulphate of ammonia has continued to have a drooping tendency throughout the past week. A fair quantity has been offered for sale by manufacturers, which has only found an outlet at a further reduction in price; the nearest values at the close being £13 17s. 6d. per ton f.o.b. Hull, £13 18s. 9d. per ton f.o.b. Liverpool, and £14 per ton f.o.b. Leith. Little activity prevails in the forward position, buyers evidently being inclined to await developments before covering their future requirements. Makers are now quoting £14 5s. per ton f.o.b. at the best ports for October-March or January-June delivery, but there are second-hand sellers at less money.

Nitrate of Soda.

The tone of the market remains quiet, but holders are very firm at 9s. 10½d. per cwt. for ordinary, and 10s. 1½d. for refined quality, on spot.

LONDON, Sept. 11.

Tar Products.

The markets for tar products still remain firm. In pitch, there has been a fair amount of inquiry for this article; and one or two important sales have been made to the Continent. Benzols are steady; and there is a fair amount of inquiry for prompt delivery. In solvent naphtha, business is quiet, but prices continue unchanged. In crude carbolic, there is a certain amount of inquiry for forward, and buyers are prepared to do business in the neighbourhood of 2s. per gallon.

The average values during the week were: Tar, 21s. to 25s. *ex works*. Pitch, London, 40s. 6d. to 41s. 6d.; east coast, 40s. to 41s.; west coast, Manchester, 39s. 6d. to 40s. 6d.; Liverpool, 40s. to 41s., Clyde, 40s. to 41s. Benzol, 90 per cent., naked, London, 8½d. to 8¾d. f.o.b.; North, 8d. to 8½d. f.o.b.; 50-90 per cent., naked, London and North, 7¾d. to 8d. f.o.b. Toluol, casks included, London, 8½d.; North, 7½d. to 8d. Crude naphtha, in bulk, London, 4d. to 4¼d.; North, 3¾d. to 3½d.; solvent naphtha, naked, London, 9¼d. to 9½d. f.o.b.; North, 8d. to 8½d. f.o.b.; heavy naphtha, naked, London, 10¼d. to 10½d. f.o.b.; North, 9d. to 10d. f.o.b. Creosote, in bulk, London, 2½d. to 2⅞d.; North, 2½d. to 2¾d. Heavy oils, in bulk, 2¾d. Carbolic acid, casks included, 60 per cent., east coast, 2s. to 2s. 3d.; west coast, 1s. 11d. to 2s. 2d. Naphthalene, £4 10s. to £9 10s. salts; 42s. 6d. to 45s., bags included. Anthracene, "A" quality, 1½d. to 1¾d. per unit, packages included and delivered.

Sulphate of Ammonia.

The market for this article has been particularly quiet during the past week, and for prompt delivery prices have declined to the extent

Two years ago we introduced the "ST. NICHOLAS"

Interior Fitting for converting a Coal Fire into a Gas Fire.

It filled a want and met with success. Its success was followed by imitations; the imitations still follow far behind.

It is the best means of utilising coal grates for gas and it is one of the most popular items on hiring lists.

In many styles and sizes.



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83, Old Market St., BRISTOL; 13, Whitworth St. West, MANCHESTER; 8, Exchange Place, Donegall St., BELFAST;
333, Queen St., MELBOURNE; and 12, Cunningham Lane, Pitt Street, SYDNEY.

of about 2s. 6d. per ton; but for the forward position manufacturers will not quote lower prices, consequently very little business has been possible. To-day, actual Beckton is still quoted £13 15s.; but outside London makes could no doubt be secured at £13 10s. In Hull, the quotation is £14; Liverpool, £14 2s. 6d.; Leith, £14 5s.; and Middlesbrough, £14.

COAL TRADE REPORTS.

Northern Coal Trade.

There is now a strong demand for coal, and the shipments would be heavier if the prompt steamers were adequate, but the delay caused by the strikes is not entirely done away with. In the steam coal trade, best Northumbrians are from 11s. per ton f.o.b., second-class steams are 9s. 6d. to 10s., and steam smalls from 5s. to 6s. The output at the collieries is fairly good. In gas coals, the demand is increasing. Durham gas coal is active. For best Durhams, 10s. 9d. per ton f.o.b. is now the current quotation, and 9s. 6d. to 9s. 10½d. for second kinds; while for "Wear specials," up to 11s. 3d. to 11s. 6d. is quoted. There has been a further portion of the contract placed for one of the Italian works, but the amount is not large; and this and some sales of cargoes are at about the current prices. On the whole, gas coals seem a little easier in price; but the home demand is growing satisfactorily. At the same time, there is the dread of a stoppage late in the autumn which may influence prices in a few weeks. Coke is steady; but the output is increasing. Gas coke is about 14s. 6d. to 14s. 9d. per ton f.o.b. in the Tyne or Wear.

Scotch Coal Trade.

The coal market is fairly active. The demand for ell and splint for shipment is well maintained, with prices firm. Small sorts and washed stuffs are still plentiful. The prices now quoted are: Ell, 9s. 3d. to 10s. 3d. per ton f.o.b. Glasgow; splint, 10s. to 10s. 3d.; steam, 9s. 3d. to 9s. 6d. The shipments for the week amounted to 327,972 tons—a decrease on the previous week of 10,603 tons, but an increase on the corresponding week of 3616 tons. For the year to date, the total shipments have been 10,831,353 tons—an increase of 82,365 tons.

Lewes Gas Company.—It was stated in the report which was adopted at the half-yearly meeting of the Lewes Gas Company that the revenue account for the six months to June 30 showed a profit of £2099. After providing for interest on mortgages, the balance of net revenue was £6392. Dividends for the half year were recommended at the rate of 5 per cent. on the original capital stock, and 3½ per cent. on the additional capital stock. Alderman Miles, who seconded the motion for the adoption of the report, said the people of Lewes received from the Gas Company a very good light for their money—a much better light, it seemed to him, than the rushlight-like electric lamps they saw about the streets of the town at the present time.

New Offices and Show-Rooms at Cambuslang.

The semi-jubilee of the Cambuslang Gas Company, Limited, was celebrated last Saturday afternoon by the formal opening of a handsome suite of new offices and show-rooms, which has been erected at a cost of £1000. The building, which was erected from plans by Mr. Robert Simpson, the Works Manager and Engineer, comprises an elegantly appointed Board-room overlooking the gas-works, a spacious show-room (in which is displayed a great variety of the latest heating, lighting, and cooking appliances), general offices, and a strong room. Underneath is a commodious store and workshop. Mrs. Rankine, the wife of the Chairman, performed the opening ceremony. In the course of his remarks in addressing the company in the show-room, Mr. Rankine mentioned that the Company was formed 25 years ago. The capital was then £12,000; it was now £36,000. The increase in the make of gas, and the variety of conditions which had been gradually evolved in its use and in the conduct of the business, had necessitated the addition of the new offices and show-rooms. Gas consumers would now have the advantage of seeing and being informed regarding latest novelties in gas lighting, cooking, and heating appliances. He was glad to be in a position to state that the Directors had decided to reduce the price of gas by 2d. per 1000 cubic feet as from next survey, and consumers through slot meters would receive a proportionate deduction, which would be handed to them in cash when the collection was being made.

Truro Gas Company.—Presiding at the annual meeting of the Truro Gas Company, Mr. John James referred to the healthy development of the concern. The demand for gas had shown a further improvement of 2½ million cubic feet, which was very satisfactory, seeing that Truro was not a town which was growing rapidly. With the exception of coke and breeze, they had done better with residual products. The Directors had under consideration the question of the erection of plant for treating the tar, so as to render it more suitable for roads. The report stated that, in order to meet any special expenditure which may arise, it had been decided to open a renewal fund, and a sum of £200 had been put to it out of the year's profit. Some property adjoining the works had been purchased. The balance of profit and loss account amounted to £2158; and the Directors recommended the payment of a dividend of 5 per cent. on the ordinary shares, leaving £251 to be carried forward. The Chairman pointed out that, with gas sold at its present price, the shareholders were entitled, under the sliding scale, to a dividend of 5½ per cent. Mr. S. J. Ingram, the Manager, replying to suggestions by shareholders, said some time ago the Directors considered the question of a reduction of price to small consumers, and came to the conclusion that it would be unfair to give an advantage to one class of customers. As to a suggestion that the price of gas for cooking and heating should be reduced, they would rather lower the price generally. It would mean the sacrifice of a large revenue to abolish the rent for cookers.

Coal

Before the end of this month it will be generally known if the miners of this country determine to take a step which must inevitably prove far-reaching in its consequences. Whether the strike takes place or not it is certain that as the time approaches **Heating by Gas** will be in the minds of all those who wish to provide against paying the high prices now ruling, and which will rule for coal.

This advertisement has for its object the **reminder** that never before have Gas Undertakings had such a unique opportunity to bring forcibly home to their consumers the unrivalled merits of Gasfires—once get them installed and it is certain thousands of

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Belfast Gas-Works Extensions.

The minutes submitted by the Gas Committee at the last meeting of the Belfast Borough Council, stated that at a special meeting on the 29th ult. it was resolved that the Council be recommended to promote a Bill in the ensuing session of Parliament to authorize the adoption of the old abattoir site for the purposes of the gas-works, and to enable them to acquire certain ground for the purposes of extensions, and to raise the necessary capital. Mr. Squire, who moved the adoption of the minutes, said that, to the surprise of the members of the Gas Committee, having regard to the recent fine weather, there had during the past two months been a very appreciable increase in the manufacture and consumption of gas. In the output for the period from June 29 until July 28, there was an increase of 2,933,000 cubic feet, equal to 2.82 per cent., compared with last year; while the comparative increase for the succeeding month was 3,047,000 cubic feet, or equal to 2.86 per cent. These figures, taken in conjunction with those for the two preceding years, showed that there was a steady increase in the consumption of gas. The minutes were adopted.

Charge of Murder by Gas.

At the Old Bailey, last Friday, before Mr. Justice Avory, Laura Ann Price (37) pleaded not guilty to an indictment for the wilful murder of Kathleen Price, and to a second count charging her with attempting to commit suicide. Mr. Muir, who prosecuted, said the prisoner was a married woman, and last August was living with her husband and two children at Pinner. The father and one child were absent during the day on the 10th of that month; and when they returned in the early evening, it was found that the tap of the gas-stove in the kitchen had been turned on, and that a large quantity of gas had escaped into the room, where the wife and daughter were lying unconscious. The woman recovered; but the child did not. On a slate in the house was written a note, concluding with the words: "I can struggle no more." Subsequently, the prisoner told the doctor attending her that she did not know why she did it, but that she had put seven pennies in the gas-meter, and thought this would have been enough. When arrested, she exclaimed: "It must have been the heat." For the defence, Dr. Harley testified that he was called in on the day of the tragedy, and came to the conclusion that the woman was not responsible for her actions; and the Medical Officer of Holloway Prison, who had had her under observation, also expressed the opinion that she was probably insane at the time of the crime, but was gradually recovering. The Jury returned a verdict of "Wilful Murder" against the accused, but added that she was insane at the time the deed was committed. Mr. Justice Avory ordered her to remain in custody as a criminal lunatic during his Majesty's pleasure.

Premier Tarless Fuels, Limited, has been registered with a capital of £50,000, in £1 shares (20,000 preference). One of the first Directors is Mr. O. J. Parker.

Wages at Wallasey.

For some time a Special Committee of the Wallasey Town Council have been engaged in considering recommendations for increasing the wages in certain cases of Corporation workmen and granting bonuses in others; and last Tuesday the proposals came before the Council in committee. Regarding the trading undertakings, it was pointed out that they have afforded substantial aid to the ratepayers during recent years, while concessions have also been made from time to time to consumers and users of the various public services. The Committee consider that labour should now receive some recognition, having regard to the increasing prosperity of the trading undertakings. As an illustration of this, the gas undertaking is quoted; its success being such, it is stated, that a reduction in the price of gas to the consumers of 2d. per 1000 cubic feet next year is seriously contemplated. At the same time, the proposals now made in favour of the whole of the gas employees barely represent one-third of a penny per 1000 cubic feet. The cry that the ratepayers cannot afford the proposed increase is thus declared to be a fallacy. The borough is dependent largely upon its trading undertakings in general, and the ferry and tramway facilities in particular. The surest guarantee of a prosperous Wallasey is the creation and preservation of contentment among its 1525 employees. "We are not justified," the report proceeds, "in keeping rates low at the expense of excessive charges for public service. Neither are we entitled to build up a reputation for low rates and cheap commodities without providing for adequate payment of labour." The bases of the recommendations involved in the report are: All workmen in the Council's regular employ drawing less than 30s. a week to be granted an increase of 1s. per week or 3d. per hour (as the case may require) on the present rate of wages. The minimum rate of wages for all able-bodied workmen in the employ of the Council to be increased to 25s. per week, except road-sweepers, whose wages are to be 22s. 6d. per week. The rate of wages of the gas stokers to be raised 4d. per shift of eight hours. Where it is considered that some recognition should be made of the conduct during the recent labour troubles of those men whose general conditions of employment are deemed satisfactory, a bonus of a week's wages is recommended. All regulations as to payment for overtime, annual holidays, public holidays, sick pay, and merit bonus to remain as at present. On Thursday, the report was unanimously adopted by the Town Council.

The list of machines already supplied or in course of construction affords evidence of the headway that is being made by Messrs. Kirkham, Hulett, and Chandler's new patent "Standard" centrifugal gas-washer. In this connection, it may be mentioned that the manufacture and sale abroad have been taken up by the following firms: Messrs. Bartlett, Hayward, and Co., of Baltimore, for the United States of America; the Compagnie pour la Fabrication des Compteurs, of Paris, for France, Belgium, Italy, and Spain; and Messrs. Zimmermann and Jansen, of Düren (Rheinland), for Germany.

Strike.

consumers will never again be without. Need we add that our **Stock of A.B.C. Gasfires** which are **interchangeable** throughout has again been prepared for still larger demands than ever, but we urge you to **lay in** your own stocks **at once**, as with all the labour unrest looming both in the **Railway World** and **Coal Fields** you cannot do wrong in **preparing** for the demand whilst supplies can be easily sent.

Our **New Season's Lists** are in your hands, further supplies are at your disposal, and our Representatives are fully equipped with details of our Winter's Programme, which has never been excelled.

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Inventors of the Interchangeable A.B.C. Series of Gasfires, Patent Gas and Air Adjuster, Air-Pad Fire Brick, Volumetric Governor, &c., &c.

Teignmouth Gas Undertaking.

At a meeting of the Teignmouth Urban District Council last Tuesday, Mr. J. A. Gray, the Gas Manager, stated that there were 51 gas authorities in Devonshire; and of these only six were supplying gas at a less rate than it was proposed to charge at Teignmouth—viz., Plymouth, Devonport, Exeter, Torquay, Torquay (St. Mary Church), and Bideford. He also presented his annual report, which showed that the gross profit for the year amounted to £2170; being a percentage of 1.4 of the capital indebtedness. Of this amount, £1076 was absorbed by the redemption of gas loans. A net profit of £572 remained, and increased the credit balance on the revenue account from £2780 to £3352. During the eight years ended March last, the annual net profit had averaged £680; resulting in financial betterment to a total amount of £4633 for this period. The output of gas for the year under review was 44,799,590 cubic feet, an increase of 2,123,590 cubic feet over the previous year, or 5 per cent. Private consumers used 30,647,800 cubic feet, an increase of 1,311,900 feet over 1909-10, or 4.4 per cent. Slot-meter consumers accounted for 5,075,600 cubic feet, an increase of 770,000 feet, or 18 per cent. Then 5,753,400 cubic feet was estimated to have been consumed by the public lamps. The annual consumption of gas per slot-meter consumer averaged 10,995 cubic feet. The capital indebtedness of the department now amounted to £15,059. Mr. French, to correct misleading statements, showed that in 1903 there was a deficit on the revenue account of the department of £1283. This had been extinguished, and a credit balance established of £3352. During the past ten years, the price of gas had been reduced by 1s. 6d. per 1000 cubic feet, and the public lighting charges by £460 a year, or nearly 3d. in the pound on the general district rate. It reflected great credit on the Manager, who had brought his department back to such a satisfactory position. Mr. Wheatley hoped that before long the Council would be able to show their appreciation of the Manager's services. The Gas Committee's recommendation that the price of gas be reduced to 3s. 1d. per 1000 cubic feet, and that the charge to slot-meter consumers be lowered proportionately, was agreed to.

Keswick Gas Company.—The report adopted at the annual meeting of the Keswick Gas Company stated that, after allowing for depreciation of cookers and bad debts, the revenue account showed a balance to credit of £1414 on the working of the year to June 30. The sum available for dividend was £1283. Mr. J. Hepworth, the Consulting Engineer to the Company, in the course of some interesting comparisons, pointed out that in the summer—which was their heavy period—they were now making more than six times the quantity of gas they produced 25 years ago. He paid a tribute to the efficiency of the work of the Manager (Mr. T. Heywood). Dividends were declared at the rate of 10 per cent. per annum on the original capital and 7 per cent. on the additional capital.

Harrogate Gas Company.

At the half-yearly meeting of the Harrogate Gas Company, Mr. F. Barber, who presided, pointed out that there were no audited accounts for the six months to June 30; but it had always been the custom to give some particulars of the half-year's working, based on tentative accounts prepared by the General Manager (Mr. H. Wilkinson). According to these, he was glad to say that, as compared with the corresponding period of 1910, the result of the working of the first half of the present year had been entirely satisfactory, as they were £1192 better than was the case at the same time last year. This was due to a steady increase in the sale of gas, and an improvement in the price of residuals, on the top of good working results. Last year they were face to face with serious litigation with the contractors who carried out the light railway works. They had refused to accept the final certificate of the Engineer, and made a claim upon the Company for a large amount. At the special request of the Board, the Chairman undertook the conduct of the matter; but notwithstanding every effort on his part, in the course of which a substantial offer of compromise was made, the Company were ultimately served with a writ. As the contracts for the work provided that all disputes were to be settled by the Engineer, application was made to the Court to stay the proceedings. Master Chitty, however, refused to grant a stay; and the Company appealed to Mr. Justice Horridge, who ordered the action to be stayed, subject to the costs of the proceedings being costs in the arbitration. The contractors then appealed to the Court of Appeal, who upheld the decision of Mr. Justice Horridge. Being left to their remedy by arbitration, the contractors ultimately gave notice to the Company of their intention not to avail themselves of that course; and the matter might be regarded as at an end, except with regard to the payment by the contractors of the costs of the proceedings in the action, which had not yet been dealt with. The usual interim dividends were declared; and a vote of thanks was passed to the Chairman, Directors, officials, and staff.

Brisbane Gas Company.—The revenue of the Brisbane Gas Company from the sale of gas, &c., during the six months to June 30 was £31,015; and there was a balance brought forward of £7729, making a total of £38,744. The expenditure on gas manufacture, &c., was £20,322; and £7000 was placed to the reserve fund. The net amount to the credit of the profit and loss account was thus £11,422, out of which the Directors recommended a dividend of 6 per cent., which, with income-tax, would absorb £10,215, and leave a sum of £1207 to be carried forward. During the half year many extensions of mains were made. A strike of gas workers, arising from a dispute with which the Company were in no way connected, took place towards the end of May. A number of the Company's employees struck work in sympathy, with the result that the public and the Company suffered much inconvenience and loss; and the work of extensions was somewhat delayed.

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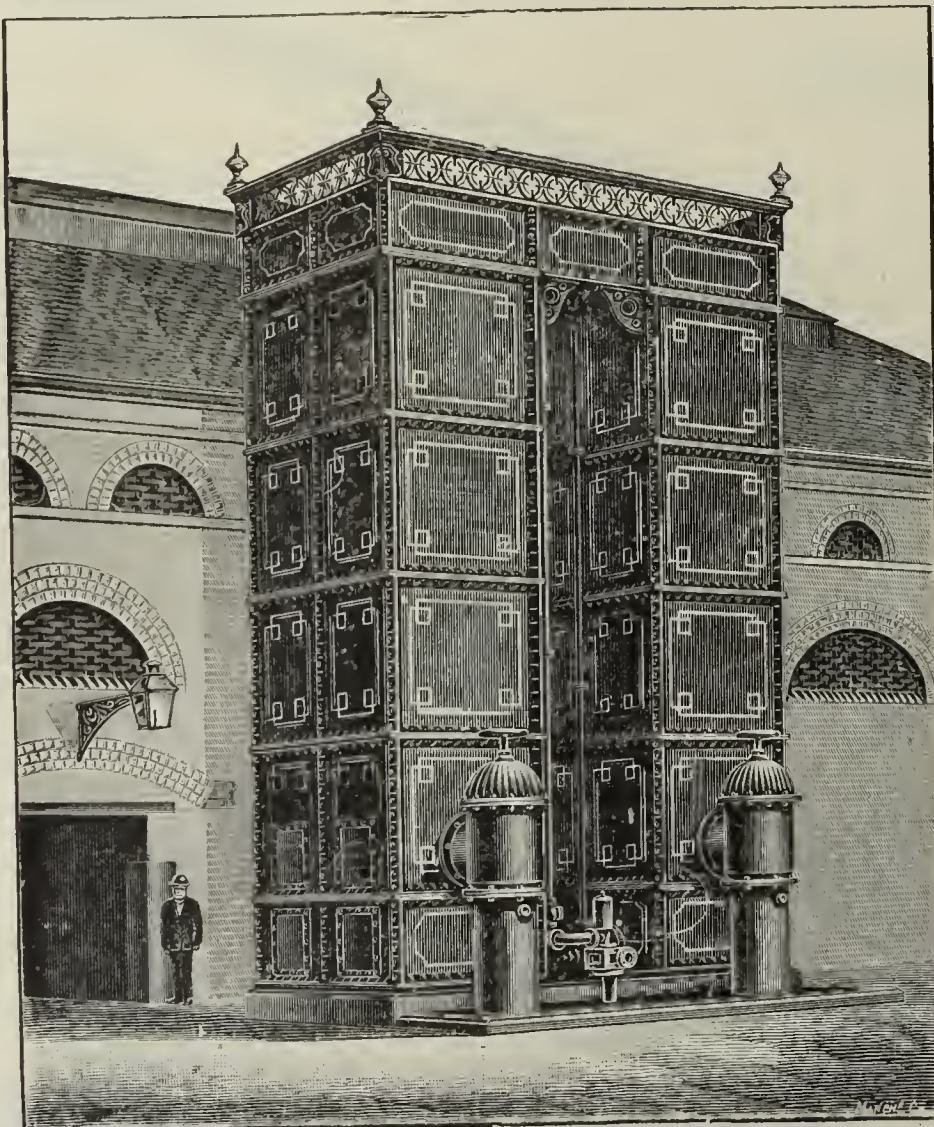
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ETRURIA,
NORWICH,
EAST HULL,
KINGSTON-ON-
THAMES,
BRISTOL,
WALKER AND
WALLSEND,
and other Works.

Unlawful Use of Water.

At the Aldershot Police Court, last Thursday, Thomas Crowther was summoned by the Aldershot Gas and Water Company for using water other than for domestic purposes. Mr. Norman Clinton, who prosecuted, described the case as an unusual one. An Inspector of the Company found there was running water on defendant's premises; and on making an examination of the cistern at the back of the house, he discovered a pipe fixed to the waste-pipe which was there to catch any overflow. The pipe first mentioned ran to a fish-tank outside defendant's premises, in which were fish swimming about. By the slightest manipulation, said Mr. Clinton, either by pressure on the ball-cock or by a little bending of the arm to the ball, there was actually continually running water; so that there was a constant stream of water keeping the fish-tank in splendid condition. It was a very excellent and ingenious arrangement; and if everybody adopted the same principle, the amount of water wasted in Aldershot alone would be something enormous. Mr. Allen, an Inspector in the employ of the Company, said a tube was suspended from the overflow-pipe, and the overflow water dropped into a funnel tied to the end of the pipe. The galvanized tank into which the water ran would contain about 80 gallons of water. At one end of the tank was a piece of perforated zinc, which would be sufficient to allow the water to pass through the tank. The only supply to the tank was from the overflow-pipe. The owner of the house only paid for water for domestic purposes. Defendant explained that the overflow used to run on to some cement he kept at the back of his house; and to prevent this, he put something to catch the overflow. The Magistrates inflicted a fine of 10s., with 11s. costs.

Reduction in Price at Bideford.—The Directors of the Bideford Gas and Coke Company have reduced the price of gas to 2s. 8d. per 1000 cubic feet, subject to discounts as previously allowed. This price is to take effect from March 31 last.

Gosberton Gas Company to be Wound Up.—At a meeting last week of the shareholders of the Gosberton (South Lincolnshire) Gas Company, it was resolved voluntarily to wind up the Company; Mr. Bryan Smith being appointed Liquidator. It is reported that the Company's property is shortly to come under the hammer.

Rochdale Gas-Workers' Wages.—The Rochdale Gas Committee have received a letter from the Gas Workers' Union asking for an advance of wages for stokers, firemen, still men, yard men, general labourers, and lamplighters. The application was referred to the Works Sub-Committee for consideration, so that they might report to the next meeting of the Committee.

Further Strike Threats at Douglas.—Two months ago, the Directors of the Douglas Gas Company granted their stokers an advance in wages from 4s. 6d. to 5s. per eight-hour shift; but it is reported that they have now been asked to revert to the old scale of wages during the winter months. They have, however, threatened to cease work unless the new rate of pay is maintained; and in this step they will receive the support of the other employees.

Ottoman Gas Company.—The Directors' report for the half year ended June 30, to be presented at the ordinary general meeting on the 19th inst., states that the gas rental amounted to £20,929 (for the corresponding half year it was £18,608). The net profit was £4598; while for the first six months of 1910 it was £4206. The amount standing at the credit of the profit and loss account is £12,534; and the Directors recommend the payment of a dividend at the rate of 7 per cent. per annum on the preference shares (less income-tax) and at the rate of 8 per cent. per annum on the ordinary shares (tax free), leaving a balance of £9639 to be carried forward.

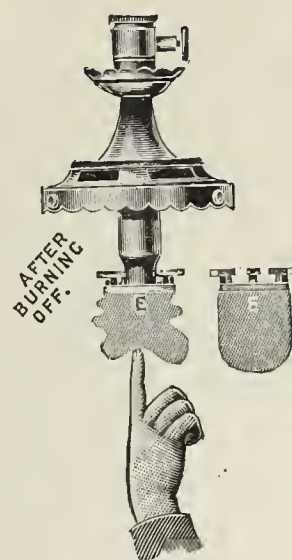
Gas v. Electricity at Lewes.—One of the recommendations made to the Lewes Town Council last Wednesday by the Highways and Works Committee, was that the tender of the Electric Supply Company, Limited, for lighting 127 lamps be accepted, and that the necessary notice be given to the Gas Company terminating the existing arrangements with respect to these lamps. Mr. Verral moved an amendment deleting the minute; arguing that the Gas Company were ratepayers to the extent of £500, while the Electric Light Company only paid one-fifth as much. The shareholders in the former were Lewes people; while the latter were a Company from London or elsewhere. Mr. Savage said the estimate of the Gas Company was about £90 less than what they had previously paid; so that their conscience was pricking them somewhere. But the estimate of the Electric Light Company was £40 to £50 less still. Mr. Lloyd thought gas was the best illuminant for outdoor lighting. Ultimately an amendment to refer the matter back for further consideration was carried by ten votes to six.

APPLICATIONS FOR LETTERS PATENT.

- 19,156.—SUTHERLAND, J. G. & A. G., "Gas governors or regulators." Aug. 26.
 19,207.—THOMPSON, W. P., "Gaslamp." A communication from the General Gaslight Company. Aug. 28.
 19,255.—KEITH, J. & G., "Incandescent gas-lamps." Aug. 28.
 19,299.—AMPHLETT, H. P., "Centrifugal governors." Aug. 29.
 19,300.—PRICE, H. S., "Universal joint." Aug. 29.
 19,330.—RIGBY, T., and TESTRUP, N., "Wet carbonizing of peat." Aug. 29.
 19,369-70.—JULIUS PINTSCH AKT.-GES., "Apparatus for giving intermittent flashes of light." Aug. 30.
 19,372.—KOPFER, H., "Regenerative gas-furnaces." Aug. 30. [Addition to 30,294/09.]
 19,420.—HELPS, G., "Gas-burners." Aug. 31.
 19,423.—HELPS, G., "Gas-lamps." Aug. 31.
 19,536.—MAERZ, J., "Regenerative furnaces." Sept. 1.
 19,555.—WADDELL, A., "Withdrawal of coke from vertical retorts." Sept. 2.
 19,559.—ALEXANDER, H. G., "Petrol gas." Sept. 2.

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Price of Gas at Radcliffe.—The Directors of the Radcliffe and Pilkington Gas Company announce a reduction of rd. per 1000 cubic feet in the price of gas. The price will then be 2s. 9d. The reduction starts next month. Large users and prepayment consumers are also to have concessions. This is the third reduction in three years.

Completion of the Lincoln Water Scheme.—The new water scheme at Lincoln is now nearing completion; and it has been definitely arranged that on the 4th prox. the water is to be turned on for the regular use of the citizens. The Council want the whole country to know, says the Lord Mayor, that the reproach which at one time rested upon Lincoln has at last been removed, and that they have now a water supply second to none in the kingdom.

Co-Partnership at Watford.—The second annual balance-sheet and report of the co-partnership fund of the Watford Gas Company, which will be presented at the general meeting of the co-partners on the 29th inst., states that the bonus and interest for the year to June 30 divided among the members of the fund amounted to the very substantial sum of £502. The Trustees have been enabled to purchase £880 of the Company's "B" Stock since the commencement of the fund. Of this amount, £470 has been allotted to 47 of the co-partners; leaving a balance of £410. This, with any stock they may be able to purchase, will be divided among the co-partners eligible to receive stock. The sum of £59 has been paid to the members on account of illness, or because of employees leaving the Company's service.

The Middleton Corporation Gas Committee have decided that application be made to the Local Government Board for sanction to borrow £1800, to be spent on mains and meters; and the Town Council have approved of the same.

The "London Gazette" for the 1st inst. contains a winding-up notice in respect of the Merlin Gas and Engineering Company, Limited, of Manchester—possibly with a view to re-construction, as the previous day (Aug. 31) a new company with the title of "Merlin Light, Limited," was registering with a capital of £5000 in £1 shares.

The minutes of the Gas Committee confirmed at last week's meeting of the Huddersfield Town Council contained an account of an inspection of the gas-works by the members of the Committee under the guidance of the Gas Engineer (Mr. E. A. Harman), who described to them the system adopted for the making of gas. "The Committee were impressed," the record set out, "by the orderly manner in which the works were kept, and expressed their admiration at the efficient working of the same. They inspected the work in progress in connection with the installation of the new middle bench of retorts, which the Engineer stated would be ready for working during the winter months. They also inspected the offices, which are to be enlarged; and at the conclusion of the visit, a vote of thanks was accorded Mr. Harman for his services in conducting the party over the works and the detailed explanations given by him of the plant and working of the different departments."

TAR PRODUCTS PRICES.

Representative manufacturers give the following as fair current values for the week ending Sept. 9. Prices are net, and they include the usual packages and delivery f.o.b., f.a.s., or f.o.r., as customary.

Article.	Basis.	London.	North-East Coast.	East Coast, Yorks.	West Coast.		Glasgow.
					Liverpool.	Manchester.	
Tar, crude	per ton	—	20/- 25/-	21/- 25/-	—	21/- 24/-	—
Pitch	"	42/6	40/-	40/-	40/-	39/6	39/6
Benzol, 90%	per gallon	1/-	-9½ -10	-9½	-9½	-9½	-9½
Benzol, 50-90%	"	—	-10	-9	—	-9	—
Toluol, 90%	"	—	-10	-9	-10	-10	-10
Crude naphtha, 30%	"	—	-4½	-3½	-3½	-3½	—
Light oil, 50%	"	—	-3½	-3½	-3½	-3½	—
Solvent naphtha, 90-160	"	—	-10 -10½	-10	-10	-10	-11
Heavy naphtha, 90-190	"	—	-11	-11	-11½	-11½	-11
Creosote in bulk	"	-2½	-2½	-2½	-2½	-2½	-2½
Heavy oils.	"	—	-2½ -2½	-2½	-2½	-2½	-2½
Carbolic acid, 60's.	"	2/4	2/2	2/3	—	—	2/3
Naphthalene, crude drained salts	per ton	—	43/9	42/6	47/6	47/6 50/-	—
" pressed	"	—	60/-	63/-	60/-	60/- 72/6	—
" whizzed.	"	—	—	—	70/- 72/6	65/- 75/-	62/6
Anthracene	per unit	-1/2	-1½	-1½	-1½	-1½	—

GAS COMPANIES' STOCK AND SHARE LIST.

Referred to on p. 644.

Issue.	Share.	When ex-Dividend.	Dividend or Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Invest. ment.	Issue.	Share.	When ex-Dividend.	Dividend or Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Invest. ment.
£			p.c.				£ s. d.	£			p.c.				£ s. d.
1,551,868	Stk.	Apl. 12	5	Alliance & Dublin Ord.	81-84	..	5 19 1	200,242	Stk.	Aug. 31	6	Lea Bridge Ord. 5 p.c.	118-120*	..	5 0 0
374,000	Stk.	July 14	4	Do. 4 p.c. Deb.	93-95	..	4 4 3	561,000	Stk.	Aug. 16	10	Liverpool United A.	210-212	..	4 14 4
250,000	5	May 12	7	Bombay, Ltd.	64-64½	..	5 3 8	718,100	"	"	7	Do. B.	161½-163½	..	4 5 8
50,000	10	Aug. 31	15	Bourne 10 p.c.	28½-29½*	..	5 1 8	306,083	"	June 30	4	Do. Deb. Stk.	102-104	..	3 16 11
311,810	10	"	7	mouth Gas B 7 p.c.	16½-16½*	..	4 3 7	75,000	5	June 15	6	Malta & Mediterranean	4-5	..	6 0 0
75,000	10	"	6	and Water Pref. 6 p.c.	14½-14½*	..	4 1 4	560,000	100	Apl. 1	5	Mct. of 5 p.c. Deb.	101-103	..	4 17 1
380,000	Stk.	Aug. 16	13	Brentford Consolidated	256-261	..	4 19 7	250,000	100	"	4½	Melbourne 4½ p.c. Deb.	101-103	..	4 7 5
330,000	"	"	10	Do. New	198-203	..	4 18 6	541,920	20	May 31	3½	Monte Video, Ltd.	123-134	..	5 5 8
50,000	"	"	5	Do. 5 p.c. Pref.	120-122	..	4 2 0	1,775,892	Stk.	July 28	4½	Newcastle & Gt. Tesh'd Con.	103-105	..	4 3 4
206,250	"	June 15	4	Do. 4 p.c. Deb.	97-99	..	4 0 10	529,705	Stk.	June 30	3½	Do. 3½ p.c. Deb.	87-89	..	3 18 8
220,000	Stk.	Aug. 31	11	Brighton & Hove Orig.	216-221*	..	4 19 7	55,940	10	Aug. 31	7/7/0	North Middlesex 7 p.c.	143-153*	..	4 10 4
246,320	"	"	8	Do. A Ord. Stk.	156-159*	..	5 0 8	300,000	Stk.	Apl. 27	8	Oriental, Ltd.	138-140	..	5 14 4
490,000	20	Apl. 12	12½	British	46-47	+1	5 6 5	60,000	5	Apl. 12	8	Ottoman, Ltd.	62-74	..	5 10 4
120,000	Stk.	June 30	6	Do. 4 p.c. Deb. Stk.	94-96	..	4 3 4	31,800	53	Aug. 16	13	Portsea Island A.	132-136	..	5 1 0
109,000	"	Aug. 16	6	Bromley, A 5 p.c.	115-120	..	5 0 0	60,000	50	"	13	Do. B.	122-125	..	5 4 0
165,700	"	"	4½	Do. B 3½ p.c.	85-90	..	5 0 0	100,000	50	"	12	Do. C.	117-122	..	4 18 4
82,278	"	"	5½	Do. C 5 p.c.	105-110	..	5 0 4	398,490	5	May 31	8	Primitiva Ord.	74-75	..	5 6 8
55,000	"	June 30	3½	Do. 3½ p.c. Deb.	82-84	..	4 2 6	796,980	5	June 30	5	Do. 5 p.c. Pref.	54-55	..	4 10 11
250,000	Stk.	"	4	Buenos Ayres 4 p.c. Deb.	95-97	..	4 3 4	488,980	100	June 1	4	Do. 4 p.c. Deb.	97-99	..	4 0 10
100,000	10	"	—	Cape Town & Dis., Ltd.	2-3	..	—	312,650	Stk.	June 30	4	River Plate 4 p.c. Deb.	95-97	..	4 2 6
100,000	10	"	—	Do. 4½ p.c. Pref.	4-5	..	—	250,000	10	Mar. 24	9	San Paulo, Ltd.	213-223	..	4 0 0
100,000	Stk.	June 30	4½	Do. 4½ p.c. Deb. Stk.	80-83	..	5 8 5	115,000	10	"	6	Do. 6 p.c. Pref.	50-51	+½	4 18 0
157,150	Stk.	Aug. 16	5	Chester 5 p.c. Ord.	107-109	..	4 11 9	125,000	50	July 1	5	Do. 5 p.c. Deb.	50-51	..	4 4 9
1,513,230	Stk.	"	5/9/4	Commercial 4 p.c. Stk.	111½-113½	..	4 16 1	135,000	Stk.	Aug. 31	10	Sheffield A.	231-236*	..	4 5 1
560,000	"	"	5½	Do. 3½ p.c. do.	105½-107½	..	4 19 3	209,984	"	"	10	Do. B.	233-235*	..	4 5 1
475,000	"	June 15	3	Do. 3 p.c. Deb. Stk.	76-78	..	3 16 11	523,500	"	"	10	Do. C.	233-235*	..	7 4 1
800,000	Stk.	May 31	4	Continental Union, Ltd.	88-92	..	4 7 0	70,000	10	June 15	7	South African	81-93	..	4 12 8
200,000	"	"	7	Do. 7 p.c. Pref.	135-137	..	5 2 2	6,429,895	Stk.	Aug. 16	5/9/4	South Met., 4 p.c. Ord.	116-118	—	3 14 6
492,270	Stk.	"	5½	Derby Con. Stk.	122-124	..	4 8 9	1,895,445	"	July 14	3	Do. 3 p.c. Deb.	78½-80½	..	5 11 10
55,000	"	"	4	Do. Deb. Stk.	104-105	..	3 16 2	209,820	Stk.	Aug. 16	8½	South Shields Con. Stk.	150-152	..	4 14 9
840,150	10	July 28	10	European, Ltd.	183-193	..	5 2 7	605,000	Stk.	"	5½	S'th Suburb'n Ord. 5 p.c.	117½-119½	..	4 14 9
16,160,600	Stk.	Aug. 16	4/14/8	Gas 4 p.c. Ord.	106-107	..	4 8 5	60,000	"	"	5	Do. 5 p.c. Pref.	115½-117½	..	4 5 1
2,600,000	"	"	3½	light 3½ p.c. max.	83-85	..	4 2 4	117,058	"	July 14	5	Do. 5 p.c. Deb. Stk.	121-123	..	4 1 4
4,062,235	"	"	4	and 4 p.c. Con. Pref.	101-103	..	3 17 8	502,310	Stk.	May 12	5	Southampton Ord.	108-110	..	4 10 11
4,531,705	"	June 15	3	Coke 3 p.c. Con. Deb.	79-81	..	3 14 1	120,000	Stk.	Aug. 16	7½	Tottenham A 5 p.c.	145-148	+1	4 16 3
258,740	Stk.	Mar. 10	5	Hastings & St. L. 3½ p.c.	96-98	..	5 2 0	483,940	"	"	5½	and B 3½ p.c.	114-116	..	4 17 0
82,500	"	"	6½	Do. do. 5 p.c.	—	..	—	149,470	"	June 15	4	Edmonton 4 p.c. Deb.	96-98	..	4 1 8
70,000	10	Apl. 27	11	Hongkong & China, Ltd.	17½-18	..	6 2 2	182,380	10	June 15	8	Tuscan, Ltd.	84-94	..	8 13 0
131,000	Stk.	Mar. 10	7½	Ilford A and C	148-152	..	4 18 8	149,900	10	July 1	5	Do. 5 p.c. Deb. Red.	96-98	..	5 2 0
65,780	"	"	6½	Do. B	122-125	+1	4 16 0	236,476	Stk.	Aug. 16	5	Tynemouth, 5 p.c. max.	113-115	..	4 6 11
65,500	"	June 30	4	Do. 4 p.c. Deb.	94-96	..	4 3 4	255,636	Stk.	Aug. 31	6½	Wands- B 3½ p.c.	142-145*	..	4 14 10
4,940,000	Stk.	May 12	9	Imperial Continental	180-183	..	4 18 4	85,766	"	June 30	3	worth 3 p.c. Deb. Stk.	71-73*	..	4 2 2
1,235,000	Stk.	Aug. 16	3½	Do. 3½ p.c. Deb. Red.	90-92	..	3 16 1								

Prices marked * are "Ex. div."

† Next dividend will be at this rate.

The Doncaster Town Council have agreed to recommendations that £5000 be raised on loan for extra gas-works plant and main extensions, and that application be made to the Local Government Board for permission to borrow £8000 for the extension of water-mains and services in the Corporation's water area.

Consequent upon their rapidly-increasing business operations, the Power-Gas Corporation, Limited, of Stockton-on-Tees, are rearranging their London office staff. They have transferred Mr. J. Whitaker Taylor from the Manchester office to London; and from the office of the Corporation at No. 39, Victoria Street, S.W., he will devote his attention to the still further extension of the interests of the Corporation and its clients.

The accounts of the Bland Light Syndicate, Limited, for the year ending April 30 last were submitted at the annual general meeting of shareholders on the 31st ult., when the Chairman (Mr. C. W. Bland) congratulated them on the results of the year's trading. An interim dividend at the rate of 10 per cent. per annum for the six months ending Oct. 31, 1910, was paid in June; and the Directors recommended a further distribution at the rate of 20 per cent. per annum—making a dividend of 15 per cent. for the year, with a substantial carry-forward. He said that the continuous expansion of the Company's business was being well maintained; and the further increase anticipated in last year's report had been fully realized. In the meantime returns this year showed considerable improvement over last year.

WANTED, FOR SALE, CONTRACTS, &c., ADVERTISEMENTS IN THIS WEEK'S "JOURNAL."

Appointments Vacant.
SECOND ASSISTANT (Gas Department), Singapore Municipal Commissioners. Applications by Sept. 15. GAS ENGINEER (as Representative). No. 5411. MANAGER AND SECRETARY. Longridge Gas Company. REPRESENTATIVE. No. 5442. GAS STOKERS. Longwood Gas Company.

Patent Licenses, &c.
"IMPROVEMENTS IN METERS." Haseltine, Lake, and Co., Southampton Buildings, Chancery Lane, W.C.

Plant, &c. (Second-Hand) Wanted.
STATION METERS. Box 297, Burton's.

Meetings.
BRITISH GASLIGHT COMPANY. London Office. Sept. 27. Twelve o'clock.
OTTOMAN GAS COMPANY. London Office. Sept. 19. One o'clock.

Stocks and Shares.
BISHOP'S STORTFORD, HARLOW, AND EPPING GAS AND ELECTRICITY COMPANY. By auction. Sept. 19.
DARTFORD GAS COMPANY. By auction. Oct. 3.
SOUTHELD WATER WORKS COMPANY. By auction. Oct. 3.
WESTON-SUPER-MARE GASLIGHT COMPANY. By auction. Oct. 4.

TENDERS FOR
Coke.
WANDSWORTH AND PUTNEY GAS COMPANY. Tenders by Sept. 18.

Livesey Washer.
GOOLE GAS DEPARTMENT. Tenders by Sept. 27.

Purifying Plant and House (Alterations, &c.)
ISLE OF THANET GAS COMPANY. Tenders by Oct. 5.

Sulphuric Acid.
MARKET HARBOUROUGH GAS-WORKS. Tenders by Sept. 25.

Tar.
MARKET HARBOUROUGH GAS-WORKS. Tenders by Sept. 25.

NOTICES TO CORRESPONDENTS, ADVERTISERS, AND SUBSCRIBERS.

No notice can be taken of anonymous communications. Whatever is intended for insertion in the "JOURNAL" must be authenticated by the name and address of the writer; not necessarily for publication, but as a proof of good faith.

COPY FOR ADVERTISEMENTS for the "JOURNAL" should be received at the Office **NOT LATER** than **TWELVE O'CLOCK NOON ON MONDAY**, to ensure insertion in the following day's issue.

Orders for Alterations in, or stoppages of, **PERMANENT ADVERTISEMENTS** should be received by the **FIRST POST** on **SATURDAY**.

Wanted, For Sale, and Tender Advertisements, Six Lines and under, 3s.; each additional Line, 6d.

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Resists 4500° Fahr. Best for GAS-WORKS.
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Pitch, Creosote, Brick and Fuel Oils, Benzol, Solvent Naphtha, Carbolic, Sulphate of Ammonia.

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See Illustrated Advertisement, Aug. 1, p. 325.

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GAS-WORKS requiring Extensions should Communicate with FIRTH BLAKELEY, SONS, AND CO., LIMITED, Dewsbury, who make a Speciality of Catering for the Smaller Gas Concerns. Prices Reasonable; quality and results, the best. Satisfaction Guaranteed.

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Correspondence invited.

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Telegrams: "CHEMICALS."

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J. E. C. LORD, Ship Canal Tar-Works, Waste, Manchester. Pitch, Creosote, Benzols, Toluol, Naphtha, Pyridine, all kinds of Cresylic Acid, Carbolic Acid, Sulphate of Ammonia, &c.

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SULPHATE OF AMMONIA SATURATORS and all LEAD and TIMBER WORK in Connection with Sulphate Plants.
We guarantee promptness with efficiency for Repairs.
JOSEPH TAYLOR AND CO., CENTRAL PLUMBING WORKS, BOLTON.
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PATENTS.—Withers & Spooner, Chartered Patent Agents, 323, High Holborn, London. Established 27 years. British, Foreign, and Colonial Patents obtained at fixed and inclusive fees. Designs and Trade Marks Registered. Send for free copy of our "GUIDE TO PATENTS," giving full information, fees, &c.

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CITY & Guilds. Records. Over 200 passes and 8 medals during the past Five years, in Gas Engineering. Classes for 1912 Exams. now working. Illustrated Lectures. Low Fees. Write for our new Gas Engineering Calendar, post free.
CORRESPONDENCE COLLEGE CO., Dept. B, KING'S LYNN.

SINGAPORE, STRAITS SETTLEMENTS.
(GAS ENGINEER'S DEPARTMENT.)

THE Municipal Commissioners of the Town of Singapore require a SECOND ASSISTANT in their Gas Department, between 25 and 30 years of Age, unmarried, and of sound constitution. He must have had a good Technical education, a thorough training and experience in Gas Manufacture and Distribution, and be able to Take Charge of the outdoor work of the Department viz:—Mains and Services, Laying Pipes, &c., Public Lighting and House Fitting. Preference will be given to Applicants who have been trained in a Gas-Works manufacturing 100 to 200 million Cubic Feet per Annum. The Engagement will be for Three Years, and the Applicant is to state the earliest date upon which he could be free to leave for Singapore. The selected candidate must pass a medical examination. A second-class passage will be provided with half-pay during the voyage out. The Salary will be 3000 dollars per Annum, rising by annual increments of 300 dollars to 3600 dollars per Annum, paid monthly, in dollars, the currency of the Colony, the value of the dollar being two shillings and fourpence sterling. Such local transport allowance as may from time to time be sanctioned by the Commissioners will be paid. Applications, stating Age and place of birth, and giving details of Education, Training, and Experience generally, and referring to the above requirements seriatim, accompanied by copies (only) of Testimonials, and also Personal References, to be lodged with C.C. Lindsay, Esq., M.Inst.C.E., 180, Hope Street, Glasgow (who will give further Particulars if requested), not later than the 15th of September, 1911.

WANTED, a Gas Engineer, of Good Address, to introduce a new Process to Gas Managers. Must be a good Chemist, Energetic, and well acquainted with Gas-Works Practice. A suitable Man will be well paid.
Apply, by letter, stating Age, Experience, and when at liberty, to No. 5441, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

WANTED, a competent Gas Manager and SECRETARY, for the Longridge Gas Company, near Preston, Lancashire, capable of taking both positions, and conducting the work of the same, and the Disposal of all By-Products. Make about 14 Millions.
Applications, stating Salary required, accompanied by Testimonials, to be sent to Mr. R. Eccles, 275, St. Paul's Road, Preston.
Applications to be sent not later than Sept. 16, 1911.

A FIRM of Gas Apparatus Manufacturers, &c., require a REPRESENTATIVE for the South Coast. Must have sound Connection.
Apply, by letter, to No. 5442, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

WANTED, near London, Two Second-Hand STATION METERS, having a normal capacity of 15,000 Cubic Feet per hour, with 10-inch Inlet and Outlet connections. Must be in thoroughly good working condition.
State Price to Box 297, BURTON'S, General Buildings, ALDWYCH, W.C.

LONGWOOD GAS COMPANY.

WANTED, One or Two good Gas STOKERS. Wages £2 per Week, and Bonus.
Apply to J. H. BREARLEY, Engineer and Manager, Gas Offices, Longwood, HUDDERSFIELD.

ISLE OF THANET GASLIGHT AND COKE COMPANY, MARGATE.

THE Directors of the above Company invite TENDERS for carrying out certain ALTERATIONS and ADDITIONS to PURIFYING PLANT and HOUSE, with Foundations, Columns, Concrete Liquor Tank, &c., &c., at their Gas-Works, Margate, to Drawings and Specification prepared for the same by the Company's Engineer and Manager, Mr. J. M. Campbell, from whom any Preliminary Particulars may be obtained on Application.
The Site may be Inspected, and the Drawings and Specification seen and copies taken, at the Gas Company's Office, Margate (by arrangement with the Engineer), on payment of Two Guineas, which amount will be returned on the receipt of a *bona-fide* Tender.
Sealed Tenders are to be addressed to the Chairman, endorsed "Tender for Purifiers, &c.," and delivered at the Offices not later than Thursday, Oct. 5, 1911.
The Directors do not bind themselves to accept the lowest or any Tender.

By order,
THOS. C. FULLER,
Secretary.

Offices: Addington Street,
Margate, Sept. 9, 1911.

COKE.

THE Directors of the Wandsworth and Putney Gaslight and Coke Company invite TENDERS for the Removal of about 18,000 Tons of Guaranteed "Wandsworth" COKE from their Works at Wandsworth, between Oct. 1 and March 31 next.
The Coke to be removed by Van or by Barge (free Waterway on River Thames).
Sealed Tenders, endorsed "Tender for Coke," to be delivered not later than the 18th of September, 1911.
The Directors reserve to themselves the right to accept any Tender in part or in whole, and do not bind themselves to accept the highest or any Tender.
Any further information may be obtained from the Engineer, Mr. H. O. Carr.

CHAS. W. BRAINE,
Secretary.

Wandsworth and Putney Gaslight and Coke Company, Fairfield Street,
Wandsworth, S.W., Aug. 24, 1911.

MARKET HARBOROUGH URBAN DISTRICT COUNCIL.
(GAS DEPARTMENT.)

SURPLUS TAR AND SULPHURIC ACID.
TENDERS are invited for the Surplus TAR produced, and also for the Supply of SULPHURIC ACID required, during the year ending Sept. 30, 1912.
Particulars may be obtained from the undersigned, to whom sealed Tenders, endorsed "Tender for Tar," and "Tender for Sulphuric Acid," respectively, must be delivered not later than noon on Monday the 25th inst.
ALFRED T. HARRIS,
Manager and Secretary.
Gas Offices, Market Harborough,
Sept. 6, 1911.

GOOLE URBAN DISTRICT COUNCIL.
TENDERS are invited for the Supply and Fixing of a LIVESEY WASHER at the Gas-Works.
Specification and full Particulars may be obtained on Application to Mr. J. Fazakerley, Gas and Water Engineer, Gas-Works, Goole.
Tenders, endorsed "Tender for Washer," to be received by me not later than Noon on Wednesday, the 27th of September, 1911.

ROBERT TYSON,
Clerk to the Council.

Council Offices, Goole,
Sept. 6, 1911.

THE Proprietors of Patent No. 19,479 of 1905, for "IMPROVEMENTS IN OR RELATING TO METERS" are desirous of entering into Arrangements, by way of LICENCE and otherwise, on Reasonable Terms, for the purpose of EXPLOITING the same and ensuring its Full Development and Practical Working in this Country.
All Communications should be addressed in the first instance to HASELTINE, LAKE, & Co., Chartered Patent Agents and Consulting Engineers, 7 & 8, Southampton Buildings, Chancery Lane, London, W.C.

SALES BY AUCTION OF GAS AND WATER STOCKS AND SHARES.

MESSRS. A. & W. RICHARDS beg to notify that their SALES BY AUCTION of NEW CAPITAL ISSUED UNDER PARLIAMENTARY POWERS, and of STOCKS and SHARES belonging to EXECUTORS and other PRIVATE OWNERS in LONDON, SUBURBAN, and PROVINCIAL GAS and WATER COMPANIES, take place PERIODICALLY at the Mart, TOKENHOUSE YARD, E.C.

Terms for Issuing New Capital, and also for including other Gas and Water Stocks and Shares in these Periodical Sales, will be forwarded on Application to MESSRS. A. & W. RICHARDS, at 18, FINSBURY CIRCUS, E.C.

By order of the Directors of the
SOUTHEND WATER-WORKS COMPANY.

NEW ISSUE OF 1250 £10 NEW ORDINARY FIVE PER CENT. MAXIMUM SHARES.

MESSRS. A. & W. RICHARDS will SELL THE ABOVE BY AUCTION, at the Mart, E.C., on Tuesday, Oct. 3, at Two o'clock, in Lots.

Particulars of the AUCTIONEERS, 18, FINSBURY CIRCUS, E.C.

By order of the Directors of the
DARTFORD GAS COMPANY.

NEW ISSUE OF £5000 ORDINARY STOCK.

MESSRS. A. & W. RICHARDS will SELL THE ABOVE BY AUCTION, at the Mart, E.C., on Tuesday, Oct. 3, at Two o'clock, in Lots.

Particulars of the AUCTIONEERS, 18, FINSBURY CIRCUS, E.C.

BISHOP'S STORTFORD, HARLOW AND EPPING, GAS AND ELECTRICITY COMPANY.
(INCORPORATED BY ACT OF PARLIAMENT.)

MESSRS. G. E. SWORDER & SONS have received instructions to Sell by Public Auction, at the "George" Hotel, Bishop's Stortford, on Tuesday, the 19th of September, 1911, at Three p.m., in Lots to suit small investors,

£2000 "C" FIVE PER CENT. PREFERENCE STOCK,
AND
£1000 FOUR PER CENT. PERPETUAL DEBENTURE STOCK.

Particulars and Conditions of Sale may be obtained of the SECRETARY of the Company, 18, Water Lane, BISHOP'S STORTFORD; and of MESSRS. G. E. SWORDER and SONS, Auctioneers, BISHOP'S STORTFORD.

GAS STOCK.

SALE OF NEW ORDINARY STOCK IN THE WESTON-SUPER-MARE GASLIGHT COMPANY.

LALONDE BROS. AND PARHAM in conjunction with C. E. MASTERS AND COMPANY, have received instructions from the Weston-super-Mare Gaslight Company, to SELL by AUCTION under the Provisions of the Weston-super-Mare Gas Act, 1901, at the ASSEMBLY ROOMS, Weston-super-Mare, on Wednesday, the 4th of October next, at 6.30 o'clock in the Evening, subject to Conditions of Sale,

£5000
NEW FIVE PER CENT. MAXIMUM ORDINARY STOCK

of and in the above-named Company, in Lots of the nominal value of £50 each.

The Stocks will be Sold and Registered in the Books of the Company free of every expense to the Purchasers thereof.

For further Particulars and Conditions of Sale Apply to LALONDE BROS. AND PARHAM, Auctioneers, High Street, and Station Road, WESTON-SUPER-MARE, and 64, Queen's Road, BRISTOL; to C. E. MASTERS AND CO., Auctioneers, 4, South Parade, WESTON-SUPER-MARE, and 12, St. Stephens Street, BRISTOL; to P. E. CULLING, Secretary to the Weston-super-Mare Gaslight Company, or to J. H. & F. W. BERE, Solicitors, WESTON-SUPER-MARE.

BRITISH GASLIGHT COMPANY, LIMITED.

NOTICE is Hereby Given, that the HALF-YEARLY ORDINARY GENERAL MEETING of the Proprietors of this Company will be held at this Office on Wednesday, the 27th inst., at Twelve o'clock precisely, to transact the usual Business; to declare a Dividend for the Half Year ended the 30th of June last; to elect Two Directors in the place of those who go out by rotation; and to appoint Two Auditors.

NOTICE is HEREBY ALSO GIVEN that the TRANSFER BOOKS of the Company WILL BE CLOSED on the 16th inst. and RE-OPENED on the 28th inst.

By order of the Court of Directors,
A. W. BROOKES,
Secretary.

Chief Office: No. 11, George Yard,
Lombard Street, London, E.C.
Sept. 6, 1911.

OTTOMAN GAS COMPANY, LIMITED.

NOTICE is Hereby Given, that the ORDINARY GENERAL MEETING of the Shareholders of this Company will be held at 9, Queen Street Place, Cannon Street, E.C., on Tuesday, Sept. 19, 1911, at One o'clock precisely, to receive the Report of the Directors and Statement of Accounts for the Half Year ended the 30th of June last; to declare a Dividend; and for General Purposes.

The TRANSFER BOOKS WILL BE CLOSED from Sept. 12, to Sept. 19, both days inclusive.

By order of the Board,
THOMAS GUYATT,
Secretary.
9, Queen Street Place,
Cannon Street, London, E.C.,
Aug. 15, 1911.

BIRTLEY IRON COMPANY,

ESTABLISHED 1820,

Owners of the Birtley Iron Works and
Pelaw Main Collieries,

GENERAL ENGINEERS & IRONFOUNDERS.

Makers of Cast-Iron PIPES and CONNECTIONS for Gas, Water, Steam, Electrical, Sanitary, and other purposes; also TANKS, COLUMNS of every description, Hydraulic, Gas, and Colliery PLANT, &c.

Illustrated Catalogue, giving complete list of our Manufacturers, on Application.

Works: BIRTLEY, CO. DURHAM.
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Price 8s. (free delivery in United Kingdom)

**A HISTORY OF
THE INTRODUCTION
OF GAS LIGHTING.**

By CHARLES HUNT, M.Inst.C.E.,
Past-President of the Institution of Gas Engineers,
Author of "Gas Lighting," which forms the Third Volume
of Groves and Thorpe's "Chemical Technology."

As a frontispiece the book has a photographic reproduction of the portrait of William Murdoch in the Edinburgh Art Gallery. There are also portraits of the Hon. Robert Boyle, F.R.S., James Watt, Philippe Lebon, Frederick Albert Winsor, &c.; a reproduction of the picture of "Scientific Celebrities in 1800," in the National Portrait Gallery, in which James Watt, Boulton, and Wm. Murdoch are included; and numerous illustrations of various apparatus used in the early Manufacture of Gas, &c., with Three folding plates.

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16, DEANSGATE, MANCHESTER,
Best Gas Coal and Cannel, giving High Illuminating Power, Large Yield per ton, and reasonable in Price.

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BOYS CALORIMETERS**

which have been in daily use in
all the Official Testing-Stations in
London for the last Five Years

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Those desiring to obtain Gas Calorimeters
as used in the Official Testing Places
should see that the apparatus bears the
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Descriptive Catalogue on Application.

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Manufacture and keep in Stock at their Works
(also large Stock in London)

PIPES and CONNECTIONS, 1½ to 48 inches
in diameter, and make and erect to order
RETORTS, PURIFIERS and TANKS, with
or without planed joints, COLUMNS,
GIRDERS, SPECIAL CASTINGS, &c., re-
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Chemical, Colliery, and other Companies.

NOTE.—Makers of HORSLEY SYPHONS.
These are cast in one piece, without Chap-
lets; doing away with Bolts, Nuts, and Covers.
and rendering Leakage impossible.

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Manufacturers of GAS RETORTS, GLASSHOUSE
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TILES, and every description of FIRE-BRICKS.
Special Lumps, Tiles, and Bricks for Regenerative
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**REALISTIC FOOD MODELS
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As supplied to leading Gas Companies, &c.

FIGURES OF CHEFS, &c.

Apply **GODFREY SUTCLIFFE,**
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**KOPPERS' PATENT
CHAMBER OVENS.**

Results obtained which have never been Sur-
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Plants at Work and under Construction for
the production of 18,000,000 cubic feet
of Gas per Day.

See our large Advertisement appearing in
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HANDLING
PLANTS.**

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HEATHCOTE GAS COAL

from the
Grassmoor Collieries
CHESTERFIELD.

Rich in Illuminating Power and Yield of Gas.
Above the Average in Weight and Quality of Coke.
Maintains a High Standard in Residuals.

MIRFIELD GAS COAL

UNEQUALLED.

Sperm Value 878.85 lbs. per ton.

Please apply for Price, Analyses, and Report to the

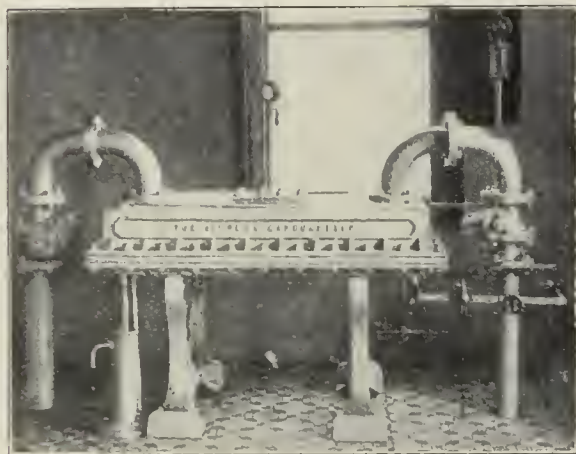
MIRFIELD COLLIERY COMPANY,
RAVENSTHORPE, near DEWSBURY.

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Highest Results in Gas, & Excellent Coke.

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— LIMITED, —
NEWBATTLE COLLIERIES,
NEWTONGRANGE, MIDLOTHIAN.

NAPHTHALINE AND ITS CURE.



THE "SIMPLEX" VAPORIZER.

THE "SIMPLEX" VAPORIZER.

This Apparatus is specially suitable for the prevention of Naphthaline deposits in the districts.

Fixed near the inlet or outlet of Gasholder, it can be used to vaporize a suitable Hydrocarbon into the Gas in such quantities as to entirely prevent the deposition of Naphthaline in the mains or consumers' services.

Orders received from Hampton Court, Great Harwood, Clitheroe, Jersey, Kilmarnock, Hornsey, Gt. Yarmouth, Walton-on-Thames, Banbury, Warwick, and Cleckheaton.

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CAST-IRON PIPES FOR GAS, WATER, & STEAM,

also **VALVES** of all descriptions.

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And LAMBHILL FOUNDRY, GLASGOW.
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TO GAS ENGINEERS

NAPHTHALENE SOLVENT.

Are you troubled with **NAPHTHALENE** in your
MAINS? If so, try our special

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For Steam, Gas, Water, or Air Blast.

In Hundreds of Ranges
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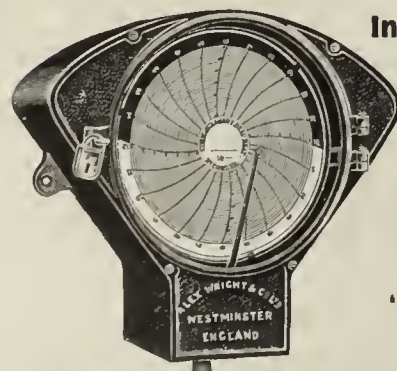
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ENGLISH MADE.

"PRECISION" ACCURACY.

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THE "PARKINSON"



FIG.

323.

INVERTED BURNER

ARC LAMP

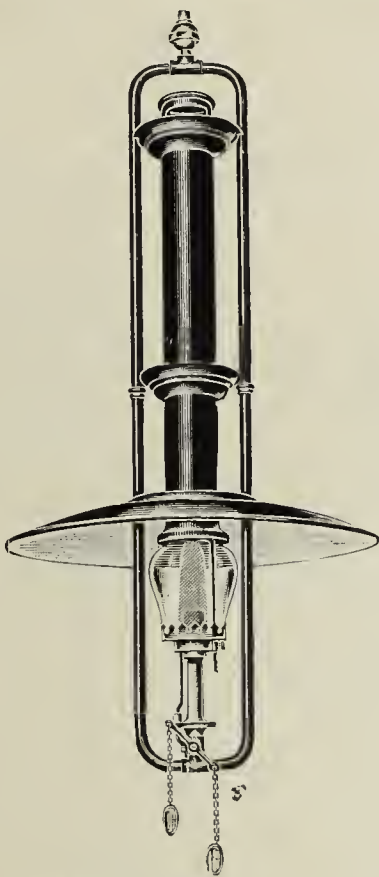
With "U" Fixing for Street Columns, &c.

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Street Lighting Specialists.

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IT STANDS ALONE.

The "Lucas" Self-Intensive High-Power Lamp.

Absolutely Wind, Dust, and Insect Proof. 200, 400, and 700 Candle-Power from a Single Mantle with Gas at Ordinary Pressure. The Lowest Consumption on Record.

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ALDWARKE MAIN, CAR HOUSE, & ROTHERHAM MAIN COLLIERIES, NEAR ROTHERHAM.

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Analysis: 12,600 Feet of 19-Candle Gas per Ton.

Value in Pounds of Sperm, 820.20.

VERY FREE FROM IMPURITIES.

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Are the exclusive Owners of the well-known HAIGH HALL & KIRKLESS HALL GAS COAL COLLIERIES, Wigan, and of the Manton Steam and House Coal Collieries, Worksop, Notts, and supply the well-known Wigan Arley Mine Gas Coal, Gas Nuts, Gas Cannel, Cannel Nuts, House and Steam Coals, &c.

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Workmanship and Materials
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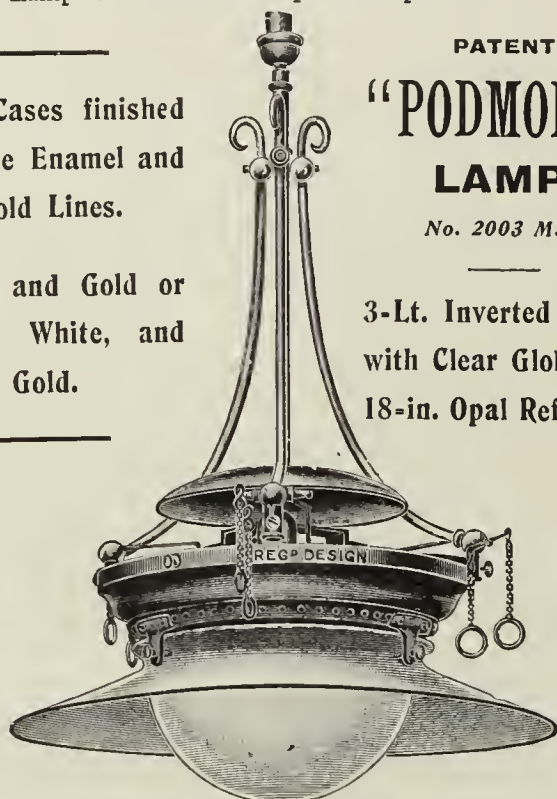
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All Parts of Lamps are interchangeable and all Wearing Parts renewable.

Each Lamp is fitted with a separate Tap to each Burner.

Lamp Cases finished in White Enamel and Gold Lines.

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**"PODMORE"
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For Coke Oven Gas.
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LARGEST MANUFACTURERS OF GAS MAIN BAGS.

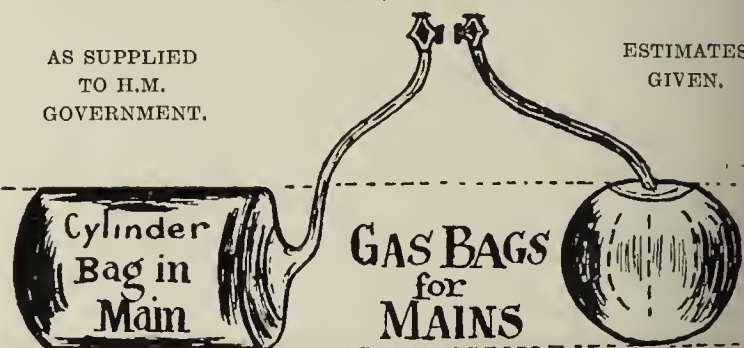
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Impervious to Main Liquor and Climatic Influences.

Oilskin Clothing, Diving and Wading Dresses, Sewer Boots, Tar Hose, Stokers' Mitts, Bellows, &c.

AS SUPPLIED
TO H.M.
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ESTIMATES
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Manufacturers,

Works:

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Messrs. ELSTER & Co. have just obtained the

HIGHEST AWARD FOR DRY GAS METERS

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Special Features: QUALITY AND PRICE.

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The Elster Meter is the result of 30 Years' experience in meter making.

Over 100,000 Meters are sold each year.

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Full Particulars on Application to—

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GRAETZIN LIGHT.

MOST IMPORTANT!

Latest Development :

600 C.P. LOW PRESSURE LAMP.

1000 C.P. LOW PRESSURE LAMP.

GAS REGULATION on the TOP of the LAMP.

All Goods are unapproachable for economy and durability.

Ask Wholesalers for Catalogue and Prices.

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SPIGOT AND FAUCET TUBES,

Seamless up to 11-inch,

Lapwelded up to the largest sizes.

ALL KIND OF TUBES, SEAMLESS & LAPWELDED,

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INCANDESCENT LIGHT POLES, INCANDESCENT LAMP PILLARS.

ARROL-FOULIS
 Stoking Machinery
HYDRAULIC COKE PUSHERS
 (HUNTER and BARNETT'S PATENT.)
WILL DISCHARGE A RETORT IN ONE OPERATION.
 LARGE NUMBERS IN USE.

Full Particulars may be obtained from the Sole Makers,
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 [See Illustrated Advertisement, Aug. 8, p. 336.]

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 Gas Engineers,
 55 & 56, High Holborn, LONDON.



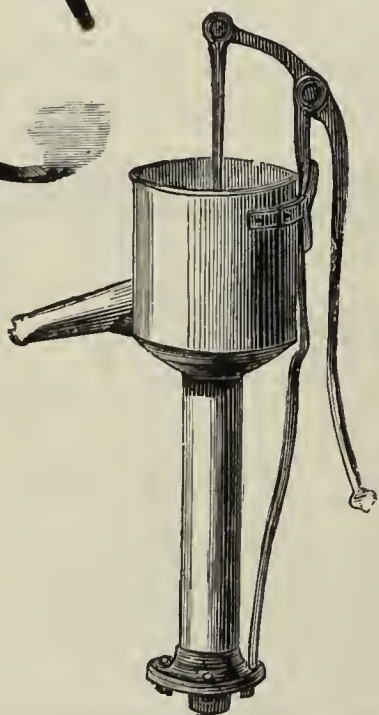
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For Small Services.
 "Light, but Powerful."

Our 'No. 49'
**GALVANIZED
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With 2½ in. Solid Drawn
 Barrel and Wrought-Iron
 Handle.

This Pattern is also made
 "All Copper."



SEND FOR LISTS.

NOTICE TO GAS ENGINEERS.

Referring to forthcoming requirements,
 we have received several unsolicited
 requests, not to alter the Composition
 of our Retorts as hitherto supplied, as
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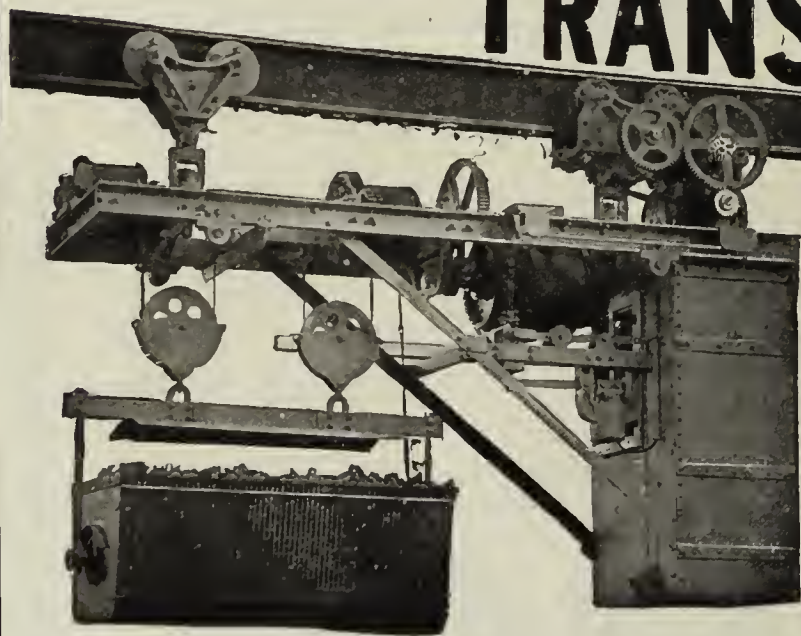
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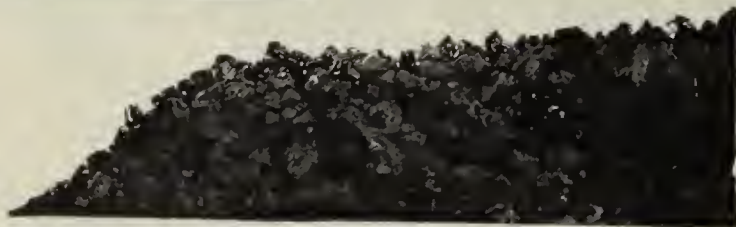
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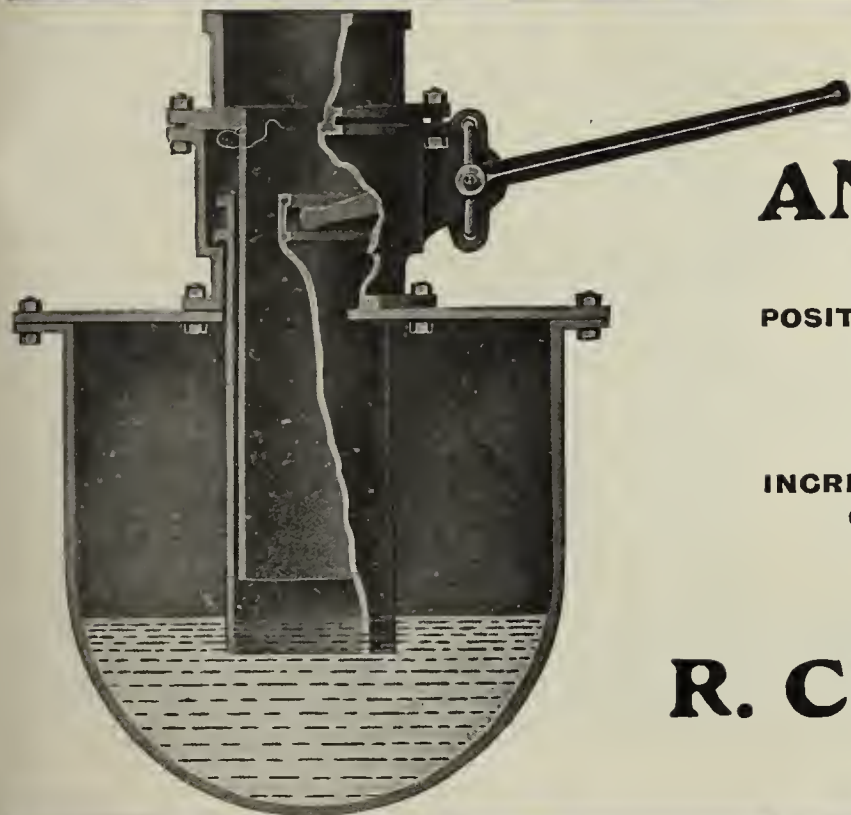
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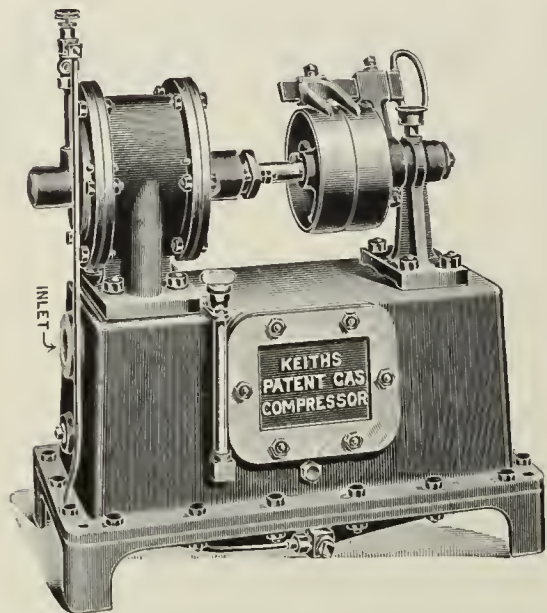
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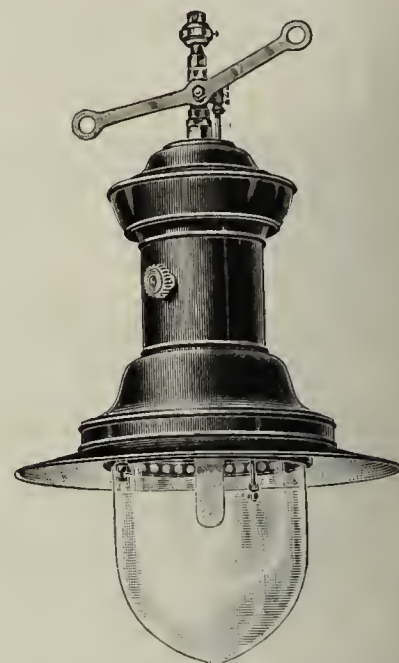
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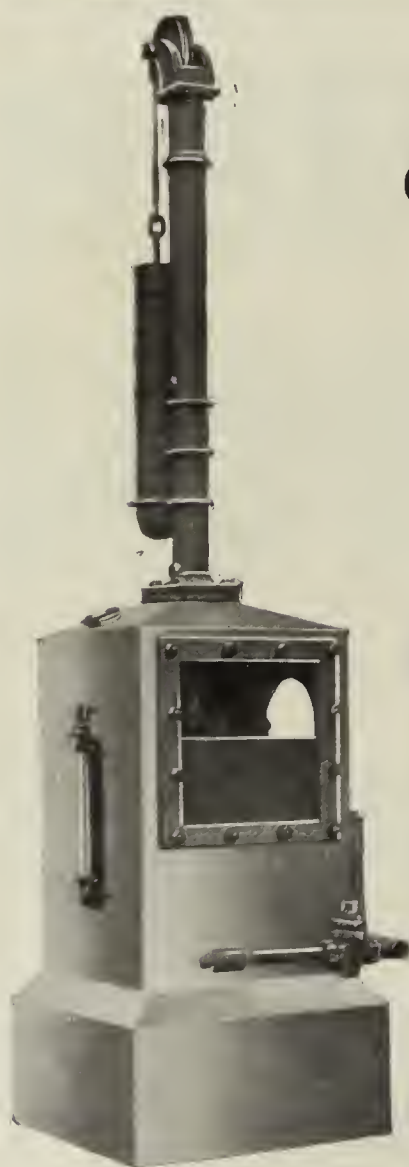
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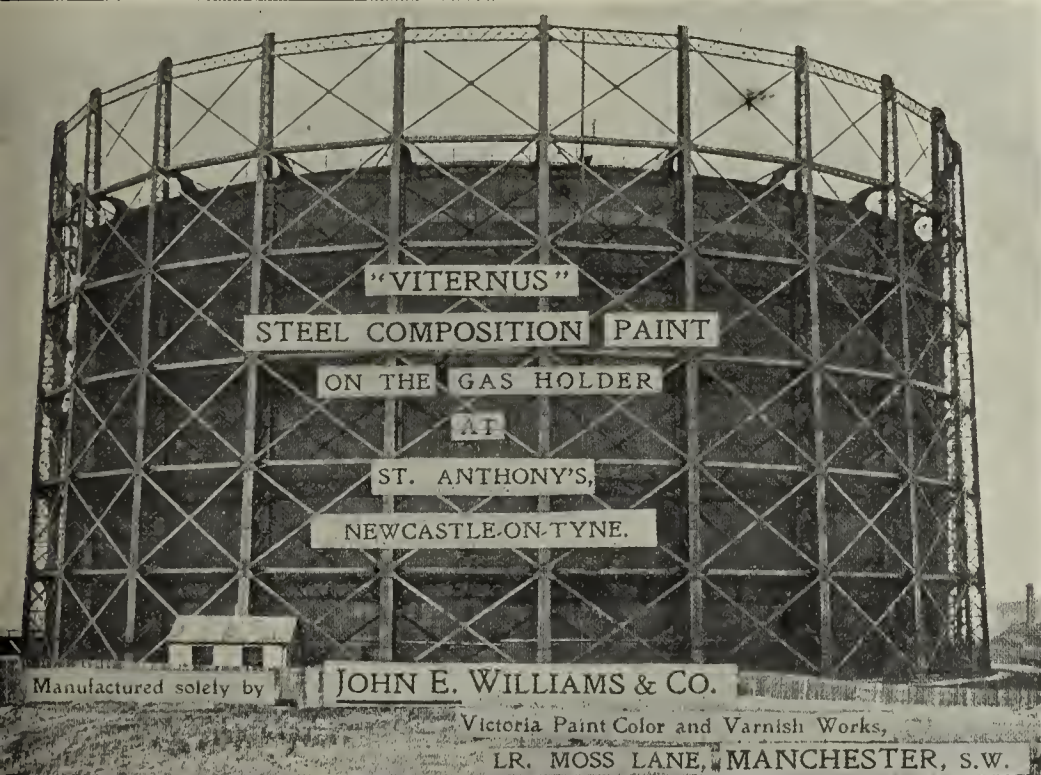
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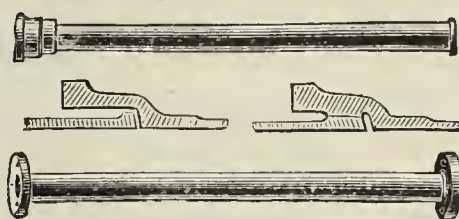
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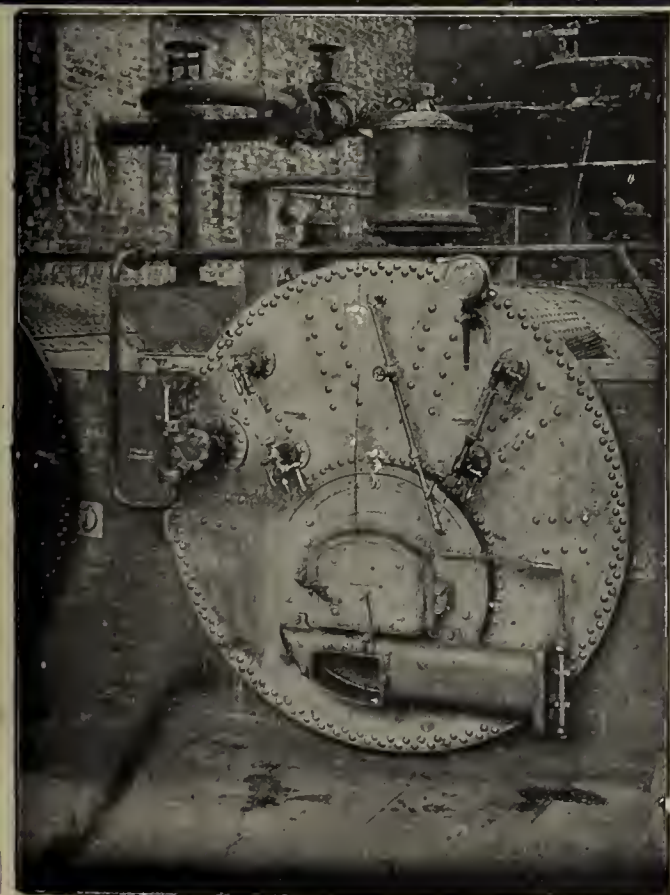
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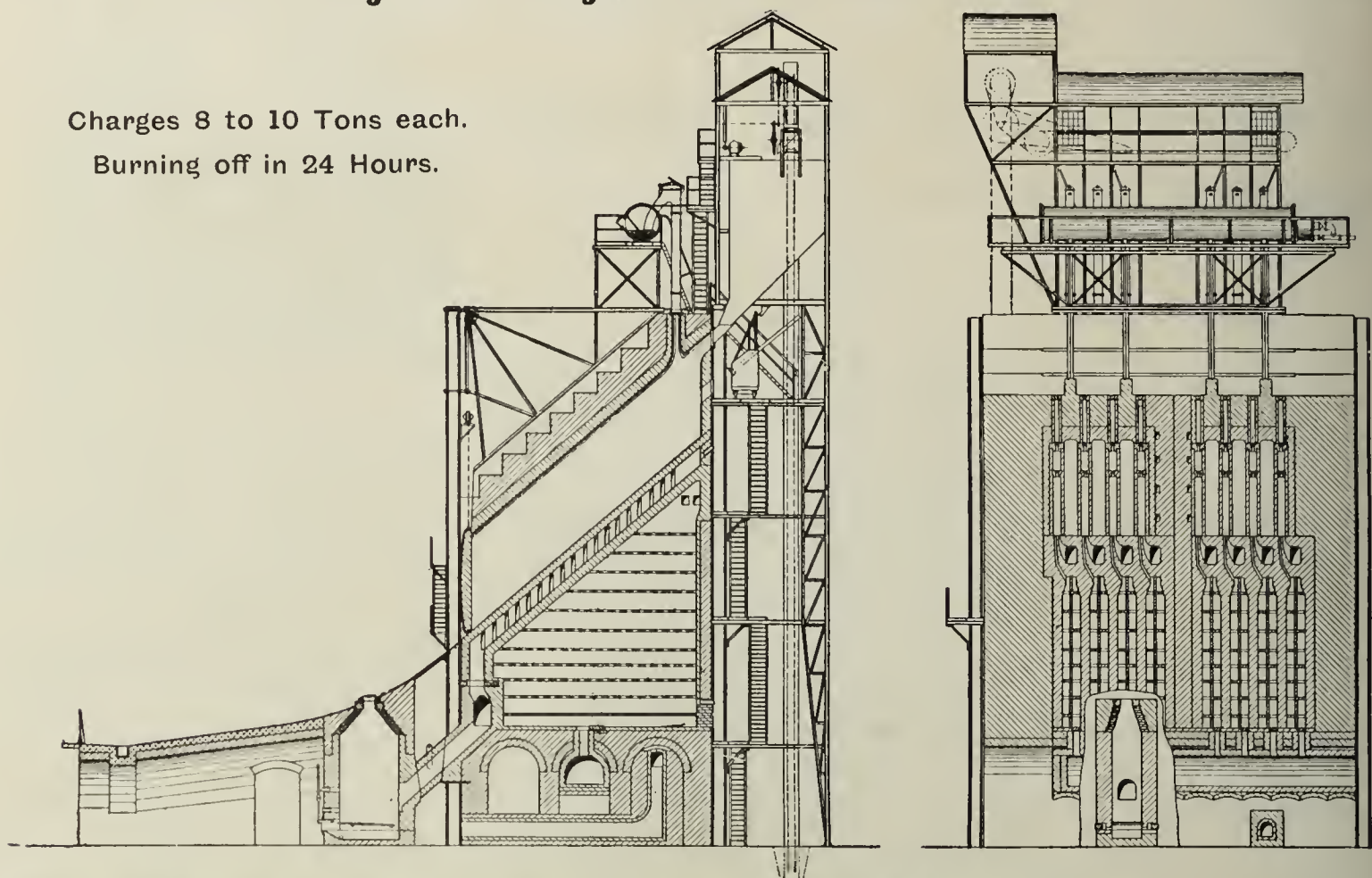
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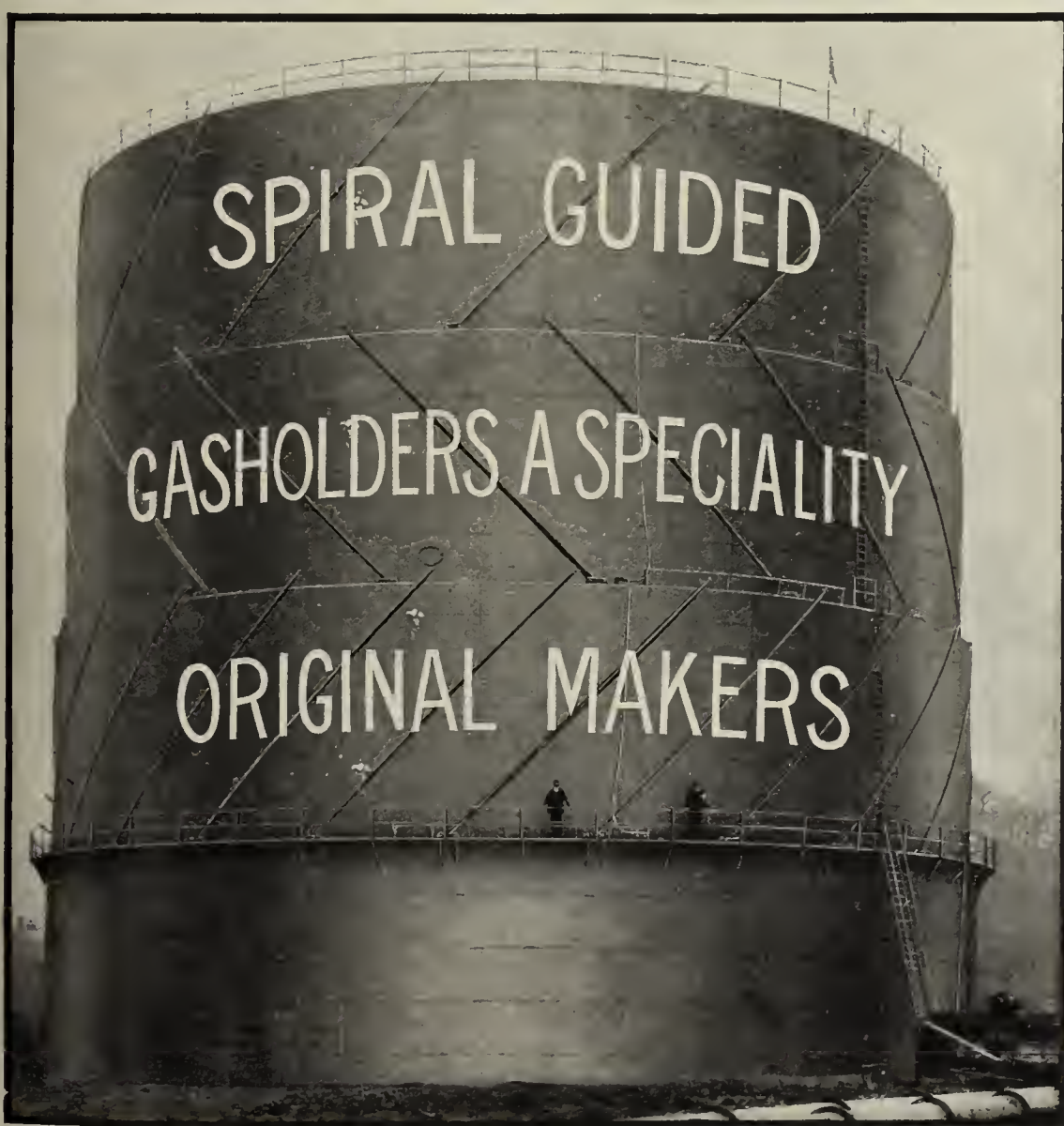


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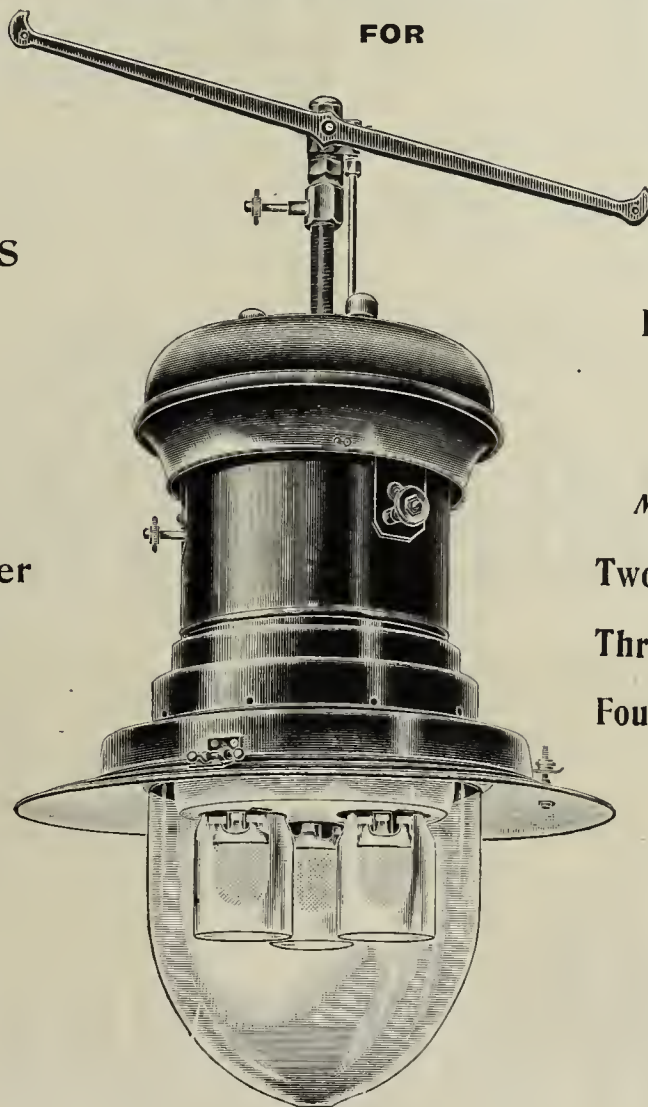
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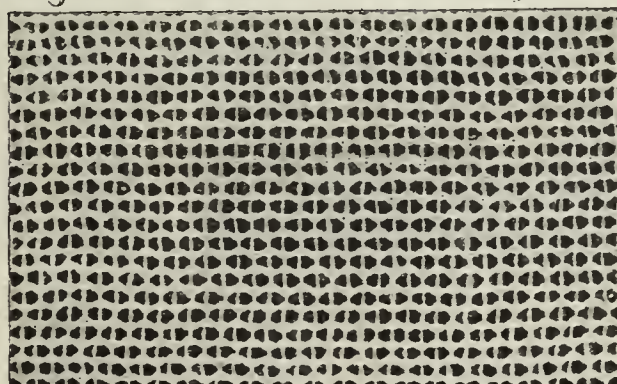
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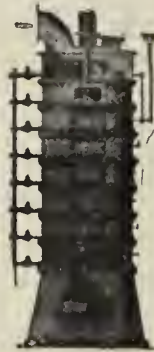


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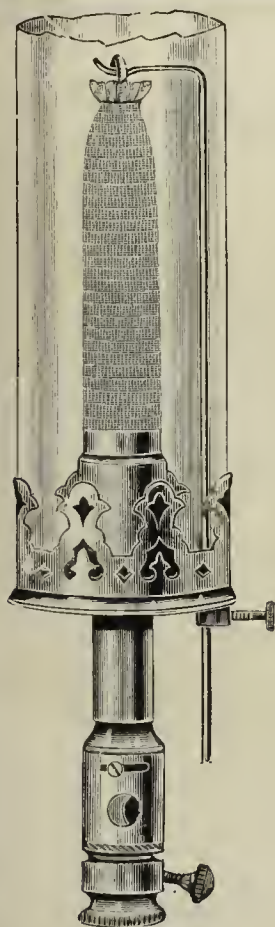
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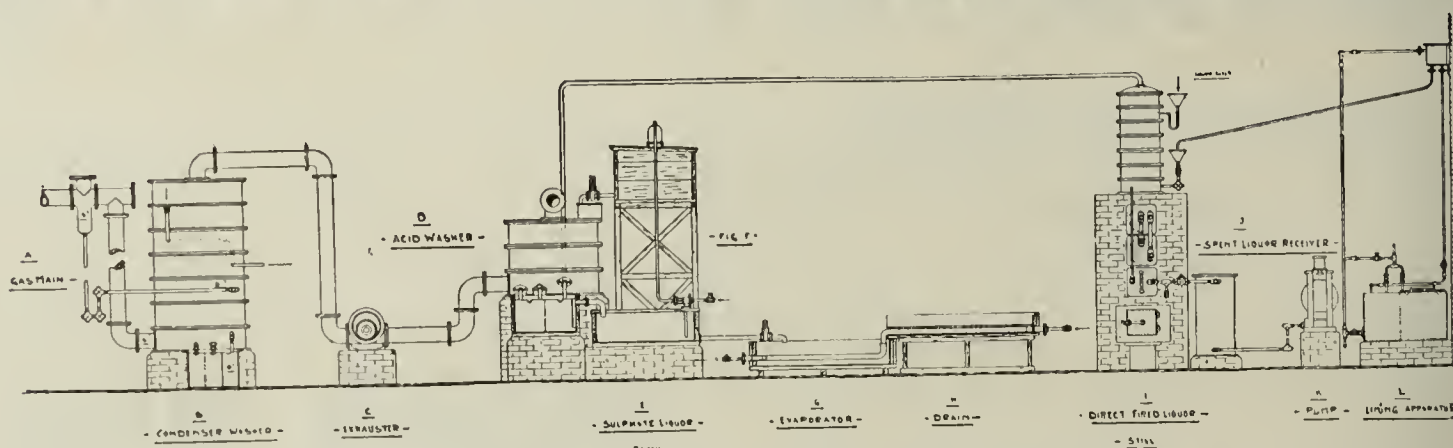
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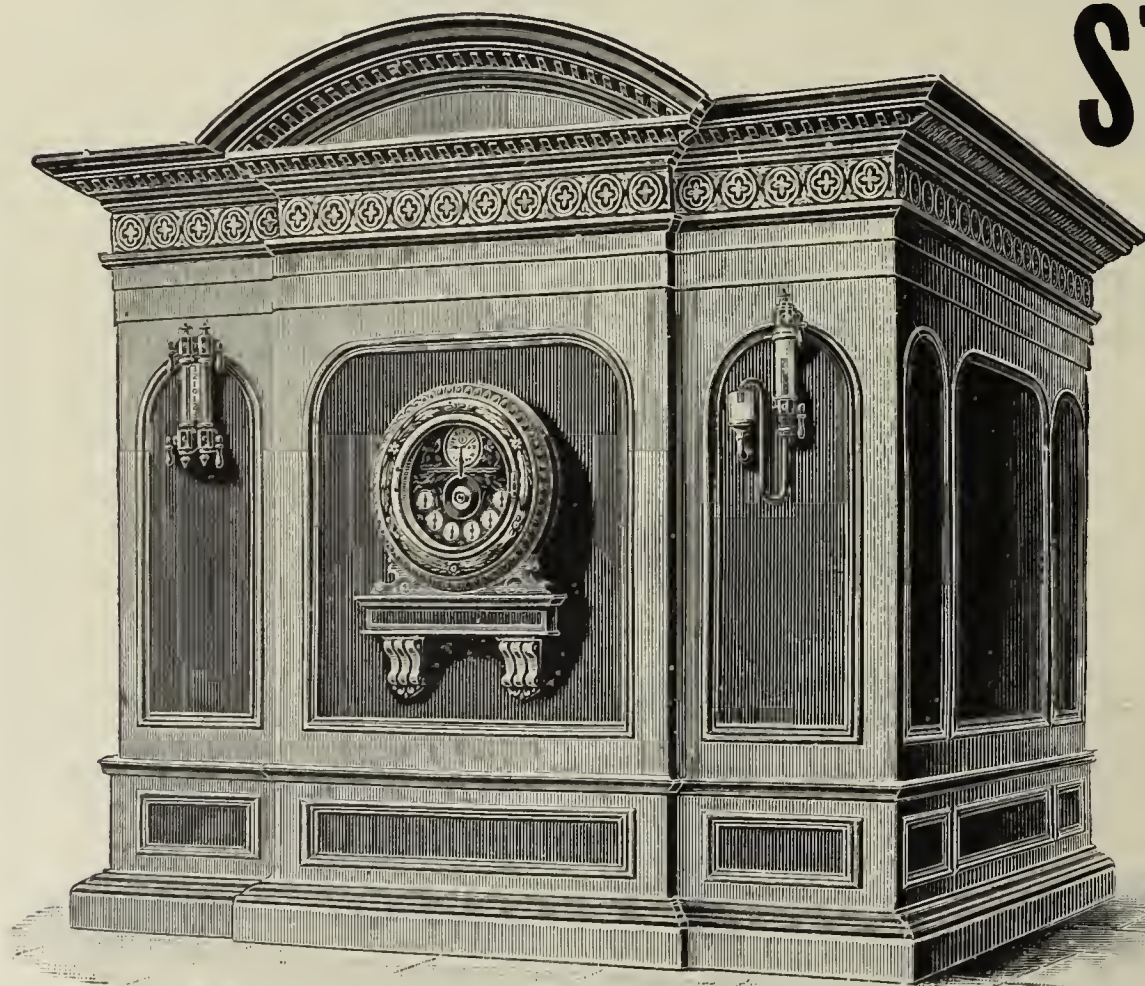
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VOL. CXV., No. 2523.—TUESDAY, SEPTEMBER 19, 1911.

EDITORIAL NOTES—GAS, &c.

Technical Gas Commissions.

THE system of Technical Gas Commissions for reporting progress in various directions, such as the Société Technique du Gaz have established, can be made of great use if the members appointed thereon take up the work seriously, and not perfunctorily. It may be submitted that such Commissions have their disadvantages as well as their advantages. In a profession such as gas engineering, every man is the better for making for himself a survey of the ever-expanding technical and commercial gas fields, and to gather from them the corn which he, in his own practice, can put to use, or which anyway increases his knowledge of what is being done in the gas industry in the matter of opening up new paths to still greater effects. The mutations in our industry are many and great; and every change seems to broaden the scope of things. Under such circumstances, Commissions whose duty it is to watch the progress of affairs, and then prepare a compendious account of it, are highly valuable even to the close student of such matters, as what is done in the nature of report serves to remind him of the facts, and to present him with the lines of thought of, and the special features that have struck, the members of the Commission. The only possible objection to such Commissions is that they rather induce the dilatory ones to become more dilatory, through the knowledge that, if they wait awhile, they will receive in a nutshell information that would demand the expenditure of time and the exercise of some amount of diligent reading to acquire the information perhaps many months earlier. But such men ultimately find their level in the profession. The existence of the Commissions would not cause the earnest student to procrastinate in the imbibing of knowledge that awaits him by the exercise of a little personal industry. Knowledge is power; and cumulative knowledge leads and draws men to the front. However, on the whole, such Commissions watching and reporting upon technical progress are of value; and if in some cases they conduce to the destruction of individual industry in the acquiring of information, the harm will only fall upon those who make the prospective reports of the Commissions their excuse for apathy.

We commence publishing to-day the reports of the Commissions appointed by the Société Technique du Gaz; and as these are but first efforts, and an introduction to work, it may be asked that they shall not be judged harshly. It is the beginning of an effort for good; and most beneficial things in this mundane world of ours have had small, sometimes very crude beginnings. With the whole of the reports before us (for copies of which we are indebted to M. Marquisan, the President of the Society), we can see that, as the members of the Commissions settle down systematically—that is to say, if they intend the result of their labours to be real, complete, and useful—to the work of collection and digest, we shall have from them something of solid worth, with all the gems of modern information in respect of advance set out in orderly manner, and the information brought close to date. To ensure that the work shall not become irksome to the members of the Commissions by the extent of their survey, it is divided between several. One Commission deals with matters affecting coal, another with manufacture, a further one with distribution, and others with application and technical training. Such Commissions want the active assistance of their fellows in the Society. Every member should be to them a reliable reporter, when anything new or suggestive comes before him. This is so especially in the case of the Commission on Coal. That body can be of vast use to the gas industry of France; but the limits of its usefulness will be set by the amount of aid received from the whole body of the Society's members. The scope of the work that the Commission hopes

to fill—the members are ambitious in their service—is a large one, and is outlined in our translation of their report. As to the Commission on Manufacture, their reports should henceforth be of greater value than the present one. As they proceed with their investigations, they will be better able to discriminate between what is not precisely new progress, and what is actual progress since their preceding report. But at the same time they have made an attempt to present in outline some of the more interesting of the modern phases of work in connection with manufacture. The Commission on gas applications are very modest; but there again, when they settle down methodically to work, they will find a vast amount of useful material from which to frame a highly instructive report. The other reports will be dealt with in future issues.

Speaking generally, some of the reports might have been even richer in information; but, on the whole, we are not—judging them as merely inceptive, and not as examples of future performances—disappointed. The system of Commissions to report upon technical gas progress is one that might be copied by other organizations, where members can be obtained who are sufficiently interested in the work to keep a sharp look-out over the period's space, to the very bounds of the subject, in order that the reports may be of actual merit and value.

Labour Contented and Discontented.

CONSIDERING the large army of labour employed by the gas industry, there is in it as little trouble between employers and workers as can be found in any line of industry. Rarely is difficulty heard of now; and, when it is, the matter is handled in a business-like way, and pacification soon enters where, under other circumstances, storm would menace. Less than a month ago, in connection with certain important gas undertakings, there were reports as to various demands; but already matters have been settled, and the bonds between employed and employers have been strengthened. The outrageous notice that was given by the Municipal Employees' Association, of the alleged refusal of the municipal unionist men in Manchester and Salford to work with non-unionists, appears to have been premature; for the men in the employ of both Corporations could not find that the non-unionists constituted a sufficiently strong *casus belli*. If other grievances can be discovered or actually exist, they are proposing to try to effect their redress by more peaceful means than throwing up their employment.

In other directions, the Gaslight and Coke Company and the Sheffield Gas Company have conceded increases of wages and other conditions, as already reported. No doubt good and sufficient reasons for this were found in the prosperity, to which the workers have contributed (more especially in the carbonizing departments), of the undertakings concerned. In the case of the Gaslight Company, the men have been dealt with in a particularly generous manner, partly through the simple means of direct communication between men and Board without unionist intermediaries, and partly by quite voluntary action by the Board. The carbonizing men, as was stated the other week have received an extra 6d. per eight-hour shift; but the Governor (Mr. Corbet Woodall) and his colleagues have gone beyond the mere question of rates of pay for service rendered. They have, as it were, penetrated into the domestic side of their men's lives by assisting them in the matter of their holidays. The co-partnership scheme has impressed the fact, which is not always present in mind through detachment from the men's private circumstances, that their holidays cause additional expense, which, if it cannot be met, means that the men and their families must spend at home the time of relief from duty. But since co-partnership was instituted, the withdrawable part of the bonus has constituted something from which the men could supplement their finances for the annual holidays; and the holidays caused a run on that part. This was just what the Board did not desire. They want the men to be co-partners in the fullest possible

reality, and to the largest extent admissible by opportunity. To save the withdrawable bonus, and increase the strength of the men's interest in the Company, it has been decided to give them double pay during the holiday week. The men have expressed their sense of gratitude; and we hope that every passing day will, by good service, deepen this feeling. We consider the action of the Board must inevitably have the effect of drawing still tighter the bonds of sympathy existing between the Company and the men. In the case of the Sheffield Gas Company, too, as we were quite satisfied would be the case, the men have been handsomely treated, and have expressed their appreciation. They are to receive an additional 3d. per eight-hour shift; and able-bodied men not specially dealt with are to have 1s. per week added to their wages. As we say, these concessions would not have been granted without the Directors saw full justification.

But the position in the gas industry stands in strange contrast with all recent happenings in the outside labour world, and with all the raucous talk that there has been at the Labour Congress and elsewhere. At the congress, there appeared to be more discord, more violent declamation, and more discontent than ever. The delegates met in an aggressive spirit; and the wake of the preceding labour wars was visible throughout the proceedings. The Government were attacked, capital was slandered, all the measures before the country conceived specially in the interests of labour were severally kicked from pillar to post on account of defects as seen by those who boast that they are the leaders in the grand march of the democracy. But the most patent thing about the congress, as also about the inquiry by the Railway Commission, is that trade unions have set their faces against conciliation and arbitration schemes. There may be a patching-up, or an attempt to rectify; but the result will only be temporary. Conciliation and arbitration are regarded as obnoxious to the principle of combination; and a more militant course of procedure accords with the tastes of the Socialistic leaders of the trade unions of to-day. "Let us have concerted action to enforce our demands" was the top note of the congress proceedings. At the Railway Commission inquiry, it was professed that the unionists do not want strikes any more than they want conciliation and arbitration; but they do desire "recognition" of the unions, and unimpaired the right to enforce their demands by striking. And it is the aim now to abandon sectional strikes, and to have them on the superlative scale. So it has come about that a resolution was passed at the congress proposing the formation of a central body to be composed of all the various trade unions and societies for the discussion of trade union and other matters. Imagination flew from this to the question of the efficacy of a universal strike. The objective, in short, is that the world is to be brought to the feet of unionist labour, and that all the elements of humanity, save the portion that is controlled by the ultra-Socialists of the world, are to have all power crushed out of them. They are to be impotent, and subject completely to the will of trade unionism. That is the vision of certain disordered brains in the present; but visions—well, they frequently remain in the incorporeal form.

There are, however, the non-unionists. They constitute a powerful antagonistic force to trade unionism, and its socialist and militant leaders. Their position has been robustly stated at the Railway Commission inquiry. Recognition of the trade unions is not to their liking. They have a preference for conciliation, and a yet greater preference for conference direct between Boards of Directors and the workers. Recognition of the unions, they also assert, would mean that the non-unionists would be subject to interference and intimidation, and would be compelled in self-protection to join the unions against their will. They object, too, to be ruled by bodies having extreme socialists at the head. There is sense in the non-unionist contentions; and the men's case, which was a plea for freedom from union manacles, for justice, and for protection, has not lightened the difficulties of the Commission in framing a report and recommendations that will satisfy the most discontented party to the issues under investigation.

Use of Air in Gas Manufacture.

THE incandescent burner has been a valuable aid to the gas industry in more ways than that of its original purpose of increasing the volume of illumination per unit of gas expended. Had it not been for the incandescent burner, it

would have been next to impossible to have made the considerable developments in the gas business in the cooking and heating fields and in industrial use that have been accomplished, and which will yet be accomplished through energy and time. The impression the burner has made upon gas manufacture and in effecting radical changes therein is incalculable—as incalculable as is the definition of the limits of its future aid in the same direction. Mr. William Key, in a paper that he read before the North British Association, visioned further ability that it places at command; but there will be a desire to know much more about his proposal than is vouchsafed in the paper. The idea of mixing gas and air in bulk prior to the point of combustion for incandescent lighting has long been among us and practised; and the fact that a considerable prior dilution of gas with air, providing there is thorough admixture, has a beneficial effect on the illuminating power of incandescent mantles has been observed by various experimentalists. The fact, also, that a fairly wide difference of calorific power has no appreciable effect upon the illuminating power of an incandescent mantle is also well known; and in this connection Mr. Key reminds of Mr. Walter Grafton's experiments, which show a lessened consumption of an air-diluted gas compared with an unadulterated low-pressure gas, with a gain of illuminating power.

Following the chain of circumstances leading up to Mr. Key's plan, air in measured quantity has long been introduced into purifiers for revivification purposes. He now goes beyond this, and suggests that all the known good advantages of the use of air with gas, and more, can be obtained by breaking down the illuminating power of high-grade gas by the introduction into the hydraulic main, in measured quantity according to requirement and under pressure, by means that he has devised, of air pure and simple, or air lightly carburetted with petrol. The proposition is an interesting one; but we wish that Mr. Key had gone farther into certain details and considerations that constitute essential knowledge in the deliberation of this matter. He has had the process in use in a small gas-works for some months; and it would have been beneficial to have had additional information as to his experiences.

We want to know more of the advantages of introducing air at the hydraulic main. Unless some economic or other benefit is to accrue from admission at this point, it would be quite unnecessary to call upon the plant and connections to deal with the part of the volume of the mixture represented by air. More knowledge is likewise required as to the corrosive effect upon plant, and as to the effect upon purification of larger and variable quantities of air than it is the present practice to introduce for revivification purposes. It has also to be remembered that lighting is not the only use of gas, and that calorific power is of importance in respect of other use. Of course, the answer to this will be that the proposition applies more especially to places where gas rich *per se* in illuminating power is produced, that the general economy and lower price will compensate, and, not only so, but the gas will be more suitable for all purposes in which an atmospheric flame is used, in consequence of the better admixture of the gas and air. But we picture a big disturbance of the conditions under which gas is utilized by adopting Mr. Key's plan. Information upon the point as to the cost of the system in working when using petrol-carburetted air would be of interest, in comparison with the cost of effecting the same objects with gas of higher calorific power produced by a carburetted water-gas plant, and at a cost to-day far below that quoted in the paper as obtaining nearly twenty years ago.

There is, further, the question as to deposition in the distribution system when petrol is used for carburetting. Mr. Key has had experience in a district of limited area; and his views as to the use of the process in connection with the gas supply of a district of extensive area would be of some value.

Suction Gas—Test and Works Conditions.

THE British Association, it will have been seen from the abstract of the paper by Mr. W. A. Tookey published last week, has again been the vehicle for the dissemination of information, more or less fresh, concerning the suction-gas engine and producer. The feature of the paper is that Mr. Tookey acknowledges, with perfect candour, that there is what was once described as a *per contra* side to the economic advantages of such plants as advertised by the makers. It

was, of course, impossible that the advertised performances of these plants under test conditions could for ever keep under cover the disadvantages and the cost leakages that take place under working conditions. And so the other side of the question has now to be met. Mr. Tookey points to some of the items that have to be set against the manufacturers' claims. But he also, like a true advocate, lightens them as much as possible; and the abstracts of the paper that we have had an opportunity of perusing do not suggest that, in his summary, he compassed the whole of the working experiences that go to discount or to modify the manufacturers' statements.

On the point as to fuel, Mr. Tookey frankly agrees that test conditions are not those that obtain in everyday working, when the attendant's ability, care, negligence, and so forth, the variability of gas demand, and the diversity in the quality of the fuel, all come in for reckoning in disestablishing the claim of the manufacturers to a fuel account of under 1 lb. of anthracite per brake-horse-power-hour. It may be that the manufacturers' claims in this respect are met under conditions of working that are exceptionally favourable. But that is not the case in all circumstances; and the low figures mentioned by Mr. Tookey as having been derived from working cannot, therefore, be taken as having common application. There is a cognate point. A great fuss is made about town-gas authorities being empowered to impose a stand-by charge where suction and other producer gas is employed; and we remember Mr. William Crossley's allegation, at a former meeting of the British Association, that gas managers had threatened to "boycott" users of suction-gas plants—a thing that is impossible under the existing state of the law relating to gas supply. But this all goes to show the recognized importance of the town-gas supply to the users of suction gas plants for starting-up and for use when their producing plants are let down to clean and repair. All such utilization of town gas—imperative as it is when works' time and expenses are matters for consideration—ought to be included in the average fuel costs. There are many other losses that are unavoidable in daily working in comparison with the standard set up by the plant manufacturers' private tests under conditions that are in every respect extremely favourable to the plant. Contrasts with working results indicate that the figures published are obtained in tests made with new plant, with skilled attendants, and under full and constant loads; and the difference between the figures is one that has produced dissatisfaction.

In the matter of fuel cost, the attendant can exercise influence by the amount of care he expends; but he is hopelessly foiled by works' circumstances over which he has no control in his attempt to reach the product of tests most propitiously conditioned. As to the cost of attendance, this is one of the points that the manufacturers do not regard as of importance when talking of the financial side of the question. Mr. Tookey mentions it, and points out that this item must vary according to the conditions of every works, and we may add according to the rates of wages obtaining in various districts for men of skill and intelligence. Again the abstracts of the paper afford no satisfactory evidence as to wear and tear and renewals. The costs thereunder must vary according to the usage of the plants; and the costs will, employing in the engine a gas somewhat crude and variable in composition and quality, be of increasing amount with advancing age. Apart from the trouble with tar, suction gas has a corrosive action upon the parts of the plant and engine upon which it impinges to an extent that does not (in the case of the engines) occur with town gas, but which became evident with the introduction of suction gas. Then, again, the more repair that is needed in comparison with town gas, the greater is the time lost. Furthermore, Mr. Tookey cannot give any reliable particulars as to the consumption of water for washing the gas, for generating the water vapour in the producer, and for cooling the engine cylinders.

We do not find anything in the abstracts of the paper as to the eventual disposal of the effluent, or as to the cost of treating it, in order to dispose of it in a manner that will not be objectionable to the powers that be. On the whole, there is much left in the way of missing links to complete the chain of evidence as to the actual expense of suction-gas plants. But this we know, that between the anticipations and the realizations of the manufacturers who adopt suction-gas plants, there is a gulf that cannot be bridged under their everyday working conditions.

Specification for Street Lighting.

The coming season for technical meetings will undoubtedly see this question well to the fore; and we shall look forward to a definite report from the Committee of the Institutions of Electrical and Gas Engineers and of the Illuminating Engineering Society bearing upon the matter. Meanwhile, the extracts that we have given from the replies to the inquiries on the subject circulated by the "Illuminating Engineer" among lighting experts abroad, are, to a certain extent, valuable, but the variability of the expert opinion rather defeats the object of affording guidance. The opinions of the Photometric Committee of the Austria-Hungary Gas and Water Association [*ante*, p. 661] are particularly interesting. The Committee are of opinion that the candle power of lamps should be specified; and when a critical comparison of existing examples of street lamps is in question, the consumption of gas or electricity should also be stated. We are quite with the Committee (if we read their replies correctly) that specifications should be as free as possible from conditions that would involve laborious street testings. For instance, they consider the process of testing the minimum illumination in the streets would be a tedious one; and we can imagine the difficulties and tediousness of the work would, after a time, result in it being done in a perfunctory manner, which would be unfair to the lamps, and might possibly lead to much dispute. Where, however, measurements are made, they should be on the horizontal plane.

Other Suggestions and Difficulties.

The Committee are further of opinion that for purposes of street lighting, the mean lower hemispherical candle power should be considered, and that this should be specified in contracts. But there a very "tedious" process is being recommended, and would not be practicable for extensive testings in the streets. But it would appear that the Committee contemplate laboratory testings, as a means of checking compliance with the conditions of the contract, as they regard testings carried out in the streets as unreliable, though periodical tests for candle power and illumination there would undoubtedly be of advantage in ensuring the efficiency of lamps being maintained. But it would be quite impracticable to be constantly removing street lamps to a laboratory for checking compliance with the contract conditions; while, on the other hand, we know that lamps tested in one locality, through the unpropitious conditions of the surroundings, will give low readings, while, under the more favourable conditions of another situation, the same lamps will, without any other change, give higher readings. Under the former circumstances, if the lamp renders the required actual candle power under standard conditions such as obtain in the laboratory, it would be unfair for it to be the subject of penalty through the detrimental effects of external conditions. The whole subject is beset with much difficulty.

Hot Water Supply.

The controversy continues in "The Times" on the subject of domestic hot-water supply. Mr. R. Herzfeld appears to have a predilection for hot-water supply distribution from a central station, which blinds him to any merit in any other system of obtaining hot water in the household. He does not see any particular good in the information given by Mr. Frederiek Dye as to the independent provision, by means of a gas-boiler, of a supply of hot water as required in a dwelling. He does concede that, if "the present difficulties as regards the safety of such apparatus are overcome, the proposal is certainly a step, although only a timid one, in the right direction." The point as to safety is evolved from the imagination of an advocate of another system. But we proceed. "Apart from the susceptibility of automatic regulating devices, the cost per 100 gallons, including interest, depreciation, repairs, and so on, looks prohibitive." That is vague. To us, it seems, the very same words may be applied, *a fortiori*, to a distributed hot-water supply from a central station, besides which there would be unavoidably serious thermal losses, and the consumer would have no control over the temperature of the supply. It is true we satisfy most of our daily requirements by supply from outside our dwelling-places; but hot water is a requirement that can be better and more economically satisfied from within. Mr. Herzfeld's system would be costly, even if effective in service. That it would be effective is problematical; that there would be much loss and waste is certain. Water heating by gas is not a thing to be summarily dismissed to-day.

ROBERT MORTON.

THOUGH he had passed, by some years, the allotted span of three score years and ten, the news of the death of Robert Morton comes to us with a suddenness that causes a depression of spirits, and a feeling that a fresh gap has been made in our lives and in personal friendship that it will be hard, we may say impossible, to fill. His death breaks an uninterrupted connection, through the gas industry, from our youth up; and as we stand and peer through that long vista of time during which his name and person have been with us as gas engineer and administrator and friend, the journey—long as the vista is—now appears at the close of his life to have been remarkably rapid. We mourn his loss. We regret profoundly that we shall not gaze again upon those strong, rugged, yet benevolent features—usually, in latter years, grave, but through which gravity the kindly nature penetrated.

There are few men such as Robert Morton has been. He was not conspicuous in public ways—his reserved nature would not allow him to be. But somehow one ever felt, and one could not exactly say why, that he was a tower of strength, and always induced confidence. As an engineer, his advice was sound; and as a manager and administrator, those who knew him set a high valuation upon his tact, judgment, and comprehensive grasp of affairs. He was a strong man in all these things, and was not conservative. There was not about him as a gas administrator any bias the product of early practice and method; but to the last, his mind was ever receptive of necessary changes and advances, with a quick appreciation of opportunity. He was a progressive by nature; and he would always rather let his own individuality and ideas stand aside rather than allow any concern or proposed development to suffer by attempting to insist on the acceptance of any view that he appreciated might be defective through his detachment from official activity. He was not a man of many words; but his words crystallized extensive thought, and that one felt as he spoke. The voice, with its Scotch accent, is now silent. The native caution, which was as a brake to a progressive inclination—so making for mature consideration, and giving just the requisite steady force to more impulsive natures with whom he might be working—is a characteristic of which many of his colleagues have acknowledged the value.

We will not say anything further in this little appreciation of his personal traits, except that those who knew him best will miss him most; and to those who knew him best, our and our readers' sympathies go out mingled with the deepest sorrow.

Death has removed—to the sorrow of a large circle of friends in the gas industry—in the person of Mr. Robert Morton, a man who was closely connected with the earlier history of the gas supply of London. While staying at the Bournemouth Hydro to recruit his health, Mr. Morton was taken ill with pleurisy; and on Thursday the doctor in attendance on him advised that the following day he should be removed to a nursing home. During the Thursday night, however, he passed quietly away; the immediate cause of death being heart failure. Those who saw him at the recent opening of the Livesey Memorial Hall, realized that his strength was failing him; but none thought the end so near. The funeral took place at Bournemouth yesterday morning.

Mr. Morton, who at the time of his death was in his 77th year, served his apprenticeship, we believe, with Messrs. H. Balfour and Co., of Leven, and acted as their representative in various parts of the country, until his appointment as Engineer of the Woolwich Gas-Works. From Woolwich he went to the Vauxhall works, then belonging to the Phoenix Gas Company, of which he became Superintendent, in succession to Mr. Douglas. On the retirement of Mr. David Watson, Mr. Morton was appointed to succeed him as Engineer to the late London Gaslight Company, who had works at Nine Elms and Vauxhall; the latter works being abandoned some few years afterwards. On the amalgamation of the London Company with the Gaslight and Coke Company, Mr. Morton retired, and was succeeded by Mr. John Methven, who had been acting as his assistant in succession to Mr. Charles Hunt when the latter gentleman went to Birmingham. At Woolwich, Mr. Morton had for a pupil Mr. Corbet Woodall, who left him to become Manager at Stockton-on-Tees, and succeeded him as Superintendent of the Phoenix Gas-Works, Vauxhall. Mr. Hunt was an assistant at Nine Elms when Mr. Morton became Engineer; he having been appointed assistant to Mr. David Watson in 1866. Mr. Morton's appointment dated from about 1868; and Mr. Hunt remained with him until 1872. During this time, Mr. Morton had a pupil named White, who afterwards became Engineer to his old works at Woolwich, and remained so until the works were bought by the South Metropolitan Gas Company. Then there was Mr. John Methven, who had only been a short time in Birmingham when Mr. Hunt went there, and left that town to succeed Mr. Hunt at Nine Elms. The late Mr. Alfred Colson (of whom Mr. Morton always entertained a high opinion) was Clerk of Works over the then new gasholder station at Battersea for a year or two before joining Mr. Hunt in Birmingham. Mr. Alex. Wilson, of Glasgow, was foreman at Nine Elms after Mr. Hunt's time, and left to become Station Manager under Mr. Foulis. Mr. Robert Johnston (the father of Mr. A. A. Johnston, Engineer to the Brentford Gas Company) also served under Mr. Morton at Nine Elms.

After his retirement from active gas-works management, Mr.

Morton was still able to turn his knowledge and experience of the industry to good account, by joining the Boards of several undertakings. He became a Director of the South Metropolitan Gas Company in 1886; of the Monte Video Gas Company, in 1887; of the Hong Kong and China Gas Company, in 1897; and of the South Suburban Gas Company, in 1899. In the welfare of all these Companies he took a keen interest up till the last. On the death of Sir George Livesey, Mr. Morton temporarily occupied the chair of the South Metropolitan Company, pending the time when a definite decision could be come to in the matters of the new Director and the future Chairmanship. In 1872, Mr. Morton was admitted as a member of the Institution of Civil Engineers; and in 1876 he filled the position of President of the British Association of Gas Managers.

The working man always had a friend in Mr. Morton; and his successful effort (in conjunction with the late Sir George Livesey, always a close friend of his) to arouse widespread interest in the question of the abolition of Sunday labour in gas-works is a case in point. As long ago as 1870 he read a short paper on the subject before the British Association of Gas Managers, the result of which was that the matter was referred to a Committee (to whom the question of the propriety of forming a Benevolent Fund in connection with the Association had also been remitted), with instructions to make inquiries and report to the next meeting. Of this Committee, Mr. (afterwards Sir) George Livesey was Chairman.

An Appreciation, by "C. H."

Mr. Morton's influence for good was scarcely less than that of his life-long friend, the late Sir George Livesey, though less apparent to the public eye. Sir George found in him a staunch, sympathetic, and withal judicious, fellow-worker. No two men could be more unlike in some respects than these were; and perhaps for this very reason they were united to each other. Mr. Morton's sound judgment and shrewd common sense were greatly valued by Sir George, whose entire confidence he possessed.

A reputation for sternness preceded him at Nine Elms; but this proved to be but the firmness by which order is brought out of chaos; and there were those who had reason to be thankful for having been brought under his influence. In reality, a somewhat uncompromising exterior covered one of the kindest of hearts; and, while inflexibly just, he knew at the same time when and how to be merciful. He was sparing of words, but had the rare gift of being able to say the right thing at the right moment; and his plainness of speech not seldom meant confusion to those who were unaware of the power which was held habitually in reserve. As an instance of this, may be mentioned his memorable encounter with the late Cardinal Manning, which occurred in connection with the first Dockers' strike fully twenty years ago. At the end of an abortive conference respecting the wages of the waterside coal men, at which Sir George (then Mr.) Livesey and he represented the South Metropolitan Company, the Cardinal, pointing with his finger to Sir George, said, "I have heard of you, Sir, and now I have seen you; and I tell you that you are the cause of all this trouble." Whereupon Mr. Morton promptly took up the cudgels; told the Cardinal that he did not know what he was talking about; and with a very few more words effectually silenced him.

Having gone "through the mill" himself, no one knew better than Mr. Morton did the conditions under which work has to be performed; and he was in every sense of the word a true friend of the working man. His voice was always raised in favour of dealing liberally with employees of every grade.

OBITUARY.

The death has occurred, at the age of 89, of Mr. JAMES GOODWIN, who was for thirty years connected with the Rotherham Gas-Works, and during the latter part of the time acted as Manager. He retired on a pension from the service of the Corporation in the year 1892.

The South Shields Gas Company have lost another member of their Board of Directors. After a short week's illness, Mr. WILLIAM BELL READHEAD died at South Shields last Friday morning. His illness came on suddenly. He was present at the funeral of the late Dr. Armstrong at Harton Churchyard the previous Friday, attending as one of the Directors of the South Shields Gas Company, but at that time he complained of being unwell. Subsequently he was found to be suffering from appendicitis, with peritonitis supervening. The deceased gentleman, who was fifty years old, was the fifth son of the late Alderman John Readhead, the founder of the firm of Messrs. John Readhead and Sons, West Docks, South Shields.

The industry has lost an earnest worker in connection with the automatic lighting and extinguishing of gas-lamps by the death of Mr. GEORGE ROBSON, which took place last Saturday week, at his residence in Clarence Gate Gardens, Regent's Park. After spending twenty years in Australia, he returned to this country in May, 1908. Some five years ago, he patented a street-lamp controller; and since then his name has become widely known as that of the inventor of the "Automaton" system. Mr. Robson took a keen interest in this subject, with which he was eminently fitted to deal; and as the result of his investigations, he was led to pin

his faith absolutely to a mechanical (clockwork) device operated by pressure waves. His patents were taken over by Auto-Lighter, Limited, of Victoria Street, S.W. While in Australia, Mr. Robson was connected with the mining industry, and was Chairman of many Mining Associations, &c. He lived at Coogee, Sydney. Last year he joined the Evening Star Masonic Lodge.

The death is announced, as having taken place on the 7th inst., of Mr. G. N. ARCULUS (aged 57), a partner in the firm of Alfred Arculus and Co., of Birmingham. The firm have always made a specialty of high-class glassware for lighting purposes, and were among the first to take up the manufacture of incandescence gas-globes. Their interest in this trade led them to experiment in the manufacture of burners; and eventually they produced the "Etna" incandescent burner, the success of which was such that the Etna Lighting and Heating Company, Limited, was formed to work it.

PERSONAL.

PRESENTATION TO MR. W. E. PRICE.

It is a pleasure to be able to record that Mr. W. E. Price, who has just completed twenty-five years' work as Engineer and Manager of the Hampton Court Gas Company, has had the gratification of being presented by the Directors of the Company with a gold watch, a cheque, and an illuminated address in commemoration of the event, and in appreciation of his services. Though it is a long period, the twenty-five years referred to does not embrace the whole time during which Mr. Price has been connected with the undertaking. He joined the Company about the year 1877; and it was in 1886 that he was appointed Engineer and Manager to succeed his father, Mr. E. Price, who retired then (and is still, we are glad to know, in good health), after serving the Company for thirty-five years. As has already been announced, the employees and staff of the Company presented Mr. and Mrs. W. E. Price with a silver salver and an album with the names of all the subscribers inserted, in celebration of their silver wedding, which occurred in June last. Mr. W. E. Price, it will be remembered, was President of the Southern District Association of Gas Engineers and Managers in 1902; while he at the present time occupies the position of Hon. Secretary. He is also the Chairman of the Commercial Section of the Association, and was instrumental in bringing before a Conference of Commercial Sections the pressing need of a "Publicity Campaign."

A copy of the August issue of a Japanese monthly, "The Musashino," to hand contains the announcement of the marriage, on July 20, of Mr. SHIGEYOSHI SUZUKI, of the Tokyo Gas Company, to Miss Kishi. The marriage was solemnized at the Daijingu Shrine at Hibiya. A dinner and reception were given at the Imperial Hotel, Tokyo, in celebration of the event.

The post of junior assistant to Mr. R. Nelson at the East Hull Gas-Works (advertised in the "JOURNAL" of the 5th inst.) has been filled by the appointment of Mr. SYDNEY HOLE, of Leeds. Mr. Hole has been trained at the Leeds Gas-Works under the Chief Chemist, Mr. A. Edwards, and holds a first-class "Honours" certificate in "Gas Engineering." He is the eldest son of Mr. Walter Hole, of Leeds.

At the last meeting of the Windsor Town Council, reference was made by Alderman Clarke to the retirement of Mr. C. SAINTY, the Water-Works Manager, after many years' service in connection with the Corporation. He said he was sure it was the wish of every member of the Council that Mr. Sainty might be spared many years to look back upon the times when he had tried, if any man had, to do his duty. He moved the following resolution, which was carried: "That the best thanks of the Council be given to Mr. Sainty for his long services and for the loyal and steadfast way in which he has carried out his work." Mr. Sainty returned thanks.

The annual outing, at Bournemouth, of the staff and employees of the South Hants Water-Works Company was made the occasion for some interesting presentations. Mr. GEORGE GREENSLADE, the retiring Manager, was handed, on behalf of the employees, a beautifully executed illuminated address, which read as follows: "We, the employees of the South Hants Water-Works Company, learn with deep regret of your decision to resign the position of Manager after 32 years' strenuous and faithful service to the Company. We heartily unite in offering you the accompanying gift as a small expression of our esteem, and in recognition of the many acts of kindness and goodwill which you have shown to one and all under your charge. While regretting the severance of the happy relationship which has always existed between us as manager and workers, our best wishes follow you in your retirement, and we express the hope that you may be spared many years to enjoy your well-earned rest." Mr. Greenslade, in responding, said he had received a very handsome silver salver with the names of the Directors inscribed on it. Though he ceased to be an official of the Company, he hoped to be spared many years to enjoy their friendship. A silver butter-dish and cruet were subsequently, on behalf of the employees, handed to Mr. W. G. Greenslade, the son of the retiring Manager, on the occasion of his marriage. This was suitably acknowledged; and the health of the new Manager (Mr. Dawson Kitchingman) was then drunk.

ELECTRICITY SUPPLY MEMORANDA.

Where Travellers Sleep—Wood Casing and Electric Wiring in Hotels—The Immovable Caterers—"Ignoramus!"—Secret of the Success of High-Pressure Gas-Lamps—The "Electrician's" Erratic Moods—A Nasty Collapse.

THERE is anguish among electrical folks in the Metropolis; and our friends of the Electrical Press are sharing in it. It has been announced—and it is looked upon as an "alarming suggestion" that the Building Committee of the London County Council are considering the question of promulgating an edict to the effect that electric wiring in all buildings where hotel or sleeping accommodation is provided for the public shall be encased throughout in steel tubing. The reason that this matter is under consideration is that the Building Committee know that "several of the recent big fires in the Metropolis were caused by badly insulated electric wires." The County Council Committee are told by the Electrical Press that there is absolutely no evidence to support the statement. Perhaps there is not in the offices of the electrical papers referred to; and if there were, it might be—we repeat "might be"—conveniently forgotten. But the County Council have the London Fire Brigade under their charge; and there may be evidence in that quarter which has not come within the ken of the electrical papers. However, they are very angry over the matter; so angry that the "Electrical Review" as good as tell the County Council that steel casing has been as great a culprit as wood casing in association with fire-raising. The "Review" might have kept that to themselves. This is what it very undiplomatically says: "There are numerous buildings of every size and description which were wired twenty or more years ago in wood casing, and in which the installation is to-day in irreproachable condition; while any contractor or consulting engineer can point to cases where steel tubing put in but few years ago has failed disastrously." The reason given is bad workmanship, despite rules and regulations by the hundred, and Fire Office inspections. Those buildings that are electrically wired in wood casing, and have escaped, have something for which to be thankful; those that have not escaped have something to deplore. It is not altogether a question of wood or steel casing or bad or good workmanship, whether or not fires occur. There is something else, and electricians know it. Fires have occurred in places in which there has been a thorough inspection of the wiring, and no defect has been traced; and the fires have not occurred immediately installation has been made. However, it is considered that any compulsory encasing in steel tubing would be a costly affair for hotels and all other places in which sleeping accommodation is provided for travellers. But if there is superior virtue in steel tubing in contrast with wood casing, then the public ought to have the protection, no matter the cost. Like the thief who comes in the night, so these electrically generated fires frequently occur when the world is asleep; and just as no one knows the day or the hour when the thief is coming, so no one knows the day or the hour when these fires are going to occur. It is in their insidious character that their greatest danger lies. The "Electrical Review" in connection with the proposal refers to the "tyranny" [*sic*] of "self-government." That must be something terrible.

Another matter over which the great part of the electrical industry represented in the person of Mr. A. Hugh Seabrook is fearfully pained is that the caterers at the forthcoming Electric Exhibition at Olympia will not use electricity, but will adhere to gas. Mr. Seabrook has been urging that pressure should be brought to bear upon the caterers to get them to adopt electric cooking; but the caterers refuse to commit themselves, and their business, to the suggested uncertainty and uneconomy. This display of interest on the part of the caterers in the preservation of their reputation is painful to Mr. Seabrook, because it proves to the public that the largest caterers in London (Messrs. Lyons and Co.), who naturally follow very closely all matters appertaining to their business, are not converts to the use of electricity in the kitchen. We charged Mr. Seabrook the other week with some loose and absurd statements about gas cooking, as well as about tainted food. We pointed out that Mr. Seabrook and certain members of the staff of the "Electrical Review" have frequently to our knowledge partaken heartily of gas-cooked food, without complaint as to "taint." All which is testimony to the absurdity of Mr. Seabrook's flabby assertions. The same character of looseness apparently applies to his exertions in the "Review" to get the caterers at Olympia to change from gas to electricity for cooking. In one letter, he remarked: "I say *emphatically* that proper steps were not taken to induce them to use electricity. . . . The attitude of the Executive Committee was feebleness itself when Mr. Cottam raised the question at a meeting of the Honorary Advisory Committee some months ago." Mr. Seabrook has since withdrawn his emphatic and ill-founded statement, and in a manner which shows the extent of the defect in his knowledge. He has since been informed as to the steps that were taken, "which probably were not so active as they would have been had the Committee been composed of electric cooking manufacturers only, and were not the steps referred to in my letter; but *undoubtedly a strong line was taken*, with, unfortunately, no success. So the Committee are entitled to my withdrawal of my criticism of their action." How very nice and condescending of Mr. Seabrook. But why did he not get a little nearer the truth before saying "*emphatically*" that proper steps were not taken to induce

the caterers to use electricity? The fact that "a strong line was taken," but without success, is the clearest possible testimony as to the present views of Messrs. Lyons and Co. on the subject of electricity as an agent in culinary operations.

"Ignoramus" has written an article in the "Electrical Engineer" on that subject of perennial interest, showrooms. He justifies the title he selected for himself by more points than one. Nearly all he says has been said by others before him. Towards the end, however, he gives to gas authorities the palm for the enterprise they display in their showrooms. He thinks the success of gas undertakings is well deserved—apparently only on account of their methods of advertising, and not on any other ground. We see this from what follows: "Of course, gas must ultimately give way to electricity, because of the inherent good qualities of the latter, which no mismanagement can effect. But meanwhile gas engineers, handicapped as they are with a filthy illuminant, have earned our sincerest admiration by the way in which they have staved off the (to them) evil day." The ideas of "Ignoramus" do not find expression in the Board of Trade returns, relating to gas undertakings, nor in the recently published Census of Production return, in which information is supplied regarding both gas and electricity concerns. But although, taking him at his own valuation, the dictionary would describe the writer of the article as ignorant, a blockhead, and a stupid, he might be courteous, and refrain from such descriptive terms as "filthy." However, the differences in the showrooms of gas and electricity undertakings are not to his liking; but he finds one excuse in the fact that "we [that is electricity folks] are on the winning side, and we know it." Knowing this, he counsels electricity undertakings to—instead of merely allowing electricity to slowly win its way purely on its merits—oust gas from its position of nearly universal popularity by extensive advertising, "regardless of cost." And this after all the advertising literature from electrical undertakings that we have seen, and the thousands upon thousands of pounds spent annually upon publicity (of a more or less honest character) by the electrical industry. It is a big business that it is lightly suggested shall be ousted promptly, "regardless of cost." "Ignoramus!" The poor fellow is partly backed up by a new venture of the same paper which gave space to his effusion. This new venture is in the form of a monthly supplement, to be known as the "Electrical Manufacturer and Installation Engineer." In the introductory lines of the first issue, we read: "The electric light is now installed as a matter of course into [sic] even small cottages; gas-lighted shops are comparatively rare." Perhaps the writers of the article and of the introduction to the supplement are one and the same person. If they are not, the latter is entitled so far as we have quoted from him to the same appellation, "Ignoramus!"

We have found the reason why high-pressure gas is "ousting" electric are lamps—flame and otherwise—from the outsides of shops. The secret leaks out in an article by "Dumb Friend" (who if dumb makes an excellent windy showing in print) in the "Electrical Review." The article censures the formalism of municipal committees, and taunts the members with assuming the possession of knowledge that (so they think) justifies them in usurping the technical control of the engineer. A concrete illustration is given; and it is this that throws light on the cause of the success of high-pressure lighting. It is quite simple, and has nothing to do with economy, efficiency, or any other merit. This is what we learn: The gas companies recently tried, with a large amount of success, to obtain the universal adoption of high-pressure gas for outside lighting. The prices charged by them for supply and maintenance are "ridiculously" low—in fact, much lower than the present rates for flame arc lamps. Handicapped by the lack of privilege to experiment with the ratepayers' money, the electrical engineer has to evolve theoretical [? theatrical] schemes to endeavour to out-do his rivals. A reduction in the price of current for outside lighting is, of course, his ultimate aim; but this is not the sort of thing that the Lighting Committee will agree to without some weeks of discussion. Finally, when they are really persuaded that the engineer has advised them well, it is too late; for the gas company have not been idle, and the high-pressure gas is installed from one end of the street to the other. In novel-ette style, the statement proceeds: "Heartbroken, the engineer hunts for another idea which will, no doubt in time—perhaps a long time—be sanctioned by the Lighting Committee and put into operation. But again too late; the private company is once more in front of him." Of course, we need not accept the explanation as true. Knowing what we do, the inclination of our belief as to the real causes for the success of high-pressure gas lighting is quite in another direction.

Competition is undoubtedly one of the best safeguards that the purchaser has; but the "Electrician" in discussing some of the effects of competition informs its readers that it is now recognized that competition without compromise is neither in the interest of buyer nor seller, of consumer nor producer. A case in point is found in the cessation of cut-throat rivalry between the various agencies competing for the traffic of London, and another is seen in the similar policy of the railway companies. Our contemporary cannot use as further examples the conditions existing in the electrical manufacturing industry, nor those obtaining among the electrical journals. There is, however, the Holborn affair that might have been quoted, but was not. Then it goes on to tell its readers of the very commonplace and well-known fact that there has been some acute and very bitter controversy between electrical and gas engineers, adding: "We hope we have at no time done anything to embitter the relations between us and them;

they have undoubtedly as much right to conduct their business in their own way as we have to conduct ours." Well said; but is it all true? We remember that the "Electrician" has said things that were somewhat rancorous about street lighting contracts; we know, too, of statements inferring oblique or unfair methods on the part of a gas company or gas companies who had secured certain of the contracts. We recollect further that an attempt was made to get the "Electrician" to commit itself to a categorical statement of an instance of what they alleged. But the endeavour was futile. The allegation was carefully left unsupported; and perhaps our contemporary in its own interests and for its own peace of mind was wise. Yet it now in sublimely innocent words says: "We hope we have at no time done anything to embitter the relations between us and them." There must have been a large amount of tongue in the cheek when those words were written.

But the "Electrician" is apt to be somewhat erratic. In the issue succeeding the one in which the statement referred to above appears, an invitation is magnanimously issued to gas consumers generally, and to ourselves in particular, to visit the forthcoming Electric Exhibition at Olympia. So far as we are concerned, the invitation was unnecessary. But in tendering it, our contemporary says that the "JOURNAL" "has lately been worried about certain facts regarding the 'Tricity' cooker, and, instead of applying direct to the makers of this effective and efficient device, asked an explanation of us." Now what is the use of making misstatements of this kind? On July 25, we asked the Berry Construction Company to reply to certain points. Failing that Company, on Aug. 15, we suggested that perhaps the "Electrician" would oblige. On Aug. 29 (p. 539) we quoted our contemporary's "weak evasion." Where is the justification for our contemporary's present assertion?

According to electric theory and literature, electric wires do not fuse and cause fires and large extinctions; in practice, they do. The Blackwall Tunnel—a nasty place for such a thing to occur—experienced the fusing of an electric wire last Tuesday night; and the convenient thoroughfare was "plunged" in darkness. It was a wonder there was not a serious panic, seeing that the collapse occurred soon after seven o'clock, when (we cannot vouch for the accuracy of reporters' estimates) "thousands" of workers were passing through the tunnel, and had to grope their way along until they reached the other end. The police found it necessary to close the tunnel to vehicular and pedestrian traffic, as the fusion was so extensive that it was impossible to effect repairs that evening so as to restore the lights. The result was that for the remainder of the evening the convenience of Blackwall Tunnel had to be denied to the public. This would not have happened had the illuminant been gas with (they would be most suitable for this position) inverted incandescent burners. Gas-pipes are not in the habit of fusing.

Scottish Junior Gas Association—Western District.

The Hon. Secretary and Treasurer of this Association (Mr. D. Fulton, of Dawsholm) has prepared the syllabus of business to be undertaken by the Western District during the coming winter. It is as follows: Oct. 7. Opening address by the President (Mr. James Mc'Ghee, of Glasgow), and address by Mr. W. Carmichael Peebles, of Edinburgh, on "Governors." Oct. 21. Visit to the Helensburgh Gas-Works. Nov. 4. A paper by Mr. J. Grant, of Glasgow, on "Prepayment Meters." Nov. 18. Visit to the Barrowfield Iron-Works. Dec. 2. A paper on "Electricity in a Gas-Works," by Mr. J. Wilson, of Falkirk, and a short address by Mr. W. B. McLusky, of Perth. Dec. 16. Annual Social. Jan. 13. Coffee Meeting. Jan. 27. Visit to the Kirkintilloch Gas-Works, and a paper on the Kirkintilloch Boosting Plant, by Mr. J. Bell, of Kirkintilloch. Feb. 10. A paper by Mr. Watson M. Cowie, of Locherbie, on "Experiences of a Manager in a Small Gas-Works." Feb. 24. Visit to the Hamilton Gas-Works. March 9. A paper on "Some Notes on a Scheme of Reconstruction," by Mr. R. D. Robertson, of Airdrie. March 30. Joint visit to the Alloa Gas-Works. April 13. Annual general meeting, and lecture by Mr. A. Wilson, of Glasgow.

A Knighthood for Mr. Askwith.—The King has conferred upon Mr. G. R. Askwith the honour of knighthood, and invested him with the Insignia of a Knight Commander of the Order of the Bath (Civil Division). Mr. Askwith's name is well known in connection with his position as Comptroller-General of the Commercial, Labour, and Statistical Departments of the Board of Trade; and he has frequently rendered excellent service in the settlement of industrial disputes.

Wales and Monmouthshire District Institution of Gas Engineers and Managers.—We are informed by Mr. Octavius Thomas, the Hon. Secretary, that a meeting of the Institution will be held at the Bush Hotel, Merthyr Tydfil, on Wednesday of next week. In addition to the formal business, there will be the Presidential Address of Mr. E. H. Swain, of Pontypridd; and a paper by Mr. J. E. Kenshole, on "The Merthyr Gas Company and their Works." After luncheon (at which the Chairman and Directors of the Merthyr Gas Company will be the hosts), the members will visit the gas-works, under the guidance of Mr. Kenshole, the Engineer and Manager.

GLASGOW AND HIGH-PRESSURE LIGHTING.

Visits of the Deputation of the Corporation to Inspect the Installations in London and the Crystal Palace.

A DEPUTATION of the Glasgow Corporation arrived in London on Saturday afternoon to inspect the high-pressure gas lighting in the streets of the City of London. The deputation consisted of Bailies Paxton and Kirkland, the Convener and Sub-Convener of the Gas Committee, Councillor Pratt, the Convener of the Lighting Committee, Councillor R. S. Brown, Convener of the Watching Committee, and Councillors James Stewart (Bromielaw Ward), James Stewart (Townhead Ward), accompanied by their Gas Engineer (Mr. Alexander Wilson, M.Inst.C.E., Immediate Past-President of the Institution of Gas Engineers), Mr. S. B. Langlands, the Lighting Inspector, and Mr. J. J. Cairns, of the Town Clerk's Department.

The deputation arrived in London at four p.m., and were received, on behalf of the Corporation of London, in the absence of the Chairman of the Streets Committee, by Mr. Deputy C. Morton, M.P. The first proceeding was to visit the Crystal Palace, to inspect the high-pressure lighting on the Keith system, installed by the South Suburban Gas Company. The deputation was received by Mr. J. W. Whimster and Mr. H. Baldry, on behalf of Mr. S. Y. Shoubridge, the Engineer and Manager of the Company, who conducted the party through the grounds, &c., and explained the lighting.

Yesterday (Monday) morning, the deputation visited the Guildhall, and were received at the Public Health Department by Deputy Morton and the officials, when matters concerning the high-pressure lighting of the City were discussed.

In the evening, after dinner at the Royal Hotel, the deputation, accompanied by Mr. Morton (who is Past-Chairman of the Streets Committee), Mr. J. W. Domoney, Deputy Matthew Wallace, Mr. Jacques Abady, Mr. Frank Sumner (City Engineer), Mr. F. W. Goodenough (representing the Gaslight and Coke Company), Mr. W. Doig-Gibb (the Engineer of the South Metropolitan Gas Company), and Mr. W. J. Liberty (the City Lighting Inspector), commenced their inspection of the streets and the bridges of the City. These include Blackfriars, Southwark, and London bridges, all of which have been lighted with high-pressure gas during the last ten years. Particular interest was taken in the new installation of the centrally-hung high-pressure inverted gas-lamps in Cannon Street, where the system was explained, and the lamps raised and lowered from the centre of the roadway to the pavement level, and *vice versa*, while the lamps were in lighting. On leaving the City, the deputation, under the guidance of Mr. F. W. Goodenough and Mr. Jacques Abady (the Chairman of the Works Committee of the City of Westminster), made a tour of the City of Westminster to inspect the new high and low pressure gas-lamps recently erected under the Westminster contract.

The deputation leave London to-day (Tuesday) for Birmingham, to inspect the lighting there.

On Thursday, the deputation leave London for Berlin, for the purpose of inspecting the magnificent system of high-pressure gas lighting in that city.

Inspection at Manchester.

On their way to London, the deputation visited Manchester, on Friday, to inspect the lighting there. They were received by Mr. W. Kay, the Deputy Chairman of the Gas Committee, in the absence of the Chairman (Alderman R. Gibson), Alderman Birkbeck, Alderman Harrop, and Councillor J. R. Smith. In their inspection during the evening of the streets now illuminated by the high-pressure system, the party were accompanied by Mr. J. G. Newbigging, the Chief Gas Engineer to the Corporation, Mr. Frederick Price, Superintendent of the Gas Department, and Mr. J. R. Brocklebank, Superintendent of Street Mains and Lighting.

As stated in previous issues of the "JOURNAL," the Manchester Corporation have now in use in the centre of the city 60 high-pressure lamps of 1500-candle power, and a further extension of the system to Oldham Street is about to be carried out, at the request of the tradesmen in the thoroughfare. Of the 22 lamps on the Piccadilly area, one is of 3000-candle power; and since the installation of the new system, the public have been much impressed by the steady, white light of the lamps, coupled with their great diffusive power. The many inquiries the Gas Department officials have received from business houses and tradesmen in the city indicate a still further extension of the system for the lighting up of business premises. The present plant of the Corporation, with the two compressors, is capable of meeting an extension up to 400 lamps of 1500-candle power.

St. Cuthbert's Church, Kensington, was the scene of the wedding, on Saturday, the 9th inst., of Mr. W. H. Bennett, the Engineer and Manager of the Redhill Gas Company, the eldest son of Mr. and Mrs. C. V. Bennett, of Herne Bay. The bride was Miss Frances Cox Smale, daughter of Mr. and Mrs. Smale, of Ystrad Hall, Llandovery. Subsequently a reception was held at the Royal Palace Hotel, Kensington. Among the presents (some eighty in number) was a handsome dining-room clock from the Directors of the Redhill Gas Company, and a spirit tandalus from the Company's employees.

FRENCH COMMISSIONS' REPORTS.

It is only a short time ago that the Société Technique du Gaz struck out a new line in appointing permanent Commissions, or special Committees, to collect, consider, and report upon information and facts relating to different departments of the gas industry. There were five of such divisions to deal respectively with the principal branches of gas interests—viz., coal analysis, manufacture, distribution, application, and technical training. Though time, of course, has not as yet allowed of anything very definite being done, the reports of these Commissions (which we recently received through the courtesy of M. Marquisan, the President of the Société Technique, and which were presented to, but not read at, the recent annual meeting of the Society) show that a good deal of preliminary work has been got through. The outlines of the Commissions' fields of labour have been mapped out, and preparations made for collecting, digesting, and disseminating the technical matter relating to their different spheres of activity.

COMMISSION ON COAL ANALYSIS.

This preparatory work particularly appears in the report of the Commission on Coal Analysis. It was only formed last winter, and has met a few times with a view to defining its programme, and of ascertaining both its immediate and future objects. Without pretending to lay down any dogmatic official theory, it will direct its labours towards the following goals—

- (a) To define as clearly as possible the qualities of different gas coals, and methods of analysis applicable to them.
- (b) To supply gas-works with useful hints and practical means of controlling deliveries of coal.
- (c) To place at the disposal of gas-works a collective technical organization, either specially formed or by utilizing what already exists, to afford as accurate analyses as necessary, and to make tests on coal under working conditions. Such organization would be able to keep gas-works subscribing to it in touch with its work by periodical confidential notes.
- (d) To establish a standard specification for the purchase of coals.

Some information has already been collected on these various points; but a number of members could give valuable help to the Commission by communicating useful facts, which they may have in their possession, upon the following and other questions—

1. Purchase of gas coals; data concerning purchase agreements; reservations or rebates in anticipation of possible defaults—such as excess of moisture or ash; copies of existing contracts.
2. Carriage of coal; capacity of waggons; liming, tarpaulins, discharging arrangements from boats.
3. Storing and screening.
4. Keeping in store, and precautions against spontaneous combustion.
5. Causes of deterioration of coal in store, and the best precautions against it.
6. Taking of samples for analysis.
7. Measurement in the works or laboratory of the amount of moisture and ash.
8. What is practically required from tests of samples?
9. Commercial analysis of gas coals; management of crucible and distillation tests.
10. Calorific power of coals, with bomb or otherwise.
11. Methods to facilitate complete or partial analysis of coals in all works, and the superintendence of the carrying out of contracts by the collieries.

To the Commission it appears that both the most important and the most difficult part of its work is the realization of the collective technical organization referred to in paragraph (c). Its only chance of success lies in the direct communication to it of ideas on the part of the largest as well as the smallest gas companies. Analogous efforts have been made abroad—as seen in the Association of Swiss Gas-Works for the purchase of coal, the Federal Swiss Laboratory for the test of fuel at Zürich, the Technical Instruction Institute at Carlsruhe and the Experimental Works and Laboratory of Dr. H. Bunte and Dr. K. Bunte. The assistance both of gas companies and of individual engineers is required if successful results are to be achieved. Only by willing co-operation will equitable clauses in coal contracts and their observance in carrying them out be attained.

The report concludes with a list of papers and documents collected by the Commission.

COMMISSION ON MANUFACTURE.

Perhaps more interest will attach to the report of the Commission on Manufacture of Gas, which embodies a review of improvements effected in manufacture during the previous year. As the report says, however, nothing of sensational novelty is revealed.

As regards carbonization, the examination of the new methods of distillation continues, and figures are published from time to time on the working of the intermittent vertical retort (Bueb), the continuous (Woodall-Duckham and Glover-West), and horizontal or inclined retort-chambers. Unfortunately, the papers

published often lose part of their documentary value, owing to lack of sufficient preciseness as to the conditions under which the results were obtained. For example, in a paper ["JOURNAL," Vol. CX., p. 167] by Dr. R. Geipert in the "Journal für Gasbeleuchtung" (April 16, 1910), recording tests made on the latest model of a Bueb bench of eighteen retorts, it is stated that the bench can produce 17,000 cubic metres of gas per man per squad. In a previous issue of the same journal (March 5, 1910), Herr Peischer, describing tests on the horizontal chambers at Innsbrück, gives them as equal to a make of 1800 cubic metres per man [see "JOURNAL," Vol. CX., p. 231]. On the other hand, M. Rank, the Engineer at Munich, gives a make of 18,000 cubic metres per man and per day with the inclined chambers there. The juxtaposition of these figures shows that they cannot be useful for purposes of comparison, owing to their defect of not defining in detail the number of men employed and the work done by each man.

The new methods of carbonization seem to continue to take their stand on long carbonization in bulk (horizontal retorts of 6 metres with minimum charges of 600 kilos., filled-up vertical retorts, and chambers). This best solves labour difficulties, while enabling the maximum number of calories per ton to be obtained. Nevertheless, Dr. Bueb is of a contrary opinion, as he has modified his bench of 12 vertical retorts into one of 18 retorts of smaller section, with which he seems to have effected considerable economy in fuel without greater labour owing to working in series of three retorts. A definite opinion would be premature, especially in France, where the antiquated question of lighting power seems to bar the road along which English and German engineers are moving. Without fear of being thought paradoxical, it might almost be said that the report of M. Dausset to the Municipal Council of Paris (Bulletin Municipal Officiel of Paris, Jan. 7, 1911, p. 178), where, for the first time in France, the lighting power of gas has been looked at in a rational light, is one of the notable facts of gas manufacture during the last twelve months.

Condensation.—It would seem that the theories of slow and hot condensation of gas continue to lose ground. The facts and the figures brought forward last year by M. Sainte-Claire Deville justify the rapid and brutal—one might say—cooling of gas and the immediate arrest of almost the whole of the products of condensation. The heavy losses in benzol and naphthalene per cubic metre are comparable, but while 0.5 gr. less per cubic metre of benzol is insignificant, the same amount less of naphthalene is sufficient to alter completely the character of the distribution and to do away with obstructions in town. Such a result as this need not be insisted upon. The practical gas engineer abroad thinks the same, if one may judge by what is done in England and elsewhere. [See Note by Dr. Ott, of Zurich, "Journal des Usines à Gaz," Jan. 20, 1911.] It is not without interest to remark that these new theories were exactly determined by the Paris Gas Company in 1907.

Purification.—Two processes for utilizing the sulphur in gas to make sulphuric acid for sulphate of ammonia are submitted for the test of practical working. The Feld process adopts the intermediary of a solution of sulphate of zinc or of iron in order to fix the ammonia in the state of sulphate. The metallic sulphate formed at the same time is later attacked by a mixture of sulphurous acid and air produced by combustion of sulphur in a small special furnace. This sulphur itself is most of the time recuperated from the gas when the latter contains sufficient of it, which is generally the case. Thus a solution is obtained progressively enriched in sulphate of ammonia which solution is evaporated and crystallized. The Burkheiser process transforms by combustion the sulphur fixed by the oxide of iron of the purification. It sends the sulphurous acid mixed with air in excess thus produced into ammoniacal liquor recovered from the other part, forming thus sulphite, then sulphate of ammonia in solution, which is evaporated and turned into crystals.

Here may be called to mind the process which M. De Lachomette brought forward at the Congress at Boulogne* (1888), which also utilized the sulphur absorbed by the purifying material to produce sulphurous acid, then sulphite of ammonia, transformed finally into sulphate by oxidation in air.

A new method of using the usual process of purification by oxide of iron has been shown by M. Allner, of Dessau. It has been adopted at Christiania, and consists in methodically changing the oxide boxes every 24 hours, at the same time utilizing Valon's oxidizing reaction, but with the proportion of air of 5 and even 6 per cent. The fixing of the sulphuretted hydrogen being more rapid than the oxidation of sulphuret of iron, the ordinary working without change leads at the end of a certain time to the thorough sulphuretting of the first line and its being practically inefficacious. It requires regenerating. Instead of emptying it to reoxidize the bulk in air, the new method transposes it into the last line by a suitable arrangement of valves. As care has been taken to increase the amount of oxygen, this sulphuretted material, receiving only gas free from sulphur with a little oxygen in excess, is progressively regenerated, so as to be able to re-enter into the first line without other manipulation when its turn comes.

The use of this method, in which the last purifier box is always charged with sulphuret of iron, only seems to be possible if the cyanide is taken out in a special washer. Otherwise, the gas charged with hydrocyanic acid passing over the sulphuret of iron

would free the sulphuretted hydrogen, as was shown by the late M. Perthuis in 1895 (Twenty-Second Congress, Paris), and the purification would be ineffective.

COMMISSION ON GAS APPLICATIONS.

The report of the Commission on the Applications of Gas, Heating, and Motive Power, is a short one, and contains little of general interest. During recent years the different uses of gas have been extended by new outlets, assisted by numerous renewals of municipal concessions at a general reduction of price. The economic transformation of modern life has created many needs which gas every day supplies.

In the short time so far available to the Commission, it has given attention to two problems—the rational use of gas for heating small apartments; and the use of gas in bakers' ovens.

The Gas Company of Paris has instituted a competition for gas heating apparatus, cheap, practical, economical, and suitable for small households. On the suggestion of the Commission, this has been extended to meet the needs of provincial towns as well; and the apparatus is to work satisfactorily at 30 mm. pressure.

Gas is particularly advantageous for bakers' ovens, both from the economic and social points of view. It is proposed to combine with the gas heating, the use of electricity for working the kneading troughs. To this end, the Commission has come to an arrangement with the Electrical Union of Paris with a view to arriving at a completely satisfactory apparatus, which in due course will be exhibited at the next Trade Exhibition.

Utilization of coke and tar and other gas derivatives will have the attention of the Commission from time to time.

The remaining two reports, dealing with distribution and technical instruction, are more lengthy and detailed documents, and will be noticed subsequently.

Manchester and Salford Smoke Abatement Exhibition.

An important step has been gained in Manchester for manufacturers of gas-fires, by the confirmation of the resolution of the Gas Committee to fix gas-fires and other gas-consuming devices of approved patterns on simple hire or on the three years' hire-purchase system. This arrangement comes into operation on the 29th inst. While the increased consumption of gas will undoubtedly add very materially to the revenue earned by the department, the resolution had the sympathy of the Council because it was introduced as a definite step towards abating the smoke nuisance in the city. The important Smoke Abatement Exhibition which is to be held in Manchester in November is receiving the practical support and sympathy of all departments of the Corporation; and readers may again be reminded of the important concessions made by the Committee to firms exhibiting in the Gas Section. The success which is attending the exhibition, we learn, leaves nothing to be desired; and it is pleasing to note that the Gas Section will be one of the strongest. The exhibition is to be held in the City Hall, Manchester. Referring to the decision of the City Council regarding gas-fires, Councillor James Kendall, J.P., the Hon. Secretary of the Exhibition, says: "Since this resolution was passed—which brings us the support of the Society of British Gas Industries—more than the amount of space originally allotted to gas exhibits has been reserved by manufacturers, awaiting the formal permission of the Society, which was promised us if we could get this concession through."

Liebig's Influence on Modern Chemistry.—A recent number of "Nature" contained the text of a lecture on "Liebig and His Influence on the Progress of Modern Chemistry," delivered at Oxford by Sir William A. Tilden, F.R.S. In the biographical portion of the lecture, the speaker referred to the appointment of Liebig, on the recommendation of Humboldt, at the early age of twenty-one, as Extraordinary Professor of Chemistry at Giessen, which position he held from 1824 till he was called to Munich in 1852. "In the Giessen Laboratory," said Sir William, "were trained a considerable number of chemists, many of whom became the teachers of the next generation. From these teachers and their pupils, guided by the same principles as those of the Giessen school, came discoveries of first-rate importance. If Hofmann, a student of Liebig's, had not been attracted to the study of aniline, an inconsiderable constituent of coal tar, if his pupil, Perkin, had not been led to a further study of its transformations, we should have had to wait a long time for the coal-tar dyes and the industries connected therewith. If a host of workers trained in Liebig's laboratory, and others emulating their example, had not cultivated the study of all sorts of carbon compounds, often unimportant in themselves, we should not have seen the numerous applications of chemistry to medicine—the saccharin, aspirin, antipyrin, sulphonal, &c.—nor the artificial perfumes, such as those of violet and lilac, which are now made independently of the original source in the flowers. Without the foundation work I have mentioned, we could not now have the beginnings of the true physiology based on the study of chemical and physical processes and reactions, nor the possibility of following the changes brought about by all sorts of ferments, on the combined results of which we may hope to have a complete development of a scientific system of medicine and the treatment of disease."

* See "JOURNAL," Vol. LII., p. 421.

THE INVENTION, DEVELOPMENT, AND PRESENT POSITION OF THE DESSAU VERTICAL RETORT.

[COMMUNICATED.]

V.

The fourth article of this series [*ante*, p. 31] was largely devoted to a comparison of the merits of the Dessau intermittent system of vertical retorts and of the continuous system of vertical retorts as represented by the Glover-West type. The latest figures available at the time of writing were quoted in it; but in the brief interval which elapsed before the article saw the light in the columns of the "JOURNAL," further and later figures had been published in respect of both the Dessau intermittent system and two continuous systems of vertical retorts. These and some other recently disclosed results may appropriately be considered in this article, which brings the series to a conclusion.

COMPARATIVE RESULTS WITH OLD AND NEW INSTALLATIONS.

Objection has been raised [*ante*, p. 111] to the comparisons instituted in the last article between the results of trials made on the one hand with the Mariendorf setting of Dessau vertical retorts, and, on the other hand, with the St. Helens setting of Glover-West retorts. Manifest unfairness is alleged in regard to these comparisons, on the ground that the Mariendorf results refer to the very latest development of the Dessau system, while the St. Helens results relate to the first trial installation of Glover-West retorts put into operation nearly three years ago. The simplest way of refuting a charge of manifest unfairness based on such a ground is to institute another comparison in which the positions of the two systems in respect of the age of the installations are reversed. This course will now be taken by the writer. But he would first point out in passing, that the figures quoted in the last article for the Glover-West system were those of the only carefully conducted trials of which detailed results had been published up to the time of writing. These trials had been made between May 20 and Oct. 5, 1909 [*ante*, p. 31], while the trials of Dessau retorts of which the results were quoted for comparison were made on Oct. 31 to Nov. 5, 1909 [see "JOURNAL," Vol. CIX., p. 27], or practically contemporaneously with the Glover-West trials. The writer inclines to the belief that the gas-works manager will judge the relative merits of different types of settings by contemporaneous performances. However, the unfairness (if any) shown to the Glover-West system in the previous article shall in the sequel be transferred to the Dessau system.

The installation of Glover-West continuous retorts at the Droylsden works of the Manchester Corporation may presumably be taken as representing the very latest development of this system. Gas making was started with it in July, 1910. On the other hand, the installation of Dessau vertical retorts at Cologne was one of the earliest of this system on a really large scale; and it was put into operation over four years ago—*i.e.*, about Midsummer, 1907. Hence the writers' critics must agree that a comparison of the results obtained in these two installations will be manifestly unfair to the Dessau system. Bearing this in mind, let us pass on to make such a comparison.

The results obtained in ordinary working of the four-year old installation of 240 Dessau vertical retorts at Cologne throughout the twelve months ending March 31 last have recently been disclosed by Dr. F. Lisse [see "JOURNAL," Vol. CXV., p. 479]. The average make of gas in the twelve months was 14,203 cubic feet per ton of Westphalian coal. The gross calorific power of the gas averaged 526 B.Th.U. per cubic foot. These figures give a calorific valuation figure—*i.e.*, the make multiplied by the calorific power—of 7,464,875 B.Th.U. per ton of coal carbonized. It should not be forgotten that these are not figures relating to specially supervised or brief trials, in which the working may have been tuned-up to the highest pitch of perfection, but the averages for a twelvemonth of the ordinary everyday running of the largest of the early installations of vertical retorts. The installation is four years old, and by no means represents the very latest development of the Dessau system.

No figures are available with reference to vertical retorts operating on the continuous system which represent in the same comprehensive manner the all-round working performances of these retorts. But in regard to the one-year old installation of Glover-West retorts at the Droylsden works of the Manchester Corporation, Mr. J. G. Newbigging has given the results of a number of trial runs, and has stated that they are typical of the results secured during the whole of the working period of those retorts [see "JOURNAL," Vol. CXIV., p. 866]. Bearing in mind that trial runs of carbonizing plant not infrequently give higher results than those obtained in ordinary working, his figures must, in default of any others, be taken for comparison with the performances of Dessau retorts.

Three descriptions of coal—*viz.*, Lancashire, Yorkshire, and Derbyshire—were tested in turn by Mr. Newbigging, and each in two ways. The object of one of these ways was to ascertain the quantity of 17-candle power gas obtainable from the coal. The figures relating thereto need not be considered in this connection, since the object aimed at therein was so totally different from the object of the ordinary working at the Cologne Gas-Works and at the majority of large gas-works in this country. The other trials

conducted by Mr. Newbigging aimed at securing a large volume of gas of an illuminating power of 15 candles. Since this agrees substantially with the general aim of gas managers in this country and with the object of the ordinary working at the Cologne Gas-Works, the figures obtained by Mr. Newbigging in these trials will alone be taken for the present comparison. They show that the average make per ton of coal was 13,842 cubic feet, and the mean gross calorific power of the gas was 548 B.Th.U. per cubic foot. Hence the calorific valuation figure is 7,585,415 B.Th.U. per ton of coal, which is 1.6 per cent. higher than the calorific valuation figure relating to the everyday working of the four-year old installation of Dessau retorts at Cologne.

But since English coals were used in the new Glover-West retorts at Droylsden, and Westphalian coals in the old Dessau retorts at Cologne, it might be contended that the comparison is futile, and that if the Glover-West retorts had been carbonizing coal equal in quality to the Westphalian coal ordinarily used at Cologne, they would have given a calorific valuation figure more than 1.6 per cent. better than that afforded by the old Cologne settings. Certain figures, however, which are available in regard to the coals used do not support such a contention.

Dr. Lisse made 118 analyses of the coal carbonized during the year at the Cologne Gas-Works, and he gives the average results. Mr. Newbigging has also given analyses of the Lancashire, Yorkshire, and Derbyshire coals used in the trials of the Glover-West retorts at the Droylsden works; and the average results thereof are stated below, alongside Dr. Lisse's figures for the coal used at Cologne:—

Average Composition of Coal Used.

—	Moisture.	Ash.	Volatile Matter.
Westphalian coal used in Dessau retorts at Cologne, per cent.	2.36	11.58	28.82
English coal used in Glover-West retorts at Droylsden, per cent.	1.29	6.76	31.52

The larger proportions of moisture and ash in the coal carbonized at Cologne are certainly to its disadvantage as a gas-producing material, and the carbonizing results will consequently be placed more nearly on an equal footing for comparative purposes if allowance is made for the different proportions of moisture and ash contained in the Westphalian and English coal. Allowing for the 13.94 per cent. of moisture and ash in the one case and the 8.05 per cent. in the other, it will be found that the make of gas in the Dessau retorts at Cologne averaged 16,504 cubic feet, and that in the Glover-West retorts at Droylsden 15,054 cubic feet per ton of ash-free dry coal. The calorific valuation figure then becomes for the Dessau retorts 8,674,035 B.Th.U. and for the Glover-West retorts 8,249,500 B.Th.U. per ton of ash-free dry coal. On this basis, the Dessau intermittent system of carbonization has an advantage of 9 per cent. in make per ton and 5 per cent. in the output of calories in the gas made, over the Glover-West continuous system. And the comparison is manifestly unfair to the Dessau system, because figures for a Dessau installation which was into operation four years ago are compared with those obtained by the latest development of the Glover-West system!

WORKING RESULTS WITH DESSAU RETORTS AT SUNDERLAND.

The working results obtained over a period of twelve months in the installation of sixty Dessau vertical retorts at Sunderland have been published since the fourth article of this series was written. They have been given by Mr. C. Dru Drury in the paper which he read before the meeting of the Institution of Gas Engineers [see "JOURNAL," Vol. CXIV., p. 851]. The paper constitutes a plain unvarnished statement of facts and observations which speak for themselves. The results may be quoted here with advantage, because they refer to the carbonization of English coal in Dessau retorts. Like the Cologne figures quoted above, they relate to the ordinary working over the period of twelve months ended March 31 last.

The coal carbonized during the twelve months dealt with has been a mixture of two second and two third class unscreened Durhams, containing on an average 1.835 per cent. of moisture, 9.59 per cent. of ash, and 29.07 per cent. of volatile matter (exclusive of moisture). It was as a rule very fine. The make of gas per ton of coal averaged 12,647 cubic feet, and the gas had a gross calorific power of 590 B.Th.U. per cubic foot. The calorific valuation figure was therefore 7,461,730 B.Th.U. per ton, which coincides closely with the valuation figure obtained from Westphalian coal at Cologne, where, however, the retorts were worked so as to give a greater volume of gas, though of lower calorific power. Allowing for the effect of the 11.425 per cent. of moisture and ash present in the Durham coals used, a year's working of the Sunderland installation of Dessau vertical retorts shows a make of 14,278 cubic feet of gas and a calorific valuation figure of 8,424,195 B.Th.U. per ton of ash-free dry coal. This latter figure, like the corresponding one for a year's working of the Cologne installation, is appreciably higher than that for the Glover-West retorts at Droylsden. It thus appears that regular everyday working at both Cologne and Sunderland has demonstrated that the Dessau system gives a considerably higher calorific valuation figure from the coal carbonized than is obtainable from the Glover-West vertical retorts at Droylsden. Yet neither the Cologne nor Sunderland installation of Dessau retorts by any means represents the latest development of this system.

Other interesting results reported by Mr. Drury referred to a trial run in the Dessau retorts at Sunderland with screened Derbyshire (Grassmoor) coal. The trial was made for Mr. J. Ferguson Bell, of Derby. Forty-five tons of this coal were carbonized with steaming, and afforded a make of 13,381 cubic feet of gas per ton; the gross calorific power of the gas being 586.5 B.Th.U.—giving a calorific valuation figure of 7,847,955 B.Th.U. per ton of coal used. The coal contained 12.28 per cent. of moisture and ash; hence the make of gas was 15,272 cubic feet, and the valuation figure 8,956,810 B.Th.U. per ton of ash-free dry coal. The latter figure is far ahead of anything achieved in special trials or otherwise in continuous vertical retorts. When Mr. Newbigging carbonized Derbyshire coal containing rather less (11.72 per cent.) moisture and ash in the Glover-West retorts at Droylsden, he obtained in one trial gas of nearly as high calorific power—viz., 582.4 B.Th.U. per cubic foot; but the make per ton was only 11,584 cubic feet, or about 13½ per cent. lower than that obtained from the Grassmoor coal in the Dessau retorts at Sunderland [*vide* “JOURNAL,” Vol. CXIV., p. 866]. The writer does not, however, desire to lay great stress upon a result obtained in a special trial, since regular working results over a long period appear to him to afford a surer basis for judging the merits of a setting. In regard to the Dessau system, well authenticated working results extending over twelve months and more are available; and it has already been shown that they demonstrate the superiority of that system.

RESULTS FROM OTHER CONTINUOUS VERTICAL RETORTS.

Mr. J. P. Leather deserves the thanks of the gas industry for the paper which he read before the Institution of Gas Engineers, in which he narrated his experiences of the Woodall-Duckham system of continuous carbonization in vertical retorts [see “JOURNAL,” Vol. CXIV., p. 857]. The account which he there gave of the difficulties encountered in the Burnley installation of these retorts, and of the way in which they have been, or are being, surmounted, is more valuable than any record from which such difficulties are omitted. The information he has given as to the make of gas per ton of coal and its quality is, however, admittedly not very full. Burnley coal has yielded 12,600 cubic feet of gas per ton. Mr. Leather quoted, however, some results obtained from four different kinds of coal—all but one English—in the later installation of Woodall-Duckham vertical retorts at the Lausanne Gas-Works. The mean of the results is 13,037 cubic feet per ton, of gas having a gross calorific power of 612½ B.Th.U. per cubic foot. This gives a calorific valuation figure of 7,985,160 B.Th.U. per ton of coal. The proportions of ash and moisture in the coals have not been given; so that it is not possible to deduce the calorific valuation figure per ton of ash-free dry coal, and thus make a comparison on substantially the same basis with the results obtained from Dessau retorts. Neither has

it been stated whether the make of gas is corrected to 30 inches barometric pressure, or whether it is measured under the low barometric pressure (about 28.45 inches) prevailing at Lausanne. In the latter case, the corrected make becomes 12,346 cubic feet, and the valuation figure 7,560,000 B.Th.U. per ton. Mr. P. G. Moon, of Bournemouth, in the discussion on Mr. Leather's paper, gave the average make and calorific power of the gas from the Woodall-Duckham retorts at Lausanne for a period of six months, during which time, however, the retorts were not always in full work. The make quoted was 12,962 cubic feet per ton, and the gross calorific power of the gas 598 B.Th.U. Again, it is not stated whether the make was corrected to 30 inches barometer.

GENERAL CONCLUSION ON CARBONIZING RESULTS.

It may be forthwith admitted that Mr. Leather has proved that continuous carbonization is feasible in vertical retorts on the Woodall-Duckham system. Others have proved that it is also feasible in vertical retorts on the Glover-West system. But nothing has yet been published to the writer's knowledge which clearly demonstrates that any system of continuous carbonization gives as high a gas-making return (as measured by the product of the make of gas and its calorific power) per ton of coal as the Dessau intermittent system of carbonization in vertical retorts. This will be obvious on reference to the figures [already quoted in this and earlier articles of this series] which are collected for convenience in Table VI.

It may be contended, perhaps, that the whole of the comparisons made in this article are vitiated by the fact that the same class of coal has not been carbonized in the different types of retorts. It is not, however, conceivable that it is by a mere chance that the figures which have been quoted for coals as widely divergent in origin and character as Derbyshire, Durham, Silesian, and Westphalian, have conspired to display the Dessau system in such a position of all-round superiority as compared with other systems of vertical retorts. If the claim of the Dessau setting to give the best carbonizing results, had rested on figures obtained with only one class of coal, it might have been regarded as insufficiently established. But uniformly high results with several classes carry conviction. The writer, however, would nevertheless welcome the further evidence that would be afforded if a suggestion which has been made were followed up—viz., that carbonizing trials should be made, under the supervision of an impartial committee, with precisely the same coal, in the Dessau and other systems of vertical retorts. The relative efficiencies of the different systems, in strictly comparable conditions, would thus be authoritatively established.

POSITION OF THE DESSAU VERTICAL RETORT.

The figures in Table VI. have been selected from all those published in technical papers with a view to demonstrating the

TABLE VI.—Comparative Results with Dessau Intermittent and Two Systems of Continuous Vertical Retorts.

Type of Setting.	Place.	Authority and "JOURNAL" Reference.	Date.	Duration.	Description of Coal.	Percentage of Ash plus Moisture in Coal.	Make of Gas, Cubic Feet.		Gross Calorific Power of Gas, B.Th.U. per Cubic Foot.	Valuation Figure. (Make × Calorific Power).	
							Per Ton of Coal as Used.	Per Ton of Ash-Free Dry Coal.		Per Ton of Coal as Used.	Per Ton of Ash-Free Dry Coal.
Glover-West. Continuous. Eight 20 feet retorts in setting.	St. Helens	H. G. Colman, Vol. CXV., p. 31	May-October, 1909.	About 14 days	Various English	6.945	12,282	13,199	580.9	7,134,615	7,667,095
Do. do.	Manchester	J. G. Newbigging, Vol. CXIV., p. 859	July, 1910, to June, 1911.	About 9 days	Lancashire, Yorkshire, and Derbyshire	8.05	13,844	15,054	548	7,585,415	8,249,500
Woodall-Duckham. Continuous.	Lausanne	J. P. Leather, Vol. CXIV., p. 859	February-May, 1911.	About 32 days	Various English and Saar	..	13,037*	..	612.5	7,985,160	..
Do. do.	do.	P. G. Moon, Vol. CXIV., p. 880	January-June, 1911.	6 months	Various	..	12,962*	..	598	7,751,275	..
Dessau. Intermittent. Eighteen 16.4-foot retorts in setting.	Mariendorf, Berlin	K. Bunte and Sentke, Vol. CIX., p. 27	November, 1909.	105 hours	Silesian	7.19	13,430	14,470	542.6	7,287,120	7,851,650
Dessau. Intermittent. Ten 13-foot retorts in setting.	Sunderland	C. D. Drury, Vol. CXIV., p. 851	April 1, 1910, to March 31, 1911.	12 months	Durham	11.425	12,647	14,278	590	7,461,730	8,424,195
Do. do.	do.	J. F. Bell, Vol. CXIV., p. 855	1911 (early)	Short	Derbyshire	12.28	13,381	15,272	586.5	7,847,955	8,956,810
Do. do.	Cologne	F. Lelsae, Vol. CXV., p. 479	April 1, 1910, to March 31, 1911.	12 months	Westphalian	13.94	14,203	16,504	526	7,464,875	8,674,035

* It is not stated that these volumes are cubic feet at 30 inches bar. and (60° Fabr.

relative capabilities of different types of vertical retort-settings. The figures for settings working on the continuous principle are believed by the writer to be the best obtained in well authenticated trials or in regular working so far as results have been published. He has not knowingly withheld any which would show these settings to better advantage. The figures quoted for the performances of the Dessau intermittent type of vertical retorts are only typical of a very large mass of similar results from the many works at which these settings have been in regular use for several years past. If the comparison instituted in the table and the accompanying text is in any respect unfair, the unfairness is to the Dessau intermittent system. Nevertheless, the latter shows to conspicuous advantage throughout. The continuous systems of carbonization in vertical retorts have still a great amount of lee-way to make up ere they will approach the position at present held by the Dessau intermittent system in respect of the make of gas and the calories in the gas from a ton of coal in every-day practical working.

Many other points have been touched upon in the earlier articles of this series—such as the freedom of the gas produced in Dessau vertical retorts from naphthalene, the larger production of ammonia, the high grade of tar obtained, and (in particular) the great superiority of the residual coke. These good points of the Dessau system may be more or less completely attained also by the continuous vertical retorts; but there is no indication that superiority has been secured by the latter in respect of any one of them. Consequently, the writer thinks it unnecessary now to go further into details in matters which are not susceptible of such exact expression or of such fair comparison as the make of gas per ton of coal and the number of calories in the gas. Enough has been said in the earlier articles to show that the Dessau system is second to none in the yield and quality of the residuals obtained, while it is superior to any other in gas-making, which is the prime purpose of a retort-setting.

It would also be inappropriate now to discuss the principles of carbonization in vertical retorts, or the judgments given in Germany and Austria in support of the patents held there by the Dessau Retort Companies in respect of the carbonization of coal in vertical retorts, since it is understood that these matters will shortly be under consideration in the English Courts of Law.

HYGIENIC ADVANTAGES OF VERTICAL RETORTS.

There is, however, one point in which the Dessau vertical retort setting is alleged to be greatly inferior to the continuous vertical settings; that is in the production of smoke and fumes in the retort-house. It is easy to say that a system of carbonization is dirty and objectionable in this respect, and such a charge is not easy to disprove, since in every case it is a question of degree. The writer took advantage of a recent visit to Germany to inspect some installations of Dessau vertical retorts expressly with the object of observing the amount of smoke, dust, or fume liberated when the retorts are being discharged and recharged. Through the courtesy of Mr. E. Körting, he was allowed to see the Dessau vertical retort settings at two of the works of the Imperial Continental Gas Association in Berlin—viz., the old Holzmarktstrasse works, and the new works at Weissensee. The former works are on the River Spree in the centre of the City of Berlin, and are closely built round.

The old settings of horizontal retorts have been displaced by four settings of eighteen 5-metre and four settings of twelve 5-metre Dessau vertical retorts. With these eight settings an output of about 1,600,000 cubic feet of gas per diem is attained. Yet the steam on discharging the settings, and the smoke and dust on recharging, were quite negligible quantities. Proof of the freedom from dirt of the working with the new settings was found in the cleanliness of the buildings on the gas-works and in the immediate vicinity. The contrast in this respect between them and the façades of the houses abutting on the railway viaduct near by was most marked. The houses near the railway were quite black, those near the gas-works were clean and as little discoloured as any buildings can be in the heart of a great city. The gas-works, with its equipment of Dessau vertical retorts, was clearly producing less smoke and dirt than other factories in the neighbourhood, quite apart from the railway. Inside the retort-house, the absence of fume, smoke, and dirt was quite a revelation as to the cleanliness of the working of a modern installation of Dessau vertical retorts.

The same thing was noticeable at the outlying works at Weissensee, where there are three beds of eighteen 5-metre and five beds of twelve 5-metre Dessau vertical retorts. Smoke and fume were again negligible quantities when the retorts were charged and discharged, and the house and surroundings were as clean as the keenest hygienist could desire. The writer came to the conclusion that there could be no reasonable objection on this score to the introduction of Dessau vertical retort settings in any position or locality.

UNIFORMITY IN THE QUALITY OF GAS MADE.

It has long been recognized that there is a marked difference in the quality of the gas evolved from horizontal and inclined retorts at different stages of the carbonization of the charge of coal. Dr. H. G. Colman, in a lecture which he delivered in Manchester in November, 1907 ["JOURNAL," Vol. C., p. 633], gave the results of an interesting series of analyses of the gas evolved from a good Derbyshire coal when carbonized in a horizontal retort at a temperature of about 1750° Fahr. The gas was collected for analysis at five different times after the commencement of car-

bonization—viz., at $\frac{1}{2}$, $1\frac{1}{2}$, $2\frac{1}{2}$, $3\frac{1}{2}$, and 5 hours. These analyses have been quoted by Mr. J. G. Newbigging to demonstrate the varying quality of the gas from intermittently charged horizontal retorts [see "JOURNAL," Vol. CXIV., p. 866]. If the calorific power of the gas is computed from these analyses (taking the mixture of ethylene and benzene as having when dry an average calorific power of 2650 B.Th.U. per cubic foot), it will be found that it ranges from about 857 B.Th.U. per cubic foot at half-an-hour after charging to about 470 B.Th.U. at five hours. That is to say, the difference between the highest and lowest calorific power is over 45 per cent. Nevertheless, an installation of horizontal retorts yields gas which, when tested at the inlet of the gasholder, does not, according to a chart published by Mr. Newbigging, show a greater variation than 14.91 per cent. in calorific power in 24 hours. The figures quoted and the chart given by him thus furnish clear proof of the equalizing effect on the quality of the gas entering the gasholder of the ordinary distribution over the 24 hours of the times of charging retorts. This distribution of the charging might in many gas-works be made even more regular, with the result that the variations in the quality of the gas entering the gasholder from intermittently charged retorts would fall below the 14.91 per cent. observed by Mr. Newbigging. But it is well known that such irregularities as his chart displays cause no practical inconvenience, because the gasholder serves in a very efficient manner to complete the equalization of the quality of the gas before it is delivered to the consumer. The gasholder cannot be dispensed with in gas supply for many other reasons, and, consequently, there is no real object to be attained in seeking to produce gas of more uniform quality than that hitherto produced the world over in intermittently charged horizontal and inclined retorts.

The gasholder, regarded merely as a mixer and equalizer, may not always be quite successful in producing a mixed gas suitable for distribution from gases varying so greatly in density as a poor coal gas and a rich carburetted water gas; and when it is a case of producing a mixed gas for distribution, any gas engineer who believes, with Mr. Newbigging, that there is some advantage in regularizing the quality of the gas prior to its admission to the gasholder, will naturally prefer that the mixed gas shall be directly produced in one plant, rather than that coal gas shall be made in (say) continuous vertical retorts, for subsequent admixture with water gas obtained from separate generating plant. The Dessau vertical retort, with its provision for steaming the coked charge, presents the desired means for producing mixed gas of more regular quality at the inlet to the gasholder than is otherwise obtainable.

The mixed gas obtained by steaming in Dessau vertical retorts is moreover as uniform in quality as the coal gas obtained by the ordinary methods of working horizontal or inclined retorts on gas-works. The two typical early installations of Dessau vertical retorts at Cologne and Sunderland afford proof of this statement. Mr. Newbigging has shown by charts that the difference between the highest and lowest recorded calorific values is, for gas made in horizontal retorts, 14.91 per cent., and for gas made in inclined retorts, 27.54 per cent. [see "JOURNAL," Vol. CXIV., p. 864]. Now a chart published by Herr Prenger, of Cologne, for the installation of 240 Dessau vertical retorts in that city, shows that, when his normal practice of charging one-quarter of the total number of the retorts every three hours is followed, the difference between the highest and lowest calorific values is about 16½ per cent. [see "JOURNAL," Vol. CII., p. 564, and the larger scale chart in the corresponding number of the "Journal für Gasbeleuchtung"]. Mr. C. Dru Drury has given charts, similar to those of Mr. Newbigging, for the gas from the installation of Dessau vertical retorts at Sunderland [see "JOURNAL," Vol. CXIV., p. 856]. One chart, which refers to the gas at the inlet of the holder, indicates that the difference between the highest and lowest recorded calorific values is well below 10 per cent. The other chart refers to the gas delivered from the holder, and shows that the difference between the highest and lowest recorded calorific values has been reduced, by the equalizing action of the gasholder, to about 3 per cent. A chart given by Mr. Newbigging for the gas produced in continuously worked Glover-West vertical retorts shows that the net calorific power ranges from about 475 to about 505 B.Th.U. in 24 hours—a difference of about 6 per cent.

It is thus clear that the fluctuations in the quality of the mixed gas produced in Dessau vertical retorts are appreciably less, at the inlet of the gasholder, than the corresponding fluctuations in the quality of coal gas, as made by Mr. Newbigging, from horizontal and inclined retorts. Presumably the latter gas, despite the great fluctuations, has proved, after passage through the gasholder, of sufficiently regular quality for the supply of consumers. Further, the fluctuations in the quality of the mixed gas produced in Dessau vertical retorts are very little greater than those of the coal gas produced in Glover-West vertical retorts, when the two gases are compared at the inlet of the gasholder. There is absolutely no evidence that the fluctuations in the quality of the gas supplied from the gasholder are any greater with gas produced by the Dessau intermittent system of vertical retorts than with gas produced by any continuous system. Indeed, if mixed gas is supplied instead of simple coal gas, the Dessau system should be more favourable than any other to regularity of quality being maintained in the gas distributed.

THE COST OF LABOUR AND CAPITAL CHARGES.

The visits to the two works in Berlin referred to above served also to confirm the general impression already held of the great

ease of manipulation of the Dessau settings—particularly the new pattern with eighteen retorts in a bed—and of the low cost of labour for working them. In both the retort-houses visited, the discharging and re-charging were at the time being carried out entirely by one man, who was able to do the whole of the manipulation involved with the greatest ease and rapidity. The automatically-acting sprinklers in use quenched the coke in a uniform manner, with a marked freedom from over-saturation with water, and without the liberation into the retort-house of great volumes of steam. The re-charging of three retorts in one operation was also an instructive illustration of the advantages possessed by the new pattern of Dessau setting. The charges were uniformly put into all the retorts, and the lids were closed before any nuisance could be caused by the liberation of gas or smoke. Some figures were kindly given to the writer by Mr. Körting as to the total cost of labour for carbonizing with these new pattern Dessau settings. The figures refer to a retort-house carbonizing about 500 tons of coal, and therefore making about 7 million cubic feet of gas per day of 24 hours. The retort-house would be equipped with four benches, each containing seven settings of 18 vertical retorts, 16·4 feet in length, making a total of 504 retorts. The charge would remain in the retort for twelve hours, and during the last two hours steam would be introduced. The stokers and furnace men would work in two shifts of eight hours each—viz., from 7 a.m. to 3 p.m., and 7 p.m. to 3 a.m. There would be no stokers or furnace men on the premises between 3 and 7 o'clock. The foremen also would work in eight-hour shifts, but the other men would be employed for nine hours a day. The men required for the retort-house would then be as follows:—

	Day.	Night.	Total.
Stokers for charging and discharging the retorts, filling generators, operating cocks for steaming, &c	6	6	12
For clinking	3	3	6
For cleaning pitch pans in hydraulic and odd jobs	2	..	2
For cleaning and lubricating gearing and odd jobs	2	..	2
For scouring and odd jobs	3	..	3
Foreman, each eight hours . . . . .	..	..	3
Total			28

The labour required, including foremen, for a retort-house equipped with the latest type of Dessau vertical retorts is therefore, according to Mr. Körting's ripe experience, one man per setting per 24 hours, or (say) one man for every quarter-million cubic feet of gas made.

The cost of labour must, however, necessarily vary with the size of the installation, and the fluctuations in the number of settings in use. That it can be appreciably lower, however, with any other system of carbonization than with Dessau vertical retorts of the latest type is highly problematical if all the labour charges in the retort-house in regular working are taken into account. There is, moreover, with the Dessau system no uninterrupted consumption of power, for the withdrawal of coke and introduction of coal, which is an essential feature of the continuous systems of carbonization in vertical retorts.

The capital charges on a modern installation of carbonizing plant must vary greatly, whatever the system adopted, with the particular and local conditions, and the size of the installation involved. Even with the Dessau system, improvements are constantly being introduced which materially reduce, from time to time, the capital charges per 1000 cubic feet of gas made. Hence it seems best to omit from these articles detailed particulars of the cost of installations of different carbonizing plants, and merely to suggest that a gas engineer who has under consideration the erection of new settings, or the reconstruction of existing beds of retorts, should ascertain by an exact estimate whether the capital charges for Dessau retort-settings will not, in regular working over a number of years, prove lower than for any others.

DEVELOPMENT OF BYE-PRODUCT TREATMENT. BENZOL RECOVERY FROM COKE-OVEN GAS.

By G. STANLEY COOPER, B.Sc.

SOME time ago ["JOURNAL" for May 9, p. 365], the writer dealt with possibilities in the development of bye-product treatment, and outlined several methods by which various useful products might be obtained from gas-works residuals. In this direction, coke-oven practice has developed very considerably of late, especially on the Continent, where much expert attention has been devoted to perfecting processes by which the utmost value can be obtained from all the bye-products in the carbonization of coal. Especially is this the case in connection with the direct process for ammonia recovery, the extraction of benzol from the crude gas, &c. Processes are now being established in which the sulphur in the gas is utilized to provide the acid necessary to convert the ammonia into sulphate. The recovery of benzol, too, is practised with very satisfactory results; and though this is not

a process which lends itself for adoption in gas-works, yet it is interesting in itself as showing the development of one of the principal "side-lines" of the gas industry. Several plants are at work in England where the ammonia is recovered by the direct process, and at the same time benzol is also recovered from the crude gas. One of the best known systems working in this way is that of the Koppers Coke-Oven Company, of Sheffield; and a very successful plant is in operation at the Cortonwood Colliery, near Barnsley, working on Koppers' system.

The principal feature of the Otto-Hilgenstock direct process—i.e., the absence of all ammoniacal liquor—cannot be worked in connection with benzol recovery owing to cooling being necessary, and consequently condensation would take place and some liquor would be produced. If, however, the process is modified so as to produce a small amount of liquor, benzol can be recovered efficiently. But in this case, distillation is necessary, if the whole of the ammonia is to be recovered.

During a recent visit to the principal colliery centres of Germany, the writer had the opportunity of inspecting several installations of coke-ovens and bye-product plants. One of the most interesting of these was the installation at Bahnschacht Colliery, Waldenburg, Silesia. There are in operation at this particular place, 160 coke-ovens, 70 of which work on Koppers' regenerative system; the remaining ovens being of the old Otto-Hoffman type. The direct process for the recovery of ammonia is in use, and there is also a plant for the recovery of benzol. This installation was the first erected by Messrs. Koppers at which these two processes are in operation simultaneously. The gas from the whole of the ovens passes through the saturator, and the usual make of sulphate is about five to six tons daily, rising to seven tons when all the ovens are in use. With the regenerative ovens there is, of course, a considerable surplus of combustible gas. This gas is used at Waldenburg for firing boilers for steam-raising purposes; eight boilers being kept going regularly for the production of steam at a pressure of eight atmospheres.

One of the principal features of interest of this particular plant is the existence of a separate benzol factory—the Deutsche-Benzol Fabrik—which deals with the whole of the benzol recovered from this and several other installations in the neighbourhood. For the recovery of the benzol, the crude gas passes up high towers and meets streams of creosote oil and washing oil, which take the benzol out of the gas. This oil is then passed through various heating arrangements, treated first with indirect steam at a temperature of 105° C., and then with direct steam, whereby the temperature rises to 180° C. In this way, the crude benzol is caused to pass off as vapour, leaving the hot washing oil to be used again. The apparatus is so arranged that there is only a minimum waste of heat. For example, the latent heat of the benzol vapour, given out when this changes to a liquid, is absorbed by the cold washing oil containing benzol from the benzol scrubbers. Again, too, the hot washing oil at 180° C.—when the benzol has passed from it as a vapour—is further used to heat up more oil from the scrubbers. In this way, the process is rendered continuous and as economical as possible.

The crude benzol which has been separated, as set out above, is cleaned and then pumped into the stills. There are three stills arranged to work at different temperatures, and so attain good fractionation of the crude spirit. Before distillation, the benzol is subjected to thorough cleansing—being first well shaken and mixed with sulphuric acid. In the mixing tank, the mechanical stirrer is arranged to work on a horizontal axis, so as to nullify the effect of the different densities of the acid and benzol. From the acid tank the benzol passes to a second tank, where it is well scrubbed with water, and hence most of the acid removed; while finally, it is washed with caustic soda to remove all traces of the acid. The acid and alkali are supplied from overhead tanks.

After cleansing, the benzol goes into the first still, which has a capacity of 30,000 kilogrammes, and it is subjected to fractional distillation; the second and third stills working at different temperatures in turn. In this way, good fractionation of the benzol is brought about, and the following products are finally obtained: Light oil, raw and refined benzol, raw and refined toluol, raw and refined solvent naphtha, xylol, naphthalene, cumaron-harz (a resinous substance). For the products there are two storage tanks of a capacity of 1000 tons each, and fourteen cylinders, each capable of holding 47 tons. The plant averages an output of 450 tons per month; and it is interesting to note that about one-half of the amount is used for motors.

The Management of Steam, Gas, and Oil Engines.—Some "Notes and Memoranda on the Management of Steam Engines and Boilers and Gas and Oil Engines" have been published by His Majesty's Stationery Office, at the price of one penny. The pamphlet, which is of handy size, should be found useful by those whose duty it is to operate plants of the types referred to.

Engineership of the East Greenwich Gas-Works.—The breakdown in health which Mr. Joseph Tysoe recently experienced will (though happily he is now much better) have to some extent prepared his *confrères* for an announcement of his retirement from the position of Engineer of the East Greenwich Gas-Works. That this event is now impending may be gathered from an advertisement which appears on another page to-day, to the effect that the South Metropolitan Gas Company are prepared to receive applications from candidates for the post. The commencing salary will be £800 per annum.

RAILWAY GAS LIGHTING.

[COMMUNICATED.]

THE lighting department of a railway deals with probably more applications of the principles of illumination, and has more difficulties to overcome, than the average engineer realizes. Not only are the more common applications of lighting most varied, such as office, station, roadway, warehouse, &c., but there are many uncommon phases met with, in which it is somewhat more difficult to combine efficiency and economy—such, for instance, as signals and trains.

The problems to be faced are by no means lessened by the extended nature of the installations—stretching, in the case of some railways, practically all over England, a district (say) 300 miles long by 150 miles broad—and by the fact that hitherto but little attention has been devoted to these matters. Some explanation of the requirements of such a department, and of the difficulties which have to be overcome, may possibly be of assistance to brother lighting engineers; to gas managers, who seem to be becoming daily more anxious to meet the reasonable requirements of consumers, and who in many cases are good enough to go out of their way to render advice and assistance; and, not least, to manufacturers of apparatus, to whom a proper appreciation of certain railway requirements should be of considerable value.

The writer of the present article, entrusted with the organization of the lighting department of a large railway company some years ago, found a very mixed state of affairs awaiting him. By reason of the fact that the selection and fitting up of gas apparatus had hitherto been left in the hands of the officials in charge in each district of the line, it was found that there were more than thirty different types of lanterns in use, and a score of burners of incandescent and flat-flame variety. More than a dozen different sizes of mantles were required; and these were purchased from almost as many different sources. No attempt had been made to keep any proper record of the quantity of gas consumed, which led to carelessness and waste; and there was general, if strange, ignorance on the part of everyone as to the uses of the commoner apparatus, such as governors and pressure-gauges.

One of the first things done, therefore, was to experiment with, and fix upon, suitable and efficient types of lamps and burners which should be used as standards on all new or replacement work; so that gradually the multiplicity of types would disappear. Great progress has been made in the construction of lanterns and burners—more especially the latter—during the last five or ten years; and it was soon found possible to decide upon certain types of each which were a very great improvement upon anything previously in use. Two descriptions of lantern were fixed upon—a 16-inch square and a wall—both fitted with two doors, on opposite sides, so that the one on the lee-side could always be opened. This latter facility, which allows of the lamp being opened for cleaning or lighting purposes on two sides, saves a large number of mantles in windy weather.

The selection of burners with which to standardize presented many more difficulties, as there were so many different types to choose from. Naturally there was a desire to use only the most efficient, and also those of simple construction, which would be unlikely to give trouble. At this point, another consideration stepped in. The various installations being in so many different places, and even then at such greatly varying altitudes, caused the pressure at the several points to vary from about 20-roths to 45-roths; a few being below the former. It was clearly necessary to decide upon a standard pressure which could be maintained by means of suitable governors, so that all burners supplied could be made specially for use with it, and so prevent the waste of gas which would take place were a burner made to give best results at (say) 15-roths put upon an installation of 30-roths, and also because a burner which might give excellent results at (say) 30-roths might not do so at the lower pressure of 20-roths, which was decided upon as a standard for the whole system.

What waste and unsatisfactory results were taking place before this change was enforced, when burners made, some for 5-roths, some for 10-roths, and some for 15-roths were placed upon pressures up to 45-roths, may easily be imagined. Yet such is the lack of appreciation of even such simple principles, that this sort of thing is going on daily almost all over the country. The new idea, that it is to the gas manager's interest to see that his customers do not waste gas, and have satisfactory apparatus, appears to be slow in taking root everywhere, even in otherwise well-informed quarters.

Experiments, then, were undertaken with numerous burners. These were limited, I need hardly say, to the inverted type; and to those burners using approximately 4, 2, and 1 cubic feet of gas per hour, and giving about 80, 40, and 15 candle power respectively. According to the makers' statements, these consumptions should yield a greater efficiency; but as measured horizontally, and without any reflector behind the light, the above is about the best that one has reason to expect on a pressure of 20-roths. The choice of a burner which shall be simple in construction and yet correctly designed in essentials, which shall have a non-metal nozzle which will not burn away, and which is made heavy enough to stand wear and tear and not too gentle handling, is perhaps not so easy a matter as might appear on the surface.

The main conclusions, reached after a considerable amount of experience and experiment, point to the following features as being desirable:—

- 1.—The primary air should be absolutely protected from the products of combustion.
- 2.—The gas-nipple should have a single hole, correctly centred.
- 3.—The nozzle should be of fire-clay, steatite, or other non-burnable substance.
- 4.—The primary air and the subsequent mixture should be as cool as possible to get the highest efficiency, in installations where the pressure is (say) under 30-roths. In order to ensure this, the mixing-tube should be short.

Possessing these points, there should not be much difficulty in getting the green or violetish cone in the flame, at 20-roths pressure, which is a sure sign that the burner is an efficient one. But it is a strange thing that with many burners, made even by well-known firms with big reputations, it is found very difficult to get this evidence of satisfaction. Certainly, at first lighting, the majority of burners will give the desired "green cone" in the flame; but how many after half-an-hour's burning no longer do so? The following points which have caused lack of efficiency might be mentioned, and recommended to the makers for their consideration.

- 1.—The undue heating of the primary air or mixture.
- 2.—The nipple not giving a straight stream of gas, which would thus impinge on the side of the mixing-tube and so lose the injector action.
- 3.—The interior of the mixing-tube being too rough and impeding the progress of the mixture.
- 4.—The mixing-tube being too long or too sharply curved.

After a considerable amount of experiment, satisfactory types of burners were decided upon, and by their use, singly or several together, the problems usually offered appear to be met without waste of light or of gas. The small 15-candle power inverteds are principally used for lighting offices, passages, lavatories, and other places where small units are an advantage. The 40-candle power burners are put to some of the above uses as circumstances may require, and are also employed for lighting some small and less important stations. At points where a brilliant illumination is required, the 80-candle power burners, either singly or in twos or threes, meet every reasonable requirement.

Incandescent burners, however, no matter how efficient and desirable for general purposes, do not meet every requirement. For instance, in some places, such as warehouses, a light may only be required on one or two evenings during the year. Also in the case of signals, where only small illumination is needed, but where this must be absolutely reliable and not subject to the possibility of mantles breaking, either owing to vibration or wind, the flat-flame burner meets requirements. Consequently, there are thousands of positions where these burners are fitted and are likely to remain. This being so, it is desirable that those giving the best efficiency should be used. Those which one sees most generally in use are of the regulator type, which the makers officially state as being made for 5-roths to 10-roths pressure. Placing these upon the standard pressure of 20-roths would therefore generally mean a decided loss. The makers will, however, supply flat-flame burners suitable for any pressure. After experiment, it was decided to obtain all made specially for 15-roths pressure, as those made for 20-roths, when placed on installations of this pressure, gave a somewhat weak flame for general requirements. Heads of the "union-jet" variety were decided upon in preference to the "slit-union," as the latter are more liable to be choked with dirt and dust. In a few cases where it was not going to pay to fix a mercurial governor at the meter, governed burners were fitted.

It is evident to any observer that flat-flame burners of the regulator type, which are unnecessarily wasteful, are still being fitted in great numbers even by gas undertakings themselves. Might one who has had some little experience with this subject suggest the advisability of investigating the difference in consumption and efficiency between the common and the special flat-flame burner?

Until the time when the lighting department was put upon a proper basis, it had been the practice to leave the cleaning of burners, replacement of mantles, and other matters of like nature, to the local officials, who generally delegated this duty to a porter or other similar official with no training in, or knowledge of, the subject. Very naturally this resulted in these matters not receiving the attention they should, and in the lighting itself suffering. In consequence, it was found advisable to divide the line up into districts, each containing from 300 to 600 burners; a man being appointed to clean burners and lamps, replace mantles, and do any trifling repairs in each. The only thing left to the discretion of the station staff was the lighting and extinguishing of the lamps. The system as described when put into practice was found to overcome many minor difficulties, and the lighting was instantly improved. Something like 30 per cent. of the mantle renewals were saved, and the change also obviated the necessity for sending out an experienced gas-fitter on many occasions. Taking the arrangement as a whole, the savings made nearly paid the wages of the men, besides which there was the immensely increased efficiency in the lighting.

Having reached this point, a measure of attention was turned

to the mantles. Experiments were undertaken with a view of determining the varieties which lasted longest without breaking, and which retained their candle power best over a period of hours. During these tests, the differences between various classes of mantles was most noticeable, some giving a much greater amount of illumination than others. It was, however, finally considered advisable to standardize with a substantial mantle giving only a medium quantity of illumination, but which did not drop its candle power greatly after continued use. Every batch of mantles is now tested by a certain number being burned in the test-room for 1000 hours; readings being taken at fixed intervals to ascertain if the candle power is maintained. It is acknowledged that this is not a wholly satisfactory method of testing; but it probably serves to detect any marked inferiority in any one batch. Having decided upon a standard, it was possible to purchase all mantles from the one maker instead of some dozen, as had been done previously. This, in itself, saved considerable trouble, and enabled better prices to be obtained for the larger quantity required. The question of mantles, though a comparatively minor one, and involving small sums of money as compared with larger questions, certainly repays some attention.

The lighting department does not stop at the provision of suitable and efficient burners, with supplying good mantles, and with keeping them in good condition. It is anxious to prevent waste of gas. Nothing has served this purpose better than the institution of the practice of making the local officials take a weekly reading of the meter and render a return of the consumption for comparison with the previous week and the previous year. These returns are entered at headquarters into ledgers, which allow of any undue increase to be instantly detected and an explanation obtained. Besides, this system permits of the gas accounts being very easily checked when rendered.

The new inverted burners also make towards economy; for an inverted burner using some 2 cubic feet of gas per hour, in my experience, may be very generally made to give about the same effective lighting as one of the older uprights using about 4 cubic feet per hour. In actual practice, however, it is quite usual with replacements to put in a more powerful burner, as the standard of illumination is rising year by year, and this prevents anticipated economies being made in many instances. But the better light is often obtained without increasing the gas consumption.

The special feature about railway lighting may, perhaps, be said to be its catholicity—that is, the fact that all kinds and conditions of lighting, each presenting its own problem, and many out of the ordinary rut, are dealt with in the day's work: Train lighting, which was dealt with in an article in the "JOURNAL" for Feb. 28 last (p. 586); signal lighting, where the problem is to provide a very small light, but one which can be absolutely relied upon to remain lighted—the effect of the flame being magnified many times by means of a suitable lens; signal-box lighting, where the object is to keep the glare out of the signalmen's eyes; yard lighting, which should be arranged so that dark shadows are not thrown by the waggons; and so on *ad infinitum*.

Many difficulties come up to be surmounted by the lighting department; but their overcoming provides one of the pleasures of living—successful work.

In conclusion, may the author mention the very kind assistance he has always had from gas engineers and managers in all parts of the country, not to say manufacturers of apparatus. He hopes that the above lines may present to them some phases in the life of one whose work is closely allied with their own.

FIRST COST OF GAS-FITTINGS AND APPLIANCES

By NORTON H. HUMPHRYS, Assoc.M.Inst.C.E., F.C.S.

THE first cost of fittings on the consumer's side of the meter has from the earliest days of gas supply been always a trouble and a hindrance to the extended use of gas; but in several respects the difficulty has never been more acute than it is to-day. A change has taken place in the habits of the people. The old idea was for everybody who could afford it to get his own house; and young couples, when marrying, looked out for an establishment that would last them to the end of their days. If they did not buy outright, they took on a long lease. Shopkeepers and business men followed the same lines. They acquired possession of their business premises, and a suitable residence attached to it or else adjoining. The landlord provided little beyond the walls and the roof. But now it is the rule for the landlord to do a great deal more. Not only have all classes of the community become more migratory in their habits, but a large class has sprung up in every district, comprising artisans, shop assistants, clerks, and generally persons who may be described as wage-earners, who take their residences on weekly or monthly terms, and expect to find them fitted with every modern convenience, and would as soon think of putting in gas-pipes at their own expense as of fixing bell-wires or hot-water cisterns. Even those who have the means object to the expenditure on various grounds. Perhaps in a few years, they say, methods of lighting and heating may be altogether revolutionized. Even where a good trade in gas-lighting is done, people now expect to spend a less sum over the whole fit-up than would formerly have been considered sufficient for the drawing-room gasolier alone. In fact, the day when it was possible for

a private individual to make a good living profit on gas-fittings alone has long passed away.

The difficulty applies not only to new districts, but to old customers also. In many of our residential towns, if there is no extension worth the name, there are hundreds of customers whose premises were fitted fifty years ago or so. None too carefully or intelligently laid even in the first place, matters are not improved by the exigencies of wear and tear, by botching and alteration from time to time, including the addition of twice as many lights, a cooker, gas-fires, geyser, and other appliances not contemplated in the first place. The condition in many instances has reached an acute stage. The old installation is approaching its last legs and its latter end. A complete clearance of the old stuff is required, in favour of a new fit-out from stem to stern, suited to modern conditions and requirements. But neither the landlord nor the tenant is willing to pay for it.

The original idea was that the consumer, or his landlord, should provide and pay for everything inside the boundary of the premises. Some companies held up their hands in horror at the recklessness of even laying the service free so far as the public highway was concerned, and charged for the whole of the pipe and labour, together with a fee of 5s. or 10s. for tapping the main, to cover loss of gas and other incidentals. But it soon became evident a policy of this sort would render extension at the works an almost superfluous feature. One or two go-ahead companies commenced the plan of 30 feet of service free and a meter on hire, or even the whole up to the inlet of the meter free. This resulted soon in the universal adoption of a more liberal policy. History repeated itself in the matter of gas-cookers. So long as the consumer had to bear the expense of fitting up the gas-cooker, not one in a hundred, exclusive of people interested in the gas-works or the gas-lighting trade, cooked by gas. To-day, as a result not of supplying a fixture gratis, but of providing free of any first cost, at a moderate but not unremunerative rental, there are in most districts two cookers on hire to every three customers. So with gas-fires, wash-boilers, baths, &c. A substantial business can be done on hire terms. But the most striking illustration of the point is afforded by the automatic meter arrangement, under which a cooker and two or three lights are fitted, not gratis, but free of first cost, at a fair rental charged as an addition to the price of gas—perhaps 8d. or 9d. per 1000 cubic feet. The introduction of this system has elicited the important and interesting fact that in most districts there is a large proportion of the population—as much as one-tenth of the total—who are prepared to use gas, but have hitherto allowed the question to remain in abeyance because they are not able, or not willing, to spend money on gas-fittings.

In the average district, the demand for slot meters and cookers has been fairly covered. The public are so familiar with the use of appliances that the cookery demonstration and the exhibition are not required. But can it be said that the ground is fully covered, and that every customer willing to use gas has been obtained? Are there not many, belonging to what is colloquially termed the better class, who are willing to use gas but not to pay the price of gas-fittings? Are there not many who have used gas for years, but are thinking of discarding it on account of the vicissitudes of uncertain supply, leakages, and other troubles incidental to worn-out and bad fittings? There is also, in every district, more or less new business to be worked up.

To those who, having fitted up every available slot user, and saturated the demand for cookers, are looking out for fresh fields to conquer, I would make this suggestion. Why not extend the hire system to embrace anything and everything that is a promising medium for the consumption of gas, to be supplied subject to proper agreements with landlord and tenant, as usual with the slot system, at an annual rental of 10 to 15 per cent. on the cost? A great deal can be done for a £5 note, and experience shows that no gas consumer objects to a moderate quarterly rent—say, 2s. 6d., 3s., or 3s. 6d. There need be no more risk in working a system of this sort than is experienced with the automatic system. The main point in any hiring scheme is to ensure regular usage. It is not sufficient to place the apparatus. If satisfactory results are to be ensured, there must be a little judicious weeding out in the matter of apparatus only used about once a month.

But the automatic system carries another important advantage with it. We have all heard a great deal about the necessity of having full control up to and including the burner. Now if gas companies are to have this, in the full sense of the word, the apparatus up to and including the burner must remain their property. They can renew, alter, and repair their own property as they find necessary, but have no control, and cannot have anything like full control, over the property of others. As an incidental matter, the automatic and hiring systems secure this result, and that they do so contributes in no small measure to their success. Purchase by instalments, sometimes called hire-purchase, although hiring and purchasing are as distinct and inimicable as oil and water, will not meet the requirement. It is all right at the start while all is new. But if spread over seven years or so, the apparatus may, in the hands of a none too careful user, be worn out, or nearly so, before payments are complete, and the result is disappointment or dissatisfaction. The apparatus, even if in good condition, may be obsolete—having been replaced in these days of rapid progress by something having greater claim to efficiency or economy. After the purchaser has completed his payments and secured sole ownership, the position is just the same, and all the difficulties above referred to are experienced. It is supposed

that the possession of the appliances will render the consumer less willing to discontinue the use of gas. But when the apparatus approaches its last days, it may have the contrary effect. Occasionally difficulties arise under maintenance schemes, through the company being expected to take over old decrepit stuff, and maintain it in good order. If this is within the bounds of possibility, it can only be done at an expense that renders complete replacement a preferable alternative. The hire system is open to the objection that it increases the outlay, and the risk of having half-used apparatus returned. But it is the only way of meeting the difficulty; and the experience so far is such as to quite warrant its extension on the lines above suggested.

STRUCTURE OF INCANDESCENCE MANTLES.

By J. O. ZDANOWICH.

CAREFUL examination of the structure of a freshly-made mantle, or after it has been in use for some little time, will unmistakably disclose the origin of the fabric used for its manufacture.

The structural differences are so distinct and decisive that there is no possibility of a mistake to be made as to whether cotton, ramie, or artificial silk was the basis for the manufacture of a given mantle. In the first instance, considering the difference in structure of the skeleton of a cotton and ramie-made mantle (by the naked eye), the apparent irregularity in thickness of the thread of ramie skeleton, being greater than that of cotton, leads to the supposition that the strength and durability of such a mantle ought to be inferior to that made of cotton. As a matter of fact, it is not the case, and very often it is just the reverse—provided: (a) in both cases mantles have been made by the same process (viz., nitrate) or simple conversion of the salts into their oxides by incineration, (b) or the ramie mantle is made by this process and cotton mantle by "precipitation" [see further]. Here it must be mentioned that there are practically no mantles on the market made from cotton by the ordinary (nitrate) process.

This supposition as to the durability will disappear when a mantle is examined under a microscope. The skeleton-ash of ramie-made mantles shows that every separate fibre of the raw-ramie fabric has conserved its original structure in the shape of resulting illuminating oxides of the rare earths, while that of cotton-made mantles shows more or less solid thread. Here, again, the difference of twist of both fabrics may be accounted for to a certain extent.

Taking then into consideration the length of the ramie (ultimate) fibres, which very often reaches 100 mm., and those of cotton, even of the best quality—such as Egyptian or Sea Island—which possess the longest fibre, and very seldom come up to 50 mm.—it will disclose the reason of the preference of ramie yarns to cotton; and this is the main reason why, since the discovery of the mantle made of cotton yarns, this has been gradually substituted by ramie and finally by artificial silk.

The above principally concerns both cotton and ramie mantles made by the ordinary nitrate process, as stated before.

There are now on the market a great many mantles which have been made, prior to incineration—e.g., conversion of the salts into oxides by heat—by converting the illuminating salts into corresponding hydroxides, by subjecting the mantles to the action of a base capable of precipitating hydroxides from corresponding salts. Such conversion, or precipitation, of salts *in situ*, which leads to the deposit of hydroxides in colloidal state, when the operations have been conducted under proper conditions, raises the quality of cotton-made mantles, if not to the same standard as the ramie-made ones, in many ways even superior to them. For instance, the elasticity and tenacity are such as could not be obtained with a ramie mantle by any ordinary process. In regard to elasticity, it must not be forgotten that the addition of certain (by themselves) non-illuminating salts, in very wide limits, increases or diminishes the elasticity of a skeleton-ash, without, however, affecting the illuminating power of a mantle.

The above-mentioned difference in structure between ramie and cotton mantles led to the suggestion to substitute both fibres by artificial silk. Judging from the number of the applications for patents, numerous experiments have been carried out in this direction during the last ten years; and despite obvious difficulties which were met with at the beginning (chiefly in respect to storage and transit of such mantles), these are now overcome, and the artificial silk mantle is steadily and surely taking its well-deserved place on the market.

Examined under the microscope, this mantle shows that each skeleton thread is composed of great numbers of separate long, loose fibres of extreme evenness, with wide interstices. This latter property is the chief condition of high illumination, because of the greater surface. On the other hand, the fineness and evenness of the fibre spell less gas for giving the illuminating power; or with a given consumption of gas one gets better light; and above all the life of the mantle is much longer, not only because of the mechanical strain (weaker rush of gas and lower temperature of flame), but through the evenness and length of fibres. This is confirmed by experience, because when, after having been in use for some 1200 hours, such a mantle is examined under a microscope, it shows it has practically undergone no changes from its original appearance, whereas cotton or ramie mantles even in use for a less time will show a considerable structural change.

Another important factor is the remarkable elasticity and tenacity of a mantle, for reasons which follow from the above statements, and which practically could not be got with either cotton or ramie mantles.

As to the number of separate fibres in each single thread, it varies considerably, according to the quality and origin of artificial silk and the way of manufacture of mantles. Generally, it is between 16 and 200 separate fibres.

With regard to the manufacture of artificial silk mantles, there are numerous difficulties to overcome. In the first instance, the origin of artificial silk is an important factor. There are three kinds of silk on the market (Chardonnet, Cupper-Ammonia, and Viscose). Each requires different treatment, and the quality of resulting mantles will vary with the origin of silk. But whatever the kind of silk it is impossible to apply it to the manufacture of mantles by the ordinary (nitrate) process, owing probably to its structure and to the fact that we are dealing here with a modified cellulose or hydrate.

The next inconvenience to be considered is that the artificial silk, of whatever origin, when in a wet state (as is the case during the impregnation process), loses strength, and, consequently, requires extremely careful handling; otherwise breakage of thread and holes in the mantles result.

As to the knitting of stockings, thanks to the numerous perfections in the manufacture of silk in the course of the last few years, it stands fairly well the tension of a knitting-machine.

A few words may be said concerning the precipitation—viz., the conversion of nitrates (although other salts may be used as well) into their hydroxides. An extremely important fact is to get these hydroxides in colloidal state, whatever the precipitating agent may be, because in this condition only do they yield elastic and tenacious mantles.

Unfortunately, the chemistry of colloids is comparatively so little known, and the conditions of getting any substance in a perfect colloidal state are so delicate and difficult that very frequently working apparently under the same conditions, one gets different results, which an average manufacturer is always inclined to attribute to some other causes than the precipitation and subsequent treatment.

GAS FROM PEAT IN GERMANY.

According to a report by the American Consul at Stettin, the annual production of peat in Germany amounts to about 11 million tons; and regarding the heating qualities of the best peat, it has been established that the average peat is equal to dry beechwood of similar weight, and equal to coal of half the weight. He says that the industrial utilization of peat for lighting purposes has been attempted for many years in Germany; but as yet there has been no satisfactory solution of the problem of how to produce power gas from peat more cheaply than from coal. In conjunction therewith the generation of ammonia and of electricity has been attracting much attention in scientific quarters; and at the last annual convention of German scientists and physicists the problem was discussed as a result of new views and investigations presented by Dr. Caro, of Berlin.

In collaboration with Professor Frank, of Charlottenburg, Dr. Caro discovered a method for the economical utilization of peat, which he claims avoids former mistakes, and which he described as follows: The generator consists of shaft-like ovens, where the burning of the peat is conducted in a way admitting limited quantities of air. Thus also, a dry peat in pieces can be treated, and produces gas strongly impregnated with tar fumes. This gas, after purification from tar, furnishes a useful heating and power gas. The inventor found that if the gasification process is properly conducted, peat containing as much as 60 per cent. of water could be used. Peat having a percentage of water above this figure could be dried by storage in the open air. The process, Dr. Caro asserts, permits the manufacture of good heating gas during the entire year; and he claims that it can be used in connection with the generation of electricity. In view of the absence of constant water power in Germany, he thinks the invention will cheapen the cost of generating current. Another result of the discovery is the extraction of nitrogen by the process; 85 per cent. of this element, contained in the peat, being recovered. The nitrogen can be converted into ammonia by the introduction of steam; and the method admits of the production of ammonium sulphate—thus, of course, furnishing agriculture with a valuable fertilizer.

The Prussian Minister of Agriculture is now engaged in preparing a comprehensive law giving the Government extensive power to stimulate, by direct financial assistance, as well as by the use of all available governmental facilities in the broadest application, all efforts for the cultivation of the German marshes and moors, although 90 per cent. of the Prussian high moorlands are in private hands.

Mr. W. PARKER has been appointed Superintendent of the Gas Street works of the Bolton Corporation, in succession to Mr. Arthur E. Saville, who recently left Bolton to take up duty as Manager and Secretary of the Farnham Gas and Electricity Works. Mr. Parker has been in the employ of the Bolton Gas Department for many years.

NEW AND CHOICE DESIGNS IN RICHMOND FIRES.

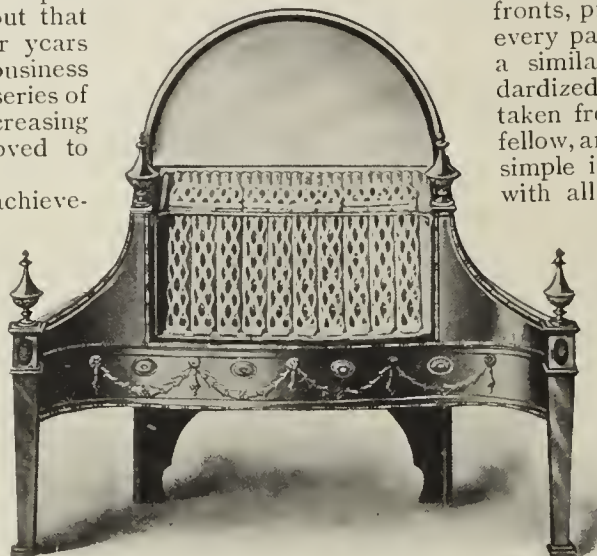
IN our "Editorial Notes" last week, use was made of the words "Insure the future by your present policy;" and although the counsel was then more particularly directed to gas undertakings, it might equally well apply to manufacturers who play so important a part in supplying efficient and up-to-date apparatus for the utilization of gas. By what we saw a few days since at their showrooms, the Richmond Gas Stove and Meter Company remind us that not only are they, by their present programme, taking thought for the future, but that the broad lines laid down by them four years ago on which to develop their gas-fire business—that is to say, at the time the "A.B.C." series of fires was introduced—have, by the increasing demand for their specialities, been proved to have been entirely successful.

While fully satisfied with their past achievements, the Company recognize that the constant changes in the decorative style of houses to-day, demand gas-fires of even higher grade in design than the past has provided; and with this in view they have, at considerable cost, produced a new series of fires which they confidently think, and with good reason, will be adjudged as great an advance as their "A.B.C." fires were at the time of their introduction. The new fires are after, in their design, the decorative architecture of the various periods known in the art world; and, generally, the

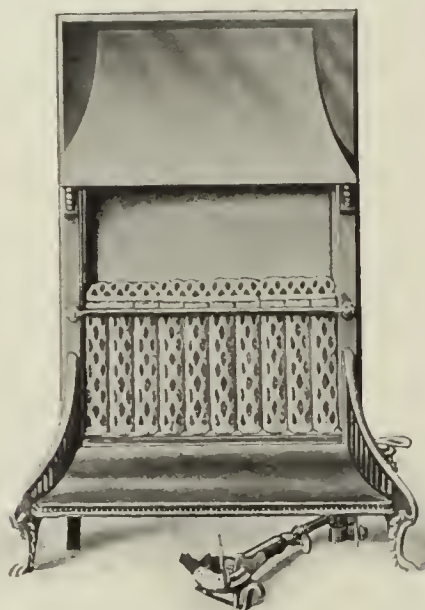
now) have combined to bring about a handsome, high-grade, and, we should say, thoroughly efficient series of fires. As to their finishes, the ground surface has been retained; and whether in art black, antique bronze, copper, or porcellanite, there is an attractive excellence about their appearance. The names of the fires are given under the illustrations; and lists are available incorporating the fullest particulars.

It will be remembered that the introduction some four or five years ago of the Company's "A.B.C." series marked a distinct change in the design and construction of gas-fires. Three different sizes of burners, and three different designs of fronts, provided a series of sixteen fires, in which every part was interchangeable with each fire of a similar sized opening. Each part was standardized and fitted so that any portion could be taken from one fire and placed in position on its fellow, and *vice-versa*. This, coupled with a design simple in taste and artistic in appearance, and with all the present-day modern improvements, made it possible from that time to this to avoid change of patterns or in general construction. This has been greatly appreciated by the large number of gas undertakings that are hiring and selling this series of Richmond fires.

For the coming season, a higher standard still has been secured as regards radiant efficiency by the series; and both the brick and patent air-pad brick-slip are made with a special mixture which it is claimed shows a marked advance on previous results. The fuel has been increased in length;



The "Adam's" Dog Grate.



The "Louis" Fire.



The "Renaissance" Fire.



The "Flambeau" Fire.

names by which they will be distinguished indicate the intention of the Richmond Company to provide, as already mentioned, designs that will harmonize with those high-class decorations. Interchangeability and standardization in the "Period" series (for this is the generic title of the new fires) is a prominent feature as in the "A.B.C." series. They are also fitted with the useful duplex burner. With the illustrations before them, readers will not require any description of the external appearance. We regard the designs as fine, and of exceedingly high artistic merit. There is something about them that gives them a distinctive stand from ordinary types of the day. In two instances, the fires have been constructed, so that the back plate will fit the usual size opening of the register grate—covering the cast iron of the latter, while leaving the tiled hearth and other decoration exposed.

An item worthy of mention, and quite unique so far as we are aware, is the position in which the boiling-burner (now so regularly demanded by consumers) is fitted. We are accustomed to boiling-burners on the top of fires, and recently they have become popular fitted on a swivel joint at the side. As one of the illustrations shows, the Richmond Company have gone a step further by placing the boiling-burner beneath the fender, from which it swings out readily when required. When not in use, it is hidden, and does not detract from the appearance of the fire. Associated with the construction of this new "Period" series on the scientific side, the name of Dr. Harold G. Colman should be mentioned. In the general design, the advice of some well-known professional gentlemen has been secured; and coupled therewith the resources of the Richmond works (which have never been so far-reaching as



and the new "Lattice" design has given a graceful appearance. Here, again, the material used in the manufacture of the fuel has been still further improved with satisfactory results. There are two or three points about the fuel that arrest attention. In the first place, it is observed that each column is in perfectly perpendicular position, and (what is more) is incapable of moving from the vertical over its burner. This is ensured by lugs formed on the fire-brick backs, and a slot in the top of each fuel to engage with its particular lug. Bar supports are provided at the bottom, midway between the burner nipples. The fuel is flat-backed and curved in front, with a slight taper from bottom to top in depth but not in width. From the appearance point of view, the fuel is a great improvement. In front the openings are larger than those at the back; and inside the fuel are small projections which, immediately the flames begin to play on them, become incandescent. With the larger openings in front and the smaller ones at back a pleasing effect is obtained, as well as a free radiation from the back of the fuel. Looking at the incandescent fuel, one sees not only the incandescence of the front part but that of the back part as well. The fuel takes one's fancy. Before

leaving the "A.B.C." series, it should be remarked that the changes indicated have in no way altered the interchangeability and standardization which have for so long been a feature. The series comprises five different designs in eighteen different sizes.

It is generally accepted that, with gas pressure varying at different periods of the day, a governor fitted on a gas-fire service ensures greater efficiency from the stove and greater satisfaction to the user. The gas and air adjuster ensures the provision of a correct flame, but is insufficient when the pressure alters either

through change in the district pressure, or through variable consumption in the house. To provide for this deficiency, the

Richmond Company have introduced a governor combined with their gas and air adjuster. It is compact, very little larger than the gas and air adjuster itself, and is supplied at quite a moderate price. It is a distinct improvement upon the independent governor. It is interchangeable with the ordinary fitting on the

"A.B.C." gas-fires and the new "Period" series. It can be set by the fitters, and then left with a certainty that not more than the required amount of gas will pass per hour. The invention is fully patented and protected. So we progress in matters of detail all contributing to efficiency.



Governor and Air Adjuster.

PUBLIC LIGHTING APPLIANCES.

GLANCING through the latest lists issued by the Public Lighting Department of Messrs. Parkinson and W. & B. Cowan (of Bell Barn Road Works, Birmingham) some special features attract attention; and a few moments may be spared to notice these. Before doing so, however, it may (though the name of the firm is a guarantee of good design and workmanship) be remarked that, before any of the lamps about to be alluded to have been put upon the market, they were subjected to careful trials on a testing tower which is fixed well above the works, and is exposed to all the high winds.

In the first place, there are two of Parkinson and Langlands' patents, which should appeal to those concerned with gas street lighting arrangements. The first of these (which has already been referred to in our pages) is in connection with inverted burner lanterns; and the particular object of the invention is to arrange and mount the burner and its fittings so that they can be raised from the outside clear of the interior of the lamp-body when the reflector and glazings are required to be cleaned, in order to prevent accidental damage to the mantle, and at the same time to facilitate the cleaning operations. It will be noted that the top of the lantern does not require to be lifted when the burner is being raised. This arrangement, which is calculated to result in a great saving of mantles, can be fitted to any of the firm's solid top lanterns. A point to be noted is that the primary air for combustion is obtained from outside the lantern, by means of a



Burner Lifting and Lowering Arrangement.

shaft—thereby excluding all products of combustion. The second of the two patents referred to is in connection with a momentary bunsen flash-light cock. In this case, the invention consists essentially in providing the lamp with a flash pilot or lighting jet controlled by a cock which is automatically opened when the trap-door in the base of the lamp is raised, by the engagement of the trap with a suitable lever or arm. The pilot-jet is thus ignited by the torch and lights the mantle. When the trap falls on the withdrawal of the torch, the cock automatically closes and cuts off the supply of gas to the pilot-jet. By the adoption of the device described, a considerable saving of gas is effected—as compared with the usual method of employing a continuously-burning bye-

pass or pilot-jet—without injury to the mantle. The "Parkinson" patent ball-roller trap-door used in conjunction with this arrangement reduces the friction and jar of inserting the torch to a minimum; and no special torch is needed.



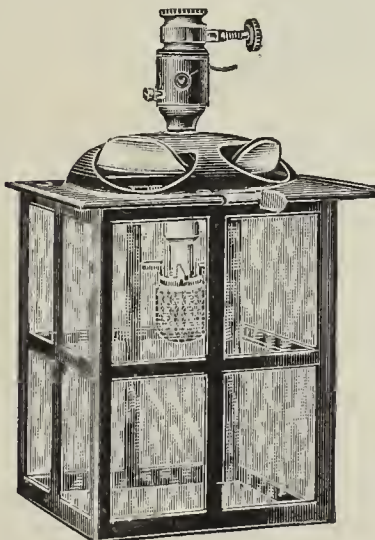
Momentary Bunsen Bye-Pass Cock.

Among other items in the lists to which attention may be drawn are the "Parkinson" inverted burner arc lamps, which are constructed of strong, hard rolled copper throughout, and fitted with "Parkinson" heavy cast-brass angle burners, having outside gas and air regulators. These lamps are made in several styles. One pattern is for suspension, and is fitted with the ordinary lever; a second is also for suspension, but is provided with a side lever; while a third has been designed specially for street lighting, &c., and can be easily fitted to existing street-lamp columns. In each case the design is neat; and all parts are interchangeable. The lamps are in four sizes—for one, two, three, or four lights. Other styles of "Parkinson" inverted lanterns include the "Wind Proof" pattern, which is extensively used, and the "Blizzard Proof" (specially designed for fixing in exposed places, such as on promenades, &c.), which is also selling well. In addition to these, the firm have this season put on the market the "Parkinson" inverted burner circular shadowless lantern, which is particularly suitable for prominent positions.

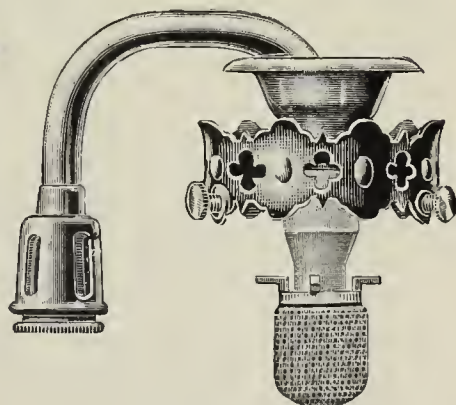
FOR THE LIGHTING SEASON.

ATTENTION is called by the Provincial Incandescent Fittings Company, of Nos. 48 and 50, Thomas Street, Manchester, to some of the novelties they are introducing for the forthcoming lighting season.

There is the "Crab" patent safety mantle, the distinguishing feature of which is that each of the three lugs is fitted with a nickel wire running vertically to the bottom of the mantle, where



The "Aladdin's Lamp."



The "Pe-i-ef" Bent-Arm Burner.

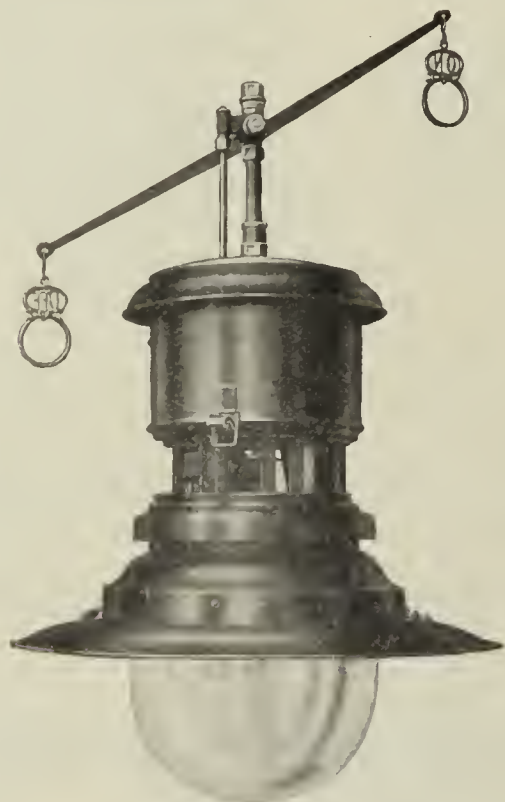
the three ends are joined. In this way, the mantle is fitted with a wire cage, the object of which is to prevent it from being touched when narrow chimneys are employed. The use of these

mantles—which are made for “Graetzin” fitting burners and for “Universal” fitting burners—will tend to reduce accidental breakages, and thus should prove economical. Then there is the “Crab” inverted burner, the most important feature of which is that it has neither screws nor springs of any kind with which to support the globe. There are just three plain lugs, specially made to receive the “Crab” patent collar, to which attention has already been drawn in the columns of the “JOURNAL.” These collars are, it is learnt, being extensively adopted by gas undertakings running maintenance schemes, as they are found to save breakage of globes. The “Crab” burner is a well-finished article, and is, of course, fitted with the usual air and gas regulators.

Upright incandescent street-lamps can be converted to the inverted system by the use of the “Pifco” convertible street-burner, which is simple in construction, and at the same time well made. An attractive combination of “ancient and modern” is to be found in the “Aladdin’s Lamp.” This, as will be seen from the illustration, consists of an old-style lantern in combination with a “Bijou” burner-tube. Finished in oxidized copper, and panelled with green wavey glass, it is a very suitable lamp for small halls and show-rooms. The other illustration depicts the “Pe-i-ef” bent-arm burner, which is fitted with a china nozzle and mixing chamber. It is substantially made, and a convenient device for converting upright gas-fittings into inverted—the claim made for it being that it secures the same efficient lighting result as is achieved by the use of pendant burners. The “Pe-i-ef” bent-arm burner is fitted with a standard size mantle and standard size bijou globe. Finally, a word may be given to the “Gray’s Inn” outdoor lamp, which is constructed on very similar lines to all the three-light “Graetzin” type lamps. An important feature, however, is the ready accessibility of the burners and regulators, which can be got at simultaneously by the moving of a spring which raises a circular shutter.

THE “DEGEA” OUTDOOR LAMP.

An improvement on the old type of “Degea” outdoor lamp has been inspected at the Farringdon Street premises of the Norden’s and General Incandescent Company. Hitherto the gas and air adjusting has been done from the outside of the casing; but if for any purpose it became necessary to get to the inside portion, the lamp had to be disconnected. This has now been obviated. The adjusting is arranged for inside the lamp body; and easy access to the interior is afforded by the provision of a telescopic case. By a simple movement, the casing is opened all round, as shown in the illustration. When the casing is in its normal position,



“Degea” Outdoor Lamp.

the lamp is quite wind and weather proof; and another point is its simple construction—all the parts being interchangeable. There is a good range in sizes—from single burner to five light clusters. In the multiple-burner lamps, there is one permanent bye-pass; the lighting-up being completed by means of flash-lights. These lamps, which are finished in black or green enamel, are claimed to give the highest lighting efficiency with a minimum consumption of gas. If desired they can be made in copper; and for outside shop lighting they are also supplied with parabolic reflectors. When required for street lighting, they are provided with side levers. A point in favour of the side levers (though possibly they are not so ornamental in appearance) is that with them, in a multiple-burner lamp, it is possible to turn off a portion of the burners when no longer needed and leave only one alight.

PROPOSED REGULATIONS FOR PITCH WORKERS.

In the “JOURNAL” for Aug. 1 (p. 293), there were reproduced a series of regulations for the preservation of health proposed to be made under the Factory and Workshop Act, 1901, for application to all factories and workshops in which the manufacture of patent fuel with the addition of pitch is carried on, except those in which “no pitch other than blast-furnace pitch is used in the manufacture of briquettes.” Objections to these draft regulations were received by the Secretary of State, who thereupon directed an inquiry to be held by Mr. A. H. Lush, Barrister-at-Law.

After having heard evidence and arguments, Mr. Lush has issued his report. The industry is not, he says, on the whole an unhealthy one—indeed, it is claimed to be in many respects exceptionally healthy. But there are two elements of danger—the action of pitch fragments or pitch dust on the eyes, and of pitch dust on the skin. As to the skin trouble, in the first place there is a burning sensation in the face and extreme sensitiveness to the action of the sun or keen winds. After a considerable period—usually several years—of working, there is a tendency for a peculiar kind of warts, known as “pitch warts,” to form on the face and neck and various portions of the body. Usually these pitch warts are not malignant in character; but when they occur in particular parts of the body, there is a distinct liability to a third stage—namely, the form of cancer called epithelioma. So far as the evidence during the inquiry went, it showed that the cases of epithelioma in fuel workers do not arise immediately from the pitch dust, but only as a secondary result of pitch warts so situated as to be exposed to irritation. It is agreed that the disease is local in its origin—that is to say, it is due to dust which has settled on the actual part affected. As to the particular ingredient in the pitch which is at fault, Mr. Lush remarks that it must be something which is commonly present in pitch obtained from gas or oil works, but absent, or practically so, from blast-furnace pitch—the investigations of Dr. T. M. Legge (His Majesty’s Medical Inspector of Factories), who drew up the proposed regulations, having shown that the mischief is confined to the two former, and that the last is innocuous. Mr. Lush goes on to say: “Mr. Hilditch, His Majesty’s Inspector of Factories at Swansea, thinks this ingredient may be anthracene, or one of the phenols which come off at the last distilling. Anthracene had formerly a commercial value which it has lately lost; and it is no longer worth the while of manufacturers to separate it from the pitch. Consequently, there should be an increase, on Mr. Hilditch’s theory, of the cases of disease in recent years. Certainly the impression I derived, from a comparison of the recollections of witnesses as to old cases with the returns of the last three or four years, is that there has been a decided increase; but a good deal must be allowed for the greater attention now paid to the disease.” In this connection it may be recalled that, subsequent to the date of Mr. Lush’s report, the Home Secretary, in answering a question—on the subject of cancer among workers with pitch—in the House of Commons [*ante*, p. 487], drew attention to the fact that it was not certain that anthracene was the constituent of ordinary pitch to which the prevalence of cancer in the industry was in reality due.

Towards the end of the inquiry, a proposal was made that, before the regulations were finally settled, time should be allowed for experiments to determine the various questions now undecided. This course Mr. Lush recommends should be adopted, on condition that experiments are conducted on certain lines which he indicates. The adjournment is to be until such time as the Secretary of State shall, on one month’s notice in writing, determine—it being understood that twelve months will be allowed in the absence of reason to the contrary. “If in the meantime,” adds Mr. Lush, “the mischievous agent in the pitch should chance to be detected, and a means of eliminating it discovered, which is commercially practicable, this would afford a more satisfactory solution of the difficulty than can possibly be attained by these regulations.”

We are asked to call attention to the near approach of the time for the opening of the International Gas Exhibition which is to be held in the Royal Agricultural Hall from the 11th to the 24th of November. Full particulars as to spaces remaining vacant may be obtained from Mr. Thomas Cordingley, at No. 11, Queen Victoria Street, E.C.

In comparing the positions occupied by Germany and the United States in the coal-tar market, Mr. J. G. O’Neill, the Chief Chemist to the Empire Coke Company, of Geneva, U.S.A., says the United States annual production of close upon 100,000,000 gallons, valued at from 1d. to 1½d. a gallon, probably averages very close to the German price for coal tar. Of this quantity (figuring from the production of creosote oil), there are distilled about 56,000,000 gallons a year. Germany, which has developed every outlet for coal-tar products, values its tar at practically the same price as the United States, which has not developed its coal tar at all. One of the reasons for this lies probably in the fact that the German gas-works are content with a smaller margin of profit than the gas-works of the United States. Moreover, the Germans do not believe in burning up their coal tar, evidently figuring that a low price for it is better than burning it for fuel.

ATTITUDE OF THE AIR QUESTION IN RELATION TO GAS MANUFACTURE, PURIFICATION, AND REDUCTION OF QUALITY.

By WILLIAM KEY.

[A Paper read before the North British Gas Managers' Association on Thursday, Sept. 7.]

The revolutionary insistence in promoting the adoption of "mantles" in recent years has successfully disposed of what are already known as the "old-fashioned" naked-flame jets, which were in their day the result of years of thought, skill, and labour, and has cemented the minds of members of such Institutions as this in a universal approval of the enormous improvement in the volume of light obtainable from gas by their use—reflecting, as they do, a continual testimony to the world-renowned inventor, the Austrian, Carl von Welsbach; so much so that not a single wasteful, nocuous, flat-flame burner could at the present day be tolerated by any gas consumer who values a good light, his health, or his money.

An inverted mantle, with its surface combustion and brilliant luminosity, gives us a diminutive yet excellent representation of what takes place on the surface of the tens of thousands of miles in thickness of the great mantle of white cloudland which forms the photosphere of our luminary, the sun. The combustion of hydrogen gas on its surface in flames 30,000 miles in height produce incandescence, from which heat and light emanate. This mantle, within which the true sun and its atmosphere exist, is even more fragile than those we handle so gingerly every day, and always in tender memory of their inventor.

It is my privilege to show mechanical means of adjusting and maintaining uniform such quality of gas as gas engineers are agreed is most suitable for modern requirements.

Leading to this demonstration, I may be permitted to read extracts from a valuable paper by Mr. F. D. Marshall, of Copenhagen, read before the Institution of Gas Engineers in 1903:

"Both Dr. Bunte and Professor Lewes have shown over and over again, as, indeed, has Dr. Colman, the writer [Mr. Marshall], and many others—that the difference in calorific value of 16-candle gas, say, of 140 calories or 573 B.Th.U., and of 11-candle gas of 115 calories or 460 B.Th.U., has practically no influence on the light developed by the incandescent burner. Any variation in calorific intensity would be met by the air adjustment to the burner; and there appears to be no reason whatever why gas of more than 10-candle power need be supplied, provided a desirable calorific value were present."

These statements represent to-day more generally the predominant opinion in the minds of gas engineers and gas managers, and much more forcibly than existed eight years ago when given expression to by Mr. Marshall.

I have appended further interesting excerpts from the "Transactions" of the Gas Institute and the Institution of Gas Engineers for the period while I was a member—from 1884 to 1905. They are quoted in order to link-up early expressions on behalf of a reduced quality of coal gas by the admixture of air, giving reasons why atmospheric air should be used as the diluent of coal gas, and at the same time act as a revivifier of lime and oxide, without their removal from the purifiers.

In 1888, Mr. Norton H. Humphrys, of Salisbury, said "he had had some experience in the use of air for purification, which he introduced very gradually, because there were two things he was very cautious indeed about. . . . One was the depreciation of the illuminating power, and the other the fear of back-pressure in the purifiers. . . . He therefore gradually felt his way during several months, increasing the supply of air to the extent of perhaps 1 per cent. at each time; and now for several weeks he had been able to carry on revivification completely in the first purifier. He found no depreciation in the illuminating power, though he did not pretend to account for it. He made 15 to 15½ candle gas; and, working under exactly the same circumstances, the use of air had not made any difference whatever."

As to the revivification of lime in purifiers, in 1888, Dr. Thorne, of London, said "he had worked very much on this subject practically. . . . There was no doubt that the formation of sulphur compounds by the action of the sulphuretted hydrogen enabled the lime to take up the carbon disulphide and other sulphur compounds which were not taken up by it in its original oxidized form, and to produce highly sulphuretted calcium compounds, which, in their turn, easily became oxidized, and produced an active lime ready to again combine with the sulphuretted hydrogen, and become re-sulphurized and ready to take up afresh other sulphur compounds, much of the sulphur being deposited in the free state."

In 1888, Mr. Thomas Newbigging, of Manchester, said: "Another good point about the lime and oxygen process of purification now described was that its adoption would not displace the existing plant. . . . The present purifying vessels would be retained; and though the process, if it proved successful, would cause a revolution in the method of purification, it would not revolutionize the purifiers. . . . The disadvantages which arose from the employment of air pure and simple in the purifiers were so great that it was felt necessary to counteract them in some way. Hence the system of carburetting the air devised by Mr. J. G. Hawkins."

Mr. Denny Lane, of Cork, said "they were all doubtless aware that the air process of revivification was a very old one. Some thirty years ago, it was introduced by Mr. Hills."

In 1892, Mr. Thomas Goulden, of Beckton, and Mr. A. M. Paddon, on the subject of "The Technology of Water Gas," wrote: "A Lowe carburetted water-gas plant for a million cubic feet of gas per day costs £8800. Carburetted water gas costs 1s. 10½d. per 1000 cubic feet."

In the discussion on a paper by Mr. H. E. Jones, M.Inst.C.E., who, in 1902, took for his subject, "The Illuminating Power of the Gas of the Future," one of the speakers, Mr. J. D. Ashworth, of Portsmouth, said: "It gives me great pleasure to congratulate Mr. Jones upon his paper, which I regard as supporting what I brought before the Institution last year—namely, the desirability of reducing the illuminating power of coal gas to 10 candles."

In 1903, a paper by Mr. F. D. Marshall, of Copenhagen—on "Lighting by Means of an Admixture of Gas and Air"—contained the following passages:

"The object of this paper is to demonstrate that the results of the so-called high-pressure systems, where the mixing of air and gas takes place in the burner itself, can be reached and surpassed by low-pressure systems where the gas and air are mixed or intermingled beforehand."

"If we are bent on diluting and thinning down, we have a medium at hand in the form of air, which costs nothing, and which may be employed with extraordinarily successful results. The idea is by no means new. The late Mr. Frank Livesey showed conclusively the effects obtainable by mixing air and gas at some distance from the incandescent burner."

"Mr. Grafton showed some remarkable results; diluting very poor 13·3-candle gas still more by the addition of air until it was only 10·9 candles, the diluted mixture gave (with gradually increased pressure from 1 inch to 3 inches)—

76 candles, as against 58 candles.
81 " " 60 "
86 " " 56 "

"By raising the pressure to 3 inches Mr. Grafton obtained 93 candles per 6 feet of mixture consumed, as against 56 candles with 6·74 cubic feet of unadulterated but low-grade gas."

"It is apparent that not only the addition of air, but pressure, plays a very important part in procuring these enhanced results."

On June 13 last the "JOURNAL OF GAS LIGHTING" (p. 721) wrote: "The altered conditions of the gas industry largely, if not completely, reverse the teachings of the past. Condensation should be organized with the view of minimizing the percentage of naphthalene in the gas. The natural absorbing agent of naphthalene is the vesicular tar in suspension in the gas at the outlet of the hydraulic main; . . . and this vesicular tar acts most effectively when cold. The gas must be rapidly and completely cooled as it leaves the hydraulic main, . . . and must be hastened by the introduction of a cooling condenser fed by the cold water as near as possible to the retorts."

A proportion of atmospheric air, or a 10 per cent. quality of petrol-air gas produced cold, and introduced into the hydraulic mains, would materially assist in obtaining and maintaining the desired results; and at the same time the hydraulic mains, pipe connections, and condensers will be kept free from tarry surfaces, and the accumulation of naphthalene in the mains and services prevented.

In order that the approved quality of gas may be produced in gas-works, it is essential that power be provided for the introduction of atmospheric air under such pressure as will deliver it cold into the hydraulic main, and in such measured volume as is necessary from day to day or for the time being. It may be necessary, in some instances, that the air be carburetted more or less to meet the revivifying conditions of the purifiers when oxide of iron is the purifying medium. This can be very simply done, and while the apparatus is in motion.

Purifiers becoming too small under former non-revivification conditions of working, will, under the air or carburetted air method of revivification, be much larger than are actually required.

The "Turbine" is a splendid apparatus for cheaply and very simply passing any required volume of air, or any percentage of carburetted air, into the hydraulic mains; and for small works it would be driven by using its own gas.

A "Centenary" petrol-air gas plant for a million cubic feet of gas per day, including petrol stock tank, costs £1500. The gas produced costs 6d. per 1000 cubic feet; gives 9-candle power per cubic foot; has a distinct gas odour; and is lighter than air. The plant would resemble a rotary washer, with a steam-engine at one end, geared-down to four revolutions per minute.

The gas is produced cold, and, by merely altering the petrol-feed regulator a tenth or two on the dial while the turbine is running, it will send forward air pure and simple, or a blue gas, or a low or high quality illuminating gas as required. A 10 per cent. quality of blue "Centenary" air-gas has been in use daily for some months in a small gas-works, where it passes through the cover of the hydraulic main and is most successful in diluting the very high quality gas the works otherwise could not help producing—mantles having taken the place of flat-flame burners.

Several years ago, the writer (being proprietor of a small country gas-works where the gas produced could not be brought down under 30-candle power) introduced one-third of atmospheric air with extraordinary advantage. The brilliancy of the lights by the mixture, using mantles, was quite phenomenal, and ultimately led to supplying the district with petrol air-gas only.

We may rest assured that, in the near future, tests for the

candle power of gas for illuminating purposes will be abandoned, and a standard of calorific value substituted.

Discussion.

The PRESIDENT (Mr. G. Keillor, of Broughty Ferry) invited discussion of the paper.

Mr. WALTER GRAFTON (Glasgow) regarded the plant which had been described as a meritorious one for the lighting of country houses by means of the incandescent mantle; but he could not quite reconcile himself to its use in a city or town such as Glasgow. Mr. Key quoted extracts from his (the speaker's) paper before the Gas Institute in 1901. He showed his first experiments, as quoted by Mr. Marshall, without taking into consideration any of the others. He (Mr. Grafton) showed results of 35 candles per cubic foot of gas—an increase of light of 115 per cent. per cubic foot, besides a reduction of 40 per cent. in the gas consumed, by using a common Kern or "C" burner, with 7-inch chinney and mantle, by simply mixing 27 per cent. of air with the gas before reaching the burner. These were far better results than the low—though they were good—results given by Mr. Marshall, and repeated by Mr. Key. It suited Mr. Marshall's purpose to quote his (Mr. Grafton's) first experiments; and he would like them to know that these tests were made on the basis of $3\frac{1}{2}$ cubic feet, at one-inch pressure, using gas of 16 candles as tested in those days. He gave, ten years ago, some of the advantages accruing by the addition of air to illuminating gas. The great advantage which he saw was that an increased light followed the use of more aerated gas, by additional pressure, but that when using more of the pure gas the efficiency fell as the pressure increased. Reference had been made to the paper by Messrs. Goulden and A. M. Paddon, on carburetted water gas, giving the cost at 1s. 10½d. per 1000 cubic feet. He was afraid Mr. Key should have omitted the shilling; for he was pretty certain that the cost at Beckton to-day for carburetted water gas was nearer 10½d. only. The paper gave no data as to the value of this recommended petrol air gas. Generally speaking, a gallon of petrol would cost (including the tax) 1s. 2d., and might make about 1500 cubic feet of carburetted air. Therefore the cost for this item alone was 10d. per 1000 cubic feet, without taking into consideration the plant to make and deal with this quantity of gas. The gas might yield, with special burners consuming about 10 cubic feet per hour, 45 candles, or $4\frac{1}{2}$ candles per foot, as against 20 or 30 comfortable candles from Glasgow gas. By the better blending of town gas with air, 45 candles per foot could be guaranteed, which was equal to a comparison of one against ten, or town gas at 8s. per 1000 cubic feet was equal to petrol air gas, if consumed at high pressure, after the same manner as the petrolized wind. For fuel purposes, the difference was yet more considerably in favour of town gas, because the thermal value of petrol air gas was about 90 B.Th.U., as against Glasgow gas of 600 B.Th.U., or its equivalent at the high price of 7s. per 1000 cubic feet. As a fact, it was not the most economical gas for cooking or heating purposes; and the manipulation of the flames was difficult to set. In fact, carburetted water gas cost just the same; but having a thermal value five times as great, it was a better invigorator—he would not call it a diluent—of coal gas. He could not understand a gentleman like Mr. Key recommending the use of such rubbish as a tonic for the betterment of Glasgow gas. However, he was sustained in the combat by the knowledge that he was championing the cause of the town consumer for cheap gas, by opposing this petroleum method.

Mr. G. R. HISLOP (Paisley) considered this rather a difficult subject for anyone who had not had personal experience to make any serious comment upon it. Evidently Mr. Grafton had gone into the matter. However, the proposal appeared to an outsider to be a very feasible thing. He could only speak from experience with pneumatic gas or gasoline, for which he had put in several installations in country houses; and these had all been very successful. He was not aware whether there were many, or any, in existence now; but he remembered that they could supply gas at about 5s. 6d. or 6s. per 1000 cubic feet. This was available for all domestic purposes. It had a very high illuminating power. Although, when compared with town gas, the gas was costly, yet for country houses it was a very useful appliance. He fancied that it was for country houses that the arrangement of Mr. Key was intended. A very crucial question came to be the absence of luminosity. He was afraid it would take a very long time to educate people to the want of luminosity. He himself proclaimed upon the house-tops that he did not make gas for flat-flame burners. Mr. Fyfe, of Glasgow, was very anxious to get a cheap gas; and he said that so long as he could get a good light in the mantle, that was all he aimed at. This was the position with regard to Mr. Key's lighting. He wanted no light from a flat flame; but he was afraid it would take a long time to educate people to this view. Therefore he feared that it would be a very considerable period before such an appliance as this could be supplied for lighting.

Mr. W. EWING (Lochgelly) looked upon the paper as containing a new theory in gas manufacture. There were hundreds of gas managers who had never seen air gas; and the result of the paper just read might be far-reaching, in connection with probably newer developments in the supply. He had known Mr. Key for a great many years, and could go back to the West of Scotland Association, where Mr. Young and Mr. Key both gave a paper on the same day—in 1874 or 1875. He carried down Mr. Young's model of a carburettor. Mr. Key's paper was on the effect of light

hydrocarbons on coal gas. His air-gas plant, if not perfect, was on the right lines. There was a wide field for this plant all over the world. There was room for it, even in Scotland. He knew many places where the people were paying double for gas what it would cost if produced by such plant as this.

Mr. S. MILNE (Aberdeen) pointed out that, in the opening paragraph of his paper, Mr. Key spoke of flat-flame burners as being noxious. He did not think they should allow such a statement to go from a gas managers' meeting without some qualification at least. They could understand flat-flame burners of a certain construction being used in such a way that they would be noxious; but they knew that there were flat-flame burners through which gas could be properly consumed. He was pleased to have the figure Mr. Grafton quoted, that the calorific value of this 10 per cent. petrol air gas was 90 B.Th.U. per cubic foot. Perhaps Mr. Key would say whether this was his view or not. Mr. Key referred to different calorific values, and the candle power of different standards. He did not think he would have them believe that a 16-candle gas, diluted with air till it reached 11 candles, would have the same heating efficiency as a gas of 11 candles, produced in (say) a vertical retort. The whole gist of the paper seemed to be the advocating of the mixing of air with coal gas. Mr. Key spoke of a certain works where 30-candle power gas was being supplied, and where one-third of atmospheric air was introduced with advantage. He suggested such a system as being very useful, if they wished to rush-up the holder. Could any of them imagine what the effect would be if they rushed-in 33 per cent. of air into the holder spasmodically? The difficulty which would be experienced in all forms of heating and motive power would be extraordinary. He was not disputing the figures given with reference to Messrs. Goulden and Paddon; but he did say that these gentlemen stated that carburetted water gas had no odour, and that it was heavier than air. He took the trouble to look up the matter, and he found that these qualities applied to carbonic acid gas, and had nothing whatever to do with carburetted water gas. His opinion was that for country mansions, or places not supplied with town gas, petrol air gas was second to none.

Mr. R. G. SHADBOLT (Grantham) said the trend of the paper appeared to be, to his mind at any rate, the substitution of petrol air gas for carburetted water gas, as a means of helping them over a certain stile. The attitude of the air question, if it ever emerged, was dealt with very scantily. The reference by Mr. Milne to the dislocation which would be produced by the introduction of petrol air gas in large quantity was very well stated by Mr. Key himself, when he showed that an ordinary burner could be quickly adapted for use with petrol air gas. There they had the *crux* of the whole question. If they added a third of petrol air gas to their ordinary coal-gas supply, they would need to adjust everything in the district in the same degree; and if they came back to the former state of things, they would require to immediately re-adjust. Of course, this kind of thing was useless to them, as ordinary, practical, every-day gas suppliers. It might meet some of the claims Mr. Key made. One of these related to naphthalene, which was a bugbear with them still. When the meeting adjourned, he left the room with the feeling that they had had a comical turn that day in this paper—he really, honestly, could not take it seriously. But since he had re-entered the room, he had found that members had taken the matter seriously; and so he must only conclude that he had misinterpreted the meaning of the author. If they were to use petrol air gas under the conditions referred to, *per se*, for specific purposes, they would set their engines, or other appliances, to the gauge of this particular gas. But as to where its utility came in with regard to the supply of coal gas under ordinary obligations and stipulations, he did not quite see. Mr. Key had not only raked up history, and quoted from the sayings of people—possibly sayings which they never dreamt would be applied in this particular way—but he also acted in the rôle of prophet, and asked them to look forward to the time when gas engineers would not be required, and when manufacturers of gas plant would go to swell the ranks of the unemployed. When they reached the perfect state in which eight minutes a day would be the utmost that any man might be expected to work, then everything would do itself, of itself, for itself, and by itself.

Mr. KEY expressed disappointment that gentlemen who had been using air for the purpose of revivification had not come forward with their opinions as to the benefit from it. The main object of the paper was that in the Corporation of Glasgow a member said they could well afford to reduce the price of gas, because they were pumping air into the pipes. He wished that they should never use the word "air," but speak of the benefits to be got from petrol gas. He felt it a very high honour recently to have put in an installation in the Parish Church of Lugar, the district in which William Murdoch was born. There they told him that they had been at great expense in renovating the church, but could not use the lighting because of the mantles going black. He thanked Mr. Grafton for his remarks, also Mr. Hislop and Mr. Ewing. Regarding the remarks of Mr. Milne, what he referred to was that people could not burn gas without the smell being noxious. As to putting in one-third of air into the holders, it was a small gas-works he referred to. He never had the least hitch in regard to anything dangerous or a nuisance; and they had a very brilliant light all the time from the use of 30 per cent. of air—the gas and air being mixed thoroughly in the holder. If the air were to be put into the hydraulic main, a blower would have to be used. He thought that the advantages to gas engineers would be enormous.

THE LIGHTING OF THE SCOTTISH EXHIBITION.

Visit of the Scottish Junior Gas Association.

What may be regarded as the first event of the session of the Scottish Junior Gas Association took place last Saturday, when the Western District paid a visit to the Scottish Exhibition in Glasgow. The principal object of the visit was to view the lighting arrangements. These are, so far as the largest installation of gas lighting is concerned, in the hands of Messrs. James Milne and Son, Limited, of Edinburgh. The Contractors have a gas-compressing station within the exhibition, in which there are placed gas-engines, in duplicate, each driving a rotary compressor, of the pattern made by Messrs. Milne and Son, each of which is capable of dealing with 4000 cubic feet of gas per hour, received at a pressure of $2\frac{1}{2}$ inches, and raised to about 60 inches; the intention being to have a pressure of over 54 inches at the burner. The compressed gas is measured in two dry meters, each of a capacity of 400 lights. Half the compressing plant, and one meter, is provided as a stand-by. In the area of the grounds lighted by gas, there are 132 standards of Manesmann tubing, 14 ft. 6 in. in height, upon which the lights are mounted, in singles or clusters of three lanterns, the attachment of the lamps being by swan-necks. Each lantern contains two lights, of the inverted incandescent pattern, each light taking 41 cubic feet of gas per hour, and yielding an efficiency, according to Corporation tests, of 50.1 candles per foot; the nominal lighting power of each lamp being rated at 2000 candles. The burners are made with special heat-resisting nozzles, and the heating of the gas and air is effected after mixture. The mantles used are of artificial silk, and are $5\frac{1}{2}$ inches long, by $1\frac{1}{4}$ inches diameter. The breakages from ordinary causes are about one per day.

The high-pressure system is used also in the lighting of the Concert Hall—a very large apartment, in which both gas and electricity are used. The gas installation consists of three sun burners, of the "Nonpareil" type, each lamp containing 28 mantles. The electric lamps are of the glow variety.

The management of the exhibition recently began an extensive scheme of evening illumination, the interior of the buildings and the grounds being both treated. In the portion of this work which is served by gas, the system employed is on low pressure. The scheme of the illumination was devised by Mr. A. C. Freeman, the Engineer to the Exhibition. It extends on both sides of the River Kelvin from the Radnor Street entrance to the Prince of Wales Bridge at the Highland Village—a distance of 1250 feet, almost a quarter of a mile. There are 62 set pieces of ornamental illumination, consisting of crowns, crosses, &c. In these, the lamps—of the float pattern and with rat-tail burners—are placed at 6-inch centres.

The company assembled beside the Kelvin Hall at five o'clock. Considerably over a hundred were present. Members had been notified that they might bring ladies with them; and these formed a goodly proportion of the assembly.

Mr. J. M'GHEE (Glasgow) the President, intimated the arrangements for the walk round. Three parties were formed, and these, again, soon subdivided, which was to the advantage of the members, as the smaller parties received more explanation than the larger ones.

The first place visited was the compressor station of the Sclas Lighting Company, Limited, of Manchester, to whom the lighting of the principal entrance to the exhibition—that in Kelvin Grove Street—has been entrusted. The installation consists of four lamps of 210-candle power each, six lamps of 300-candle power each, and 59 lamps of 100-candle power each—a total illumination of over 16,000 candles. The compressor is electrically driven. It is equal to raising the pressure of 30,000 cubic feet of gas per hour from $2\frac{1}{2}$ inches to about 10 inches. The compressor is of 1-horse power capacity, but is seldom required to run so high— $\frac{3}{4}$ -horse power being found to be sufficient. Great care is exercised in the mixing of the gas and air, the proportions of which are two of air to one of gas.

The next visit paid was to the compressing station of Messrs. James Milne and Son, Limited, where Mr. R. Milne had a rotary compressor opened up for their inspection, and gave full explanation of the construction and working of the apparatus. In commenting upon the advantages of high-pressure gas, Mr. Milne stated that at the Milton House works, Edinburgh, his Company were in the process of discarding all other forms of gas supply, and were fitting up compressing plant in the various departments to provide high-pressure gas for both industrial and lighting purposes. The plant would be of a capacity of 8000 cubic feet an hour. The fixed plant in the station was seen both standing and at work.

In the Kelvin Hall, the Tilley High-Pressure Gas Syndicate, Limited, of London, exhibit two compressors—one driven by water, the other electrically. The former is equal to raising 180 cubic feet per hour to 38 inches pressure; and the latter is of a capacity of 500 cubic feet per hour, and is capable of producing a pressure of 60 inches. The stand was very brilliantly lighted by means of gas compressed by the plant.

There was then a walk through the grounds, undertaken in order that the illuminating effect might be observed. The opinion freely expressed was that the light of the gas-lamps in the grounds was exceedingly soft in character, and of great fulness, reaching to the furthest corners of open space, and shining upon the fronts

of buildings in the exhibition with such clearness that the outlines of the structures, and the traceries of the decorations upon them, could be seen to great advantage, even at a distance.

At half-past seven, the party—now augmented to quite 160— assembled in the Carlton Restaurant, where they were entertained to tea by Messrs. James Milne and Son.

Mr. R. MILNE, at the close of the repast, said he was instructed, on behalf of his Company, to extend to them a very hearty welcome. They had with them Mr. Freeman, the Engineer of the Exhibition; and he wanted him to tell them all about the lighting of the exhibition, and more particularly how the lighting stood so far as gas was concerned.

Mr. A. C. FREEMAN stated that in the exhibition they had a total lighting power of two million candles. About 30 per cent. of this was exclusively by gas. He did not think there was anything very materially special in the gas-lighting scheme when they considered what had been seen in other exhibitions in London, Edinburgh, and Dublin; but he did say that the plan propounded had been carried out in a most eminently satisfactory manner by Messrs. Milne and Son. The scheme of high-pressure lighting was second to none, not even to that of the Crystal Palace. Though their units were smaller than in the Crystal Palace, he maintained that they gave a much better distribution of light. He also thought they worked more economically. He trusted that they had seen something which they could put into practice. Even if there were nothing which they could adopt, they might have seen something which they felt they ought to avoid. He hoped that those who were engaged in gas lighting would be able to give them a more flexible system of lighting. He did not think it would be an impossibility to do this.

The PRESIDENT thanked the members, on behalf of the Committee, for their presence. The illumination by gas in the exhibition redounded very greatly to the credit of Messrs. Milne and Son, and of Mr. Milne, their representative; and he asked them to recognize Messrs. Milne's kindness and generosity by according them a very hearty vote of thanks.

This was cordially given. Thereafter the party embarked upon motor-boats in the River Kelvin; and in the course of an enjoyable trip saw to great advantage the schemes of illumination on each side of the river. They were then admitted to the concert hall, where they witnessed an entertainment in the form of a pageant, and when the public had retired, the scheme of lighting the hall by gas and electricity was shown and explained to them. The contrast between the two systems was most marked; the more effective being, on all hands admitted to be, the gas one.

This was the last item on the programme.

PRODUCER GAS IN TEXAS.

The Use of Lignite.

There are contained in the July "Bulletin of the University of Texas" (U.S.A.) articles on the "Composition of Texas Coals and Lignites" and the "Use of Producer Gas in Texas"—the latter by Mr. Drury McNeill Phillips. There is a brief introduction to the Bulletin, which is signed by Mr. W. B. Phillips (Director of the Bureau of Economic Geology and Technology), Mr. S. H. Worrell (Chief of the Testing Laboratory), and Mr. D. M'N. Phillips (Special Agent). In this, it is stated that during the last few years there has been a marked increase in the use of lignite in gas-producers; the gas thus made going to gas-engines for the generation of power. Lignite is also used in gas-producers for fuel to be employed in the burning of lime, &c. Considering the great extent of the lignite fields in Texas, and that it affords the cheapest and best fuel in the State (with the possible exception of natural gas in certain favoured localities), for many commercial purposes, it is well within reason to believe that this fuel will be their chief industrial reliance for power. Since 1895, the production of lignite has increased from 124,343 to 979,232 tons. In this period of sixteen years, the production of coal increased about 200 per cent., while that of lignite increased 700 per cent. The following is taken from Mr. McNeill Phillips's article.

No illuminating gas is made from lignite, though an excellent light could be supplied by using some of the well-known types of incandescent mantles—such as the Welsbach, &c. There have been installed in Texas 56 producers for making gas. Of this number, there are now 47 in active operation. Of the 36 establishments that have been recorded, 23 use Texas lignite exclusively. The consumption of lignite at these plants is about 180 tons per 24 hours. Most of the installations are of comparatively small size; but the success that has been reached in the smaller plants indicates the adaptability of the producer and gas-engine to requirements varying from 50 to 250 H.P., quite as well as to the larger uses. The producer plants in Texas are scattered over a wide area; and this circumstance has an important bearing on the utilization of the bye-products—such as tar and ammoniacal liquor—for it means that they would have to be transported over considerable distances to some central plant for treatment. This is out of the question now; so that the utilization of the tar and ammoniacal liquor is possible only at the large plants.

The cost of the lignite, delivered, varies from 90 c. to \$3.65 a ton, according to distance from the mines, amount involved in the contract, &c. The lignite area in Texas comprises nearly one-half of the whole known area in the United States, and is nearly as large

as the entire State of Missouri. Practically, all varieties of lignite are found here; and there is offered a wide choice to the designers of producer plants, even inclusive of material that carries 75 per cent. of volatile and combustible matter. There is no intention to prepare a dissertation on gas-producers, or to enter into the details of the design and construction of producer-gas plants. It is wished merely to give the chief results of personal observation at 26 plants that were visited and information derived by correspondence with ten other plants. It is beyond question that a very active interest is now being shown in the use of producer gas made from lignite; and as experience is gained both in the handling of the various types of producers, and, more especially, in the design and construction of engines to use large volumes of a gas of low heating power, the employment of lignite will grow.

If there is any one thing that stands out more prominently than others, as the result of these observations and investigations, it is that the best results in producer gas-engine practice are likely to follow from a consideration of the plant as a compact unit—a unit in which the producer is part of the engine and the engine part of the producer. Good results are obtained in establishments where the producer is designed and built without particular reference to the type of engine to be used, as also where the engine is supposed to handle the gas from almost any kind of standard producer. But it is believed that better results—more uniform and more economical—can be secured by designing the producer for the engine and the engine for the producer. Producer and engine must be regarded as a compact and symmetrical unit, to do a certain thing at all times to the best advantage. Furthermore, a producer and engine designed to operate on a certain kind of fuel cannot be expected to give as good results on some other kind of fuel. Within certain limits, to be determined when the plant is designed, the results should not vary excessively; but they will vary, through no fault of producer or engine, if the character of the fuel is materially changed. There is a wide variation in the composition of lignite; and this variation gives rise to differences in the amount and nature of the gas, the tar, and the ammoniacal liquor. An engine designed to operate on a rich gas will certainly not work to its rated capacity on a poor gas. It is not fed on material that it can utilize. If the heat units are not in the gas, the engine certainly cannot get them out; and if the heat units are not in his gas, the lime-burner certainly cannot burn his charge. It is not a question of tuyeres, or gas-ports, or air-valves; it is a question of heat units in the gas. A further fact worthy of mention is the apparent lack of interest shown by the manufacturers after installation and acceptance by the purchaser. The operator is frequently left to work out his troubles alone; and the almost invariable experience has been: "Trouble the first six months, but as soon as I learned to run my plant I got along fine. The manufacturers seemed not to care." Some makers are a gratifying exception to this general rule; but it is the belief of the writer that, if the makers took a more intimate interest in the operation of their equipment, there would be more general satisfaction, particularly during the first year.

The province of the producer-gas power plant is by no means unlimited. It has its uses; and for these particular uses it is undoubtedly the most efficient type of prime mover—water excepted, of course—yet developed. Where water for boiler purposes is scarce, and even where water is plentiful, but the size of the plant does not warrant condensers, the producer is peculiarly adapted—more especially if the distance from good steaming coal is great. The widespread area of lignite in Texas, its cheapness, and the question of water, all combine to make the producer-gas power plant well worthy of close consideration.

The article contains a number of analyses and tests of lignite. One set is by the Westinghouse Machine Company, of Pittsburg, who give the results of testing lignite from the mines of the Consumers' Lignite Company, of Hoyt, Wood County, Texas. The analysis of the lignite used was:—

	Per Cent.
Moisture	23.83
Volatile matter	38.32
Fixed carbon	29.22
Ash	8.63
Heating power, B.Th.U.	8007

The engine was operated 72 hours. The total lignite fired was 16,970 lbs. The average load was 128 brake-horse-power; and the gross lignite per brake-horse-power was 1.85 lbs. The gas was delivered through a line of 8-inch pipe over 650 feet long, with no correction for leaking or for gas consumed by three pilot-lights burning continuously in the producer-house, laboratory, and engine-room.

In another case, given by this Company, the same lignite being used, the following statement is made:—

Duration of test	46.5 hours
Total lignite fired	12,693 lbs.
Heat value per pound	8007 B.Th.U.
Total heat input	101,632,857 B.Th.U.
Total gas made (corrected to 62° Fahr. and 30 inches bar.)	612,361 cubic feet or 49.03 cubic feet per pound of lignite fired.
Total heat value of gas per cubic foot	128.3 B.Th.U.
Effective heat value of gas per cubic foot	117.1 B.Th.U.
Total output	78,565,816 B.Th.U.
Effective output	71,707,463 B.Th.U.
Total efficiency = $\frac{78,565,816}{101,632,857}$ . . . . .	.773 per cent.
Effective efficiency = $\frac{71,717,463}{101,632,857}$ . . . . .	.705 per cent.

The composition of the gas in this latter test was:—

	Per Cent.
Carbon dioxide	12.4
Oxygen	0.9
Carbon monoxide	13.3
Marsh gas	3.6
Hydrogen	14.7
Nitrogen	55.1

CORRESPONDENCE.

[We are not responsible for opinions expressed by Correspondents.]

Artificial Silk Mantles.

SIR,—In the article by Professor Nass, in your issue of Aug. 29, about "Bamag" mantles, it is stated that the beginning of experiments to adapt artificial silk to the manufacture of mantles goes as far back as 1903, when Mr. Knöffler tried the effect of admixing hydroxydes of incandescent salts upon a cellulose solution, so as to spin it, after forcing it through fine orifices.

May I direct your attention to the fact that a French chemist, M. Plaissetty, was carrying out similar experiments in 1900; and that he applied for a patent in England in 1901—No. 20,747.

I may mention as well that, besides "Bamag" mantles, there have been on the market for some time artificial silk mantles the quality of which leaves nothing to be desired.

Wellesley House, South Kensington, Sept. 5, 1911. J. O. ZDANOWICH.

Gas and Electricity for Cooking and Heating.

SIR,—I notice from correspondence in various prints that the theory that electricity is as cheap as gas, or even cheaper, for cooking and heating purposes, is still being maintained. Apart from many other arguments which stand in the way of the acceptance of such a proposition, there is one which, even if it stood alone, would, to my mind, be perfectly final.

A kilowatt, or Board of Trade unit, of electricity, contains, approximately, 3500 British thermal units. Taking a cubic foot of gas at the extremely low figure of 500 B.Th.U. net, and reckoning gas at 2s. 6d. per 1000 cubic feet, and electricity at 3d. per unit, one finds that for the same money one can purchase more than fourteen times as many B.Th.U. in the form of gas as he can buy in the form of electricity.

These figures represent no *ex parte* statement or personal opinion, but are a matter of publicly known fact, which I believe require only to be examined to be found absolutely incontrovertible.

Essex Works, Birmingham, Sept. 14, 1911. H. JAMES YATES.

[In the London and many other districts, electricity is sold for heating and cooking purposes at 1d. per unit; and, in such cases, the number of B.Th.U.'s purchasable for 1d. with gas at 2s. 6d. per 1000 cubic feet, would be nearly five times the number realizable from a unit of electricity—that is to say, taking Mr. Yates's figures, approximately 3500 B.Th.U. per unit of electricity and 16,500 B.Th.U. from a penny-worth of gas.—ED. J.G.L.]

Gainsborough Gas Department.

The profit and loss account of the Gas Department for the year ending March 31 was presented at a recent meeting of the Gainsborough Urban District Council by Mr. Cooper, the Chairman of the Gas Committee. The statement showed receipts £16,112, and expenditure £15,910, revealing a profit of £201. During the past year extra discount was allowed amounting in all to £128; the total amount being now £1015. More coal was carbonized; and this item represents an expenditure of £310 in excess of last year. Repairs of works and renewals of mains entailed heavier expenditure than in the previous twelve months. Receipts from all sources are much in advance of last year; slot-meters alone producing £500 more. The quantity of gas made was 87,855,000 cubic feet, or an increase of 5,166,000 cubic feet. Coal was carbonized to the extent of 7729 tons, or an increase of 422 tons. The make of gas per ton of coal was 11,366 cubic feet, or an increase of 52 cubic feet. Gas-cookers continue to be in demand; the number now in use being 1025, or an increase of 79. The total number of consumers is 3010, which is an increase of 258 as compared with last year. The Committee have decided to give consumers another 2½ per cent. discount, making 10 per cent.

Suicide by Gas.—A verdict of "Suicide while temporarily insane" was returned by a Coroner's Jury who inquired into the circumstances attending the decease of a Birmingham master tailor named Levine, who was found dead on his bed. Attached to the gas-bracket (the tap of which was turned on) was a piece of rubber tubing, one end of which was near the man's mouth.

Gas Matters at Abercarn.—A recommendation by the Abercarn Gas Committee, that the public lighting of the district should be undertaken by the Works Committee out of the general district rate, led to some discussion. The Chairman (Mr. F. J. Matthews) explained that the step had been taken as it was thought that the Gas Committee did not receive a fair quota from the district rate. Mr. A. E. Meredith said that, in other words, the gas concern was not paying; and they did not like to ask for more money. Instead of running the works more cheaply, they were increasing the cost; and the figures relating to the gas undertaking should be supplied to the members. It was easy to show that the concern was a good thing, if they could "fleece the people" to do it. The matter was relegated to a joint meeting of the Works and Gas Committees; it being decided to publish the figures asked for.

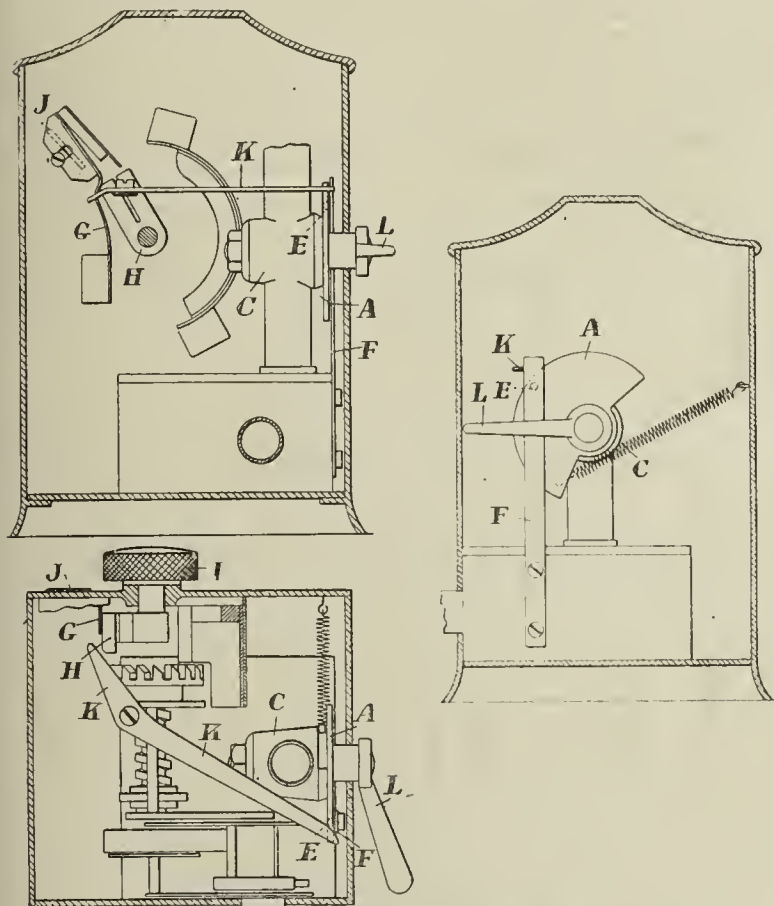
REGISTER OF PATENTS.

Gas Controlling Apparatus for Heating Appliances.

YATES, H. J., of Aston, near Birmingham.

No. 21,222; Sept. 12, 1910.

This invention relates to apparatus as described in patent No. 3377 of 1910, with the object of rendering the operation of the auxiliary tap necessary under all circumstances before gas can be obtained from the apparatus; the invention comprising the employment of means, in conjunction with the auxiliary tap and the coin carrier (or equivalent part), whereby, prior to every insertion of a coin in the apparatus, the tap is automatically closed.



Yates's Gas Controlling Apparatus.

The illustration shows a sectional side elevation, a sectional plan, and a sectional end elevation of the apparatus.

A bell-crank lever or a plate A is mounted in conjunction with the plug of the auxiliary tap C, and arranged for actuation by a spring. The tap is held open against the action of the spring by a pawl E, which engages an aperture in the plate. The pawl is carried on the spring blade F. By means of another spring blade G acting on the part of the coin-carrier H, which is actuated by the external knob I, the carrier normally lies in advance of the coin-slot J; so that before a coin can be inserted for operating the mechanism the coin-carrier must first be moved backwards. This movement is utilized to close the tap C through a lever K, which is acted upon by the coin-carrier at one end, and which, at the other end, is adapted to act upon the spring blade F for disengaging the pawl E from the plate A.

At each return movement of the coin-carrier for the reception of a coin, a similar operation is performed; so that if the auxiliary tap be open at the time, it will be liberated and automatically closed by its spring. The auxiliary tap is opened by manipulating the handle L against the spring action.

By the means described, gas cannot be obtained under any circumstance without the auxiliary tap being first closed, and, in consequence, "any inconvenience that might otherwise be caused by the user omitting to ignite the issuing gas at the fire or other appliance, after operating the main valve with a coin, is effectively avoided."

Cup-and-Ball Gas-Joint.

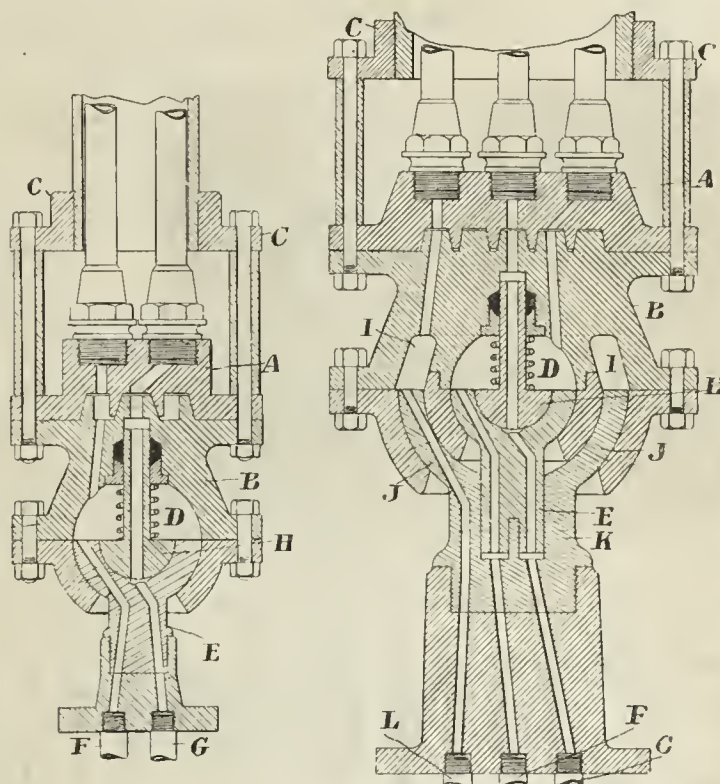
GLOVER, T., of Edmonton.

No. 27,491; Nov. 25, 1910.

This invention relates to a cup-and-ball joint in which two supplies of fluid or liquid can be passed through the same joint, and yet the supply for each will be controlled by separate valves.

For two lamps two supply pipes are connected each to a plate A by union joints, and communicating with separate holes in the plate—one leading to the centre of the plate. To the plate is attached, in a gas-tight manner, a socket B, having a central passage which communicates with the central hole in the plate, and another passage communicating with the other hole in the plate—the socket and the plate being connected together and to a ring C carried by the tubular bent arm of (say) a lamp standard or secured to the ceiling of a room.

The socket is formed hollow at D, and carries the usual cup, in which is a hollow half ball forming the ball proper, to the stem E of which, or to a piece attached to it, the gas bracket or chandelier is suspended. The hollow half ball has a central hole leading from the hollow and through its stem, and another hole through its wall and stem, so that two gas-pipes F G may be connected to the stem.



Glover's Cup-and-Ball Joint.

Inside the hollow half ball, is a half-sphere H, having a hole surmounted by a tube, which fits in a gas-tight manner in the central hole of the socket B. The half-sphere is controlled by a spring to keep it in gas-tight connection with the hollow half ball, and the connection of the tube with the socket is such that, though gas-tight, there is a slight amount of play to allow of the movement due to the action of the whole joint.

In this construction, the gas flows through one supply pipe through the hole in the plate A leading to the centre, then down the central tube and half-sphere H to the central hole in the hollow half ball; and through one hole in the stem E to one gas-pipe G; through the other supply pipe through the not central hole in the plate A into a hole (not central) in the socket B into the hollow D of the socket, and then through the hole in the body of the half hollow ball to the stem E to the other gas-pipe F. By fitting a valve in each pipe, the supply can be determined to both gas-pipes F G.

When three gas supplies are required (as shown), there are three gas-supply pipes, three union joints, and three holes in the plate; the third hole leading to a hole opening out in a ring channel I in the wall of the socket or otherwise to a second hollow half ball J, which is positioned outside the cup and held in place by another cup secured to the socket B. The second hollow half ball is secured to, or provided with, a stem K, and carrying the stem E of the hollow half-sphere; a hole in the wall stem of the half-sphere J communicating with the channel I and with the hole in the socket B.

The stem K, in this case, carries three gas-pipes F, G, L, and the hollow half balls with the cups and half-sphere are struck from the same centre for the proper movement of the hollow half ball.

Purification of Coal Gas.

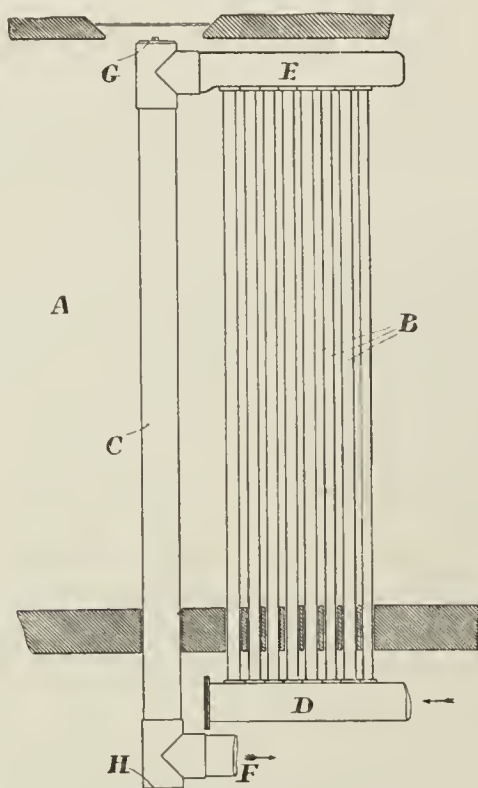
EVANS, E. V., of the South Metropolitan Gas Company, Old Kent Road, S.E.

No. 29,673; Dec. 21, 1910.

It is known, says the patentee, that the sulphur existing in coal gas in forms other than sulphuretted hydrogen, and present chiefly in the form of carbon bisulphide, can be partially converted into sulphuretted hydrogen by subjecting the gas to the action of a heated contact substance—such as firebrick, or iron, nickel or certain other metals, or compounds of such metals—either with or without the introduction of steam. He has found that in the case of fire-brick and like materials the temperature at which the conversion occurs is considerably higher than when metals like iron and nickel or their compounds are used, and that the temperature when iron or its compounds are the contact-substance is slightly higher than when nickel or its compounds are used. The chief difficulty which, it is said, has militated against the introduction of this mode of converting the sulphur into sulphuretted hydrogen, arises from the high temperature to which the contact-substance was heated—a temperature which soon proved fatal to externally-heated iron or like containers, and in some cases led to trouble owing to fusion of the contact-mass. He has, however, found that the temperature to which the contact-substance is heated need not be nearly so high as has been previously supposed if care be taken to preheat the gas before it passes over or through the heated contact-substance. This means that the furnace temperature can be reduced below that at which the iron pipes or other container of the contact-substance are rapidly deteriorated, and that at which trouble due to fusion of some forms of the contact-mass ensues.

According to the present invention, therefore, when contact-substances are used with or without the addition of steam, the gas is preheated and the furnace temperature is maintained sufficiently low to avoid rapid deterioration of the container and fusion of the contact-mass, if this be fusible—for instance, when iron or nickel is used as contact-mass, at 400° to 450° C.; although he does not wish to limit himself to this precise temperature. The preheating may be effected either in the furnace itself, in which case it is advantageous that the

arrangement should be such that the gas becomes heated to a temperature amounting to about 80 per cent. or higher of the temperature of the furnace.



Evans's Gas-Purification Apparatus.

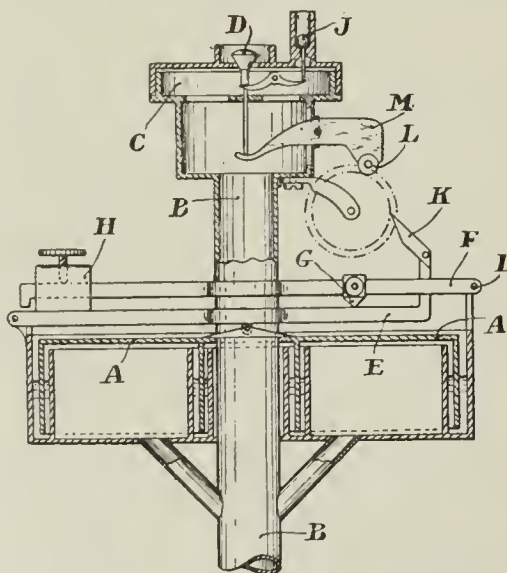
A suitable arrangement is illustrated in longitudinal vertical section through part of a furnace chamber A containing the apparatus for pre-heating the gas and converting the sulphur compounds. The gas enters the apparatus through the pipe D, and travels through a number of iron pipes B (of comparatively small diameter) situated in the furnace chamber. These pipes open into a collector E in communication with the container C, which is an iron pipe considerably wider than any of the pipes B, and likewise situated in the furnace chamber. The container contains pieces of firebrick which have been saturated with a nickel salt solution and then dried. The gas having been thoroughly preheated before entering the container, a furnace temperature of about 450° C. suffices; and the gas passes away at F containing its sulphur almost completely in the form of sulphuretted hydrogen. When it is found that the nickel compound is becoming insufficiently active, the current of gas is stopped, and the plugs G and H are removed from the ends of the pipe C, so that a current of air is maintained by natural draught through the pipe, whereby the contact-substance is revived.

Automatic Igniting and Extinguishing Devices for Gas-Burners.

LIED, O. S., of Christiania, Norway.

No. 3019; Feb. 6, 1911.

This invention relates to an automatic igniter and extinguisher wherein the burner-valve is alternately opened and closed by increasing the pressure on a lifting member—such as a diaphragm, floating-bell or piston—transferring its movement through a loading lever to valve-operating mechanism; the movement of rotation, and consequently the loading force of the lever, being varied (if required) by



Lied's Automatic Burner Lighter and Extinguisher.

providing the lever with an adjustable weight. The object aimed at is to provide a device which will allow of varying the load exerted on the lifting member within very wide limits. For this purpose, a second pivoted loading lever and an adjustable pressing-piece form a load-translating member between the two levers. When this piece is displaced in a longitudinal direction along the levers, the loading force is quickly and easily varied.

In the illustration, the floating-bell A is, by means of a pipe B and branch pipes, connected with the gas supply pipe. The pipe B is further connected with a valve-chamber C, in which a valve B opens or closes the opening leading to the burner mounted above. The movable member A subjected to the gas-pressure is in operative connection with two oscillating levers E F; the former being also connected with the valve-operating mechanism shown, while the lever F serves for adjusting the member A in the following manner.

The gas-pressure tends to lift the bell, which is very light. The hinged lever E lies above the bell and rests upon two rollers at its middle portion. Above the lever E is the lever F, which is also hinged, and which by an adjustable pressing-piece G acts on the subjacent lever acting again on the rollers of the bell. The lever F, besides, has an adjustable weight H. The pressure on the bell from the loading mechanism thus depends upon the position of the piece G between the two levers. The further this pressing-piece is removed from the fulcrum I, the less the pressure on the rollers—i.e., the less is the bell loaded, and *vice versa*, when the pressing piece is moved towards the point I.

In addition to forming a member of the loading mechanism, the lever E serves to cause the opening or closing of the burner-valve D, and eventually also of the pilot-light valve J. For this purpose, the lever, through a pawl K and an ordinary ratchet and cam wheel, operates a roller L carried by the lever M. The latter is secured gas-tight in a flexible material forming one wall of the chamber C, and enabling the lever M to move as required on its pivot without the use of slide-surfaces, stuffing-boxes, or the like.

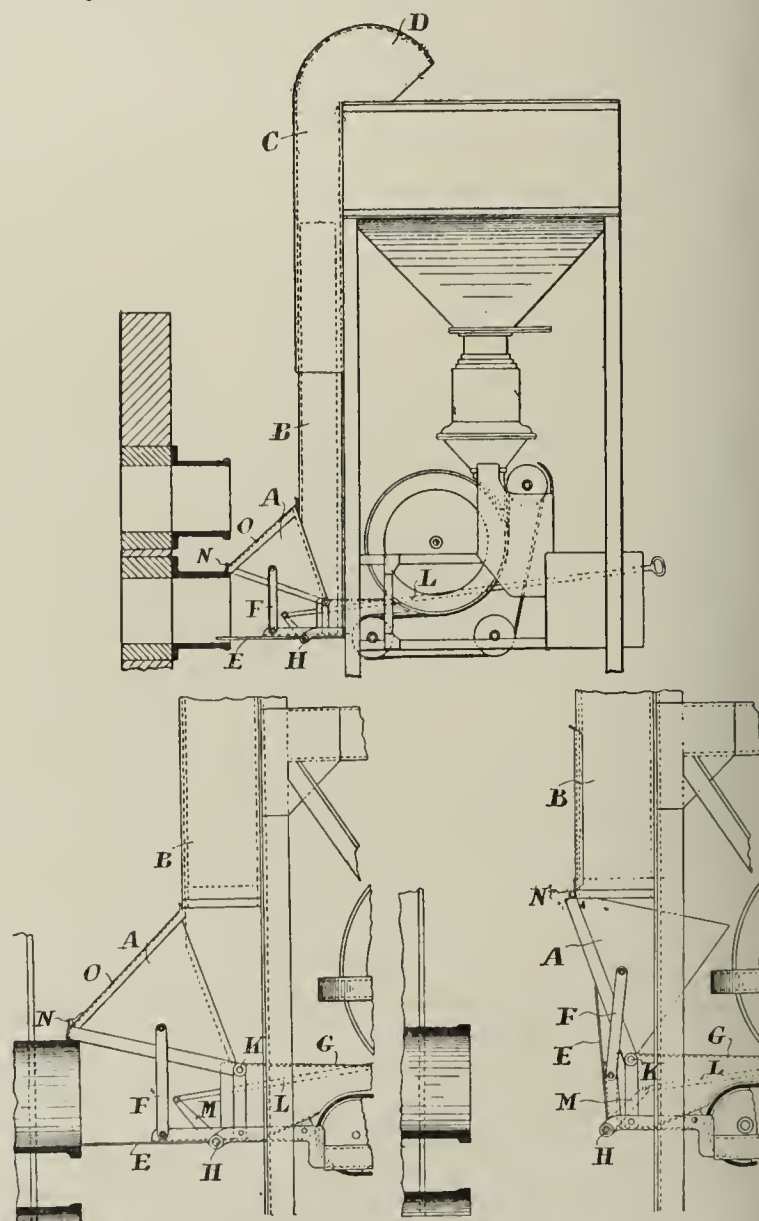
The stem of the main valve D (guided by a cross-piece) is connected through a double lever with the stem of the pilot-light valve, so that the latter is closed when the valve D is opened, and *vice versa*.

Charging Gas-Retorts.

GILL, G. M., of the Commercial Gas-Works, Wapping, and MIDDLETON, A., of Commercial Road, E.

No. 2392; Jan. 30, 1911.

This invention has for its object to collect and deal with the dust and smoke caused by the charging of retorts with coal by machinery, by providing a telescopic chimney and hood, so that the hood can be adjusted over the mouth of the retort being charged and the smoke and dust collected and delivered to the chimney to be carried away to any desired place.



Gill and Middleton's Retort Smoke and Dust Collector.

The telescopic chimney is arranged so that the machine can be set at any required height, with a hood at the lower end for collecting the smoke and dust. At the top, the chimney is turned over to deposit the dust in the hopper of the machine or as desired. The coal being projected into the retort causes a displacement of hot air, which leaves the retort and is collected in the hood of the apparatus and rises naturally up the chimney. The draught caused carries along the smoke and dust made during the operation of charging, and deposits it in the

hopper of the machine or in some suitable receptacle. The telescopic chimney may be fixed on the framework of the stoking machine, and is made adjustable in height to suit the height of the machine when charging the different rows or tiers of retorts.

The illustration shows a side elevation of the apparatus; an enlarged detail of the lower part; and the apparatus closed up and out of action.

The hood A is shown in the first two views let down resting on the top of the mouthpiece of the retort ready for catching the smoke and dust caused by the operation of charging the retort. The smoke and dust collected in the hood now have a clear vertical path up the chimney B C, the lower part of which is made telescopic to allow for the operation to take place at each tier of retorts. The top length of chimney (which is fixed) is fitted with a head D, curved in towards the hopper on the top of the machine, in order to deflect the smoke and dust into it. The hood is pivoted at K to the fixed shoot G, and is connected by the two links F to the hinged flap-plate E, so that the two close up out of action together. The hood is operated by the hand lever L, which is carried away behind the machine to some convenient place—motion being applied through the short lever M, which is fixed to the flap-plate E pivoted at H. The loose top-plate O of the hood is hinged at N, and slides vertically up the front of the chimney, being guided by its flanged sides, and is held in a vertical position by butt hinges that prevent the plate falling over towards the mouthpieces when in the last position shown.

Converting Sulphite of Ammonia into Sulphate.

BURKHEISER, K., of Hamburg.

No. 12,227; May 20, 1911. Date claimed under International Convention, May 21, 1910.

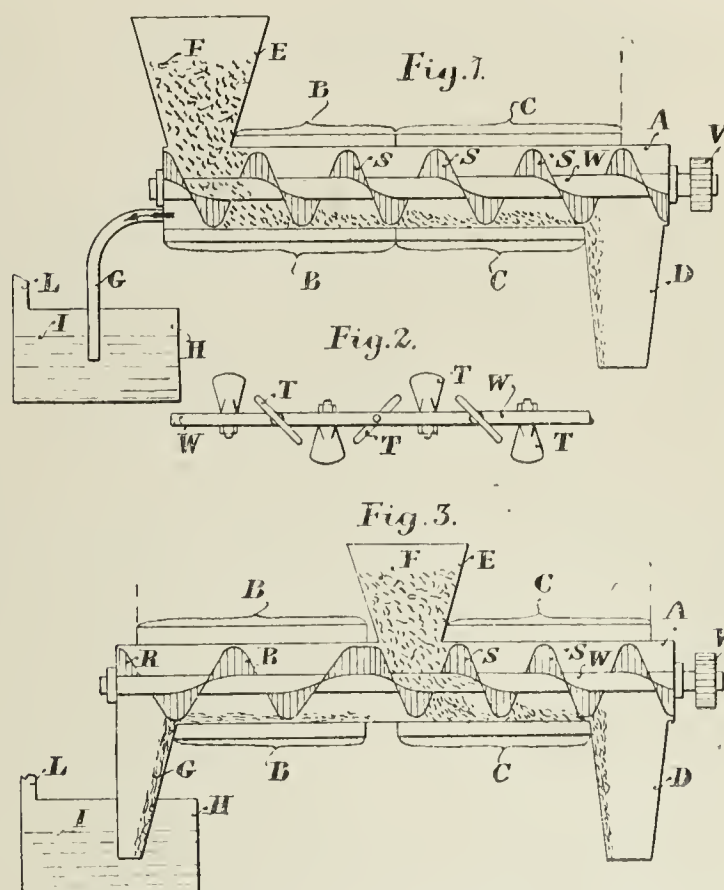
It is known, says the patentee, that sulphurous compounds in general, if left exposed to the air or if submitted to the action of air, are transformed into sulphates. It is also known that sulphite of ammonia is converted into sulphate of ammonia by bringing it into contact with the oxygen of the air. This conversion is generally effected by bringing a solution containing sulphite of ammonia into contact with air, or by spreading the precipitated salt and conducting air over it. As numerous experiments have shown, however, it is not possible to convert by such means the whole of the sulphite into sulphate. "In a surprisingly short space of time a state of equilibrium is reached between freshly-formed sulphate of ammonia and sulphite of ammonia which remains unchanged, which state is not materially changed even if air be introduced into, or conducted over, the mixture for a considerable length of time. This state of equilibrium is regularly reached when about 60 to 65 per cent. of the sulphite of ammonia has been converted into sulphate; so that the mixture still contains 35 to 40 per cent. of unchanged sulphite. The conversion of the pure sulphite of ammonia into a mixture of about two-thirds of sulphate of ammonia and one-third of sulphite of ammonia is accomplished very quickly and even unintentionally during the regular manufacture of sulphite of ammonia; the manufacture of an absolutely pure sulphite of ammonia being possible only under absolute exclusion of all free oxygen both during the manufacture and during the subsequent storage. It is, therefore, impossible to produce pure sulphite of ammonia by means of the customary process of manufacture. The product obtained will always consist of about one-third of sulphite of ammonia and two-thirds of sulphate of ammonia—the latter being formed even undesired during manufacture or storage if access of air is not impeded. On the other hand, this condition of equilibrium between the sulphite of ammonia and the sulphate of ammonia will not change materially, even if air is intentionally made to act on the sulphite for a long time."

The present invention relates to a method of converting sulphite of ammonia completely into sulphate of ammonia—consisting in continuously separating the sulphate of ammonia freshly formed under the action of the air, during and after its formation, from the sulphite remaining unconverted; in then oxidizing the latter; again separating; and, so on, until the whole of the sulphite is converted into sulphate. The separation by the new method may be effected by utilizing the differing properties of the sulphite and the sulphate of ammonia as (for example) their different solubilities or the property of the sulphite to sublimate at temperatures below 100° C. The patentee proceeds to describe a method of carrying out the latter process together with an apparatus adapted for the method, and which admits of continuous working until the whole of the sulphite of ammonia has been converted into sulphate of ammonia.

Fig. 1 is a diagrammatic representation of the arrangement for conveying the charge by means of a worm conveyor to one side of the apparatus; the arrangement being shown in longitudinal section. Fig. 2 is a conveyor in which the worm is composed of single vanes fitted to a shaft. Fig. 3 is a conveyor with right and left handed worms.

The arrangement shown in fig. 1 consists of a conveyor body A of long, tubular shape, surrounded along its front part—say, to about one-half of its length—by a cooling jacket B, and along its rear part by a heating jacket C. Through the cooling jacket is passed a cooling medium—such as cold water or cool air, for example; and through the heating jacket a heating medium—such as hot water, hot air, or steam. The part of the tubular body surrounded by the heating jacket is to be heated to such a temperature that the sulphite of ammonia will be sublimated with certainty, whereas the part surrounded by the cooling jacket is to be cooled so far that the vapours of sulphite of ammonia are again condensed on its walls. In the centre of A is rotatably journaled a worm conveyor S, the shaft W of which is driven by a pulley V in such a direction that the worm conveys the charge F from left to right. At the left-hand end—that is, at the coldest part—is arranged a funnel-shaped hopper E for the introduction of the charge, and at the right-hand end is provided (below) a funnel D. From the lower side of the front cooled end of A a pipe G leads to a suitable depth into liquid in a tank H, from the top of which an air suction pipe L leads to suitable suction apparatus.

The arrangement operates in the following manner: The sulphite of ammonia (or, better, the mixture of sulphite and sulphate of am-



Burkheiser's Apparatus for Converting Sulphite of Ammonia into Sulphate of Ammonia.

monia) is charged into the hopper E and conveyed in thin layers by the worm conveyor S from left to right in A. By the rotation of the worm, the particles of salt F are continuously agitated and thereby intensely exposed to the action of the current of air rushing in an opposite direction. The air required for the oxidization of the sulphite of ammonia is aspirated through the suction pipe L by suitable apparatus; and the air thereby rushes through A from right to left, and comes into intimate contact with the layers of the charge between the threads of the worm. In this way, the sulphite of ammonia introduced is converted as far as possible into sulphate of ammonia. The air then passes through the pipe G into the liquid in the tank H, where it is washed, before being drawn off through the suction pipe L. The sulphite of ammonia which remains unconverted in A is sublimated on the hot walls C. The sulphite vapours thus formed are carried by the current of air rushing through A to the left, and are again condensed on the cooled walls B as sulphite (or as a mixture of sulphate and sulphite), from which walls they are scraped off by the sharp edges of the worm conveyor S, and again conveyed with the charge introduced afresh to the right, to be here again oxidized and separated; while such particles of sulphite vapours or sulphite solution which are carried by the current of air through the pipe G are retained in the liquid in H, to be subsequently treated and recovered. The charge, which finally passes to the right and is discharged through the funnel D, consists of pure sulphate of ammonia only.

The constructional form shown in fig. 1 is diagrammatic only. It is obvious that the tubular body A and the worm S must be made of considerably greater length so that the charge F is exposed to the oxidizing current of air as long as possible. On the other hand, also, the hot walls C and the cold walls B respectively have sufficient time to act on the sulphite so as to completely sublimate it and free the sulphate formed in the latter part of A entirely of all sulphite, and to give the sulphite vapours carried back by the current of air sufficient time to condense on the cold walls of the jacket B, so far as this should not yet have occurred on the cooler freshly supplied salt charge F.

The worm conveyor shown in fig. 2 differs from that shown in fig. 1 only in that single vanes or blades T are fitted to the shaft W in place of one continuous worm.

While the arrangement shown in fig. 1 is intended to convert, as far as possible, the whole charge introduced into the hopper E into sulphate of ammonia, wherein the sulphite not at first converted is sublimated on the hot walls C and subsequently condensed on the cooled walls B, and is again brought (together with the fresh charge F) under the action of the current of air, until the whole charge is converted into sulphate, the arrangement shown in fig. 3 is intended to obtain a more rapid separation of the sulphate produced from the not yet converted sulphite. Here the hopper E is arranged about in the middle between the ends of the tubular body A. The worm conveyor has a right-handed spiral S, which receives and conveys the whole charge F from the hopper E to the right, and a left-handed spiral R which only scrapes the condensed sulphite from the cooled walls B and conveys it to the wide mouth of the discharge pipe G. In this arrangement, the part of the tubular body A to the left of the hopper E is surrounded by the cooling jacket B, and the part to the right by the heating jacket C. The operation of this arrangement differs from that of the arrangement shown in fig. 1 in so far as in this case only the part of the charge F is recovered which has been converted during one operation into sulphate of ammonia, while the sulphite sublimated on the hot walls, carried off to the left by the current of air, and here condensed on the cold walls B, is conveyed into the tank H. Here the solution is further oxidized, as far as this has not been effected by the current of air; and the solution thus obtained is again mixed with the mother lye obtained in the manufacture of the salt, and further used.

MISCELLANEOUS NEWS.

FIFTY YEARS' SERVICE AT RUGBY.

The Reminiscences of a Veteran Secretary.

Octogenarian, fifty years Secretary of the Rugby Gas Company, upright, alert, with mental capacity unimpaired, and taking a live interest in the affairs in which he has participated so long, sat Mr. T. M. Wratislaw to the right-hand side of the Chairman of the Company (Mr. A. J. Lawrence) at a little informal dinner at the Hotel Cecil last Wednesday. Others present included the Vice-Chairman (Mr. A. G. Chamberlain) and Messrs. I. Brooks, C. J. Elkington, J. B. Gray, Alderman J. Watson, all Directors of the Company. Also of the little party were Mr. Charles Meiklejohn, the Engineer of the Company, and the Assistant-Secretary (Mr. M. E. T. Wratislaw). The occasion was a special one. Mr. T. M. Wratislaw has almost reached the jubilee of his connection with the Company as Secretary; and the Chairman and Directors, his colleague the Engineer, and the shareholders, had determined not to let such an event pass without giving some tangible expression to their regard, which should also stand as a lasting memento of the long years of official connection with the Company. No other living man's memory goes back so far in the internal history of the undertaking as does that of Mr. Wratislaw; and therefore to all others associated with the Company, he stands in a peculiar position—uniting, as he does in his person, the distant beginnings of the concern with its present mature and still developing conditions. The “tangible expression of regard” and the memento, it was resolved, should take the form of a silver rose-bowl and a portrait of the recipient in oils. The portrait is not quite finished, but the rose-bowl was presented after the dinner last Wednesday. It is a beautiful and chaste representation of the silversmith's art. The bowl is mounted on an ebony stand, and bears the following inscription:—

PRESENTED
(Together with his Portrait in Oils)
to
THEODORE MARC WRATISLAW, Esq.
by the
DIRECTORS OF THE RUGBY GAS COMPANY
to Commemorate the Completion of Fifty Years,
as Secretary, in the Service of the Company.
1861-1911.

Dinner finished, the Chairman proposed the loyal toasts, and then that of the “Rugby Gas Company” followed. Succeeding came the event of the evening.

The CHAIRMAN said it had been his pleasure on more than one occasion, during the thirty years he had been connected with the Rugby Gas Company, to have very felicitous duties to perform; but he did not think there had been a more pleasurable occasion than the present, when he had the great honour of undertaking a duty which gave not only himself, but everybody at the table, the greatest possible delight. It was given to very few men to have lived to eighty years of age, and to have been connected with one Company for more than fifty years. But they had with them a gentleman, in the person of their Secretary (Mr. T. M. Wratislaw), representing these facts. They were extremely glad to welcome him. He linked the distant history of their Company with the present. He did not want in any way to be reminded of those with whom he was early associated in the Company, and whom he knew so well—Mr. Wells, Mr. Gates, Mr. Edmunds, Mr. White, Mr. Haswell, and many others. On the 7th of next month Mr. Wratislaw would, according to the annals of the Company, have reached the fiftieth anniversary of the day on which he was made Secretary. As he (the Chairman) had said, it was given to very few men to live to see their jubilee in one official capacity; and they all congratulated Mr. Wratislaw very heartily. Such an event could not be overlooked by the Board and the shareholders of the Company, and those with whom Mr. Wratislaw worked; and though they were anticipating the date a little, they had determined to present him with a small memento of the occasion, and of the great regard in which he was held. They therefore asked him to accept the silver rose-bowl and the portrait with the best wishes of the Directors and of every shareholder of the Company. The rose-bowl had been filled with beautiful roses at the thoughtful wish and desire of their excellent Engineer's wife; and he (the Chairman) hoped that their fragrance would remind their veteran friend of those who revered him in Rugby. The Chairman read the inscription on the bowl, and, proceeding, said he hoped the portrait would be a good representation of their friend. He remembered some years ago being at the Incorporated Law Society; and after lunch in the Board-room, he saw the portrait of Mr. Wratislaw's ancestor. That portrait was the delight of their friend and of his brothers and sisters. He hoped the present one would be the same to Mr. Wratislaw's family. He asked him now to accept the rose-bowl, which was chosen with a great deal of deliberation and consideration, knowing the love of their Secretary for gardens and flowers.

The DEPUTY-CHAIRMAN remarked that he should like to supplement the words of the Chairman, because he had known Mr. Wratislaw for so long, and he could thoroughly appreciate that this was one of the proudest moments in his (Mr. Chamberlain's) life. Mr. Wratislaw knew thoroughly well what he meant. He was very pleased to congratulate him upon attaining his jubilee as Secretary of the Company;

and he hoped they might all live to celebrate his diamond jubilee. This was one of those golden moments that occurred in every man's life.

Mr. WRATISLAW said it was hard work to open one's mouth to reply to such kind words as had fallen from the Chairman and the Deputy-Chairman. He desired to give to all with whom he had been associated in the Company, and were now with them, the right-hand of fellowship for all their kindness to him during the great number of years that he had been with them. Each man knew his own past best; and, knowing his own, he could appreciate the way in which they had been good enough to express and show their appreciation of his services. His memory went back to the very foundation of the undertaking, when a few gentlemen met together, and struggled to form a Company—a private partnership—by which, through the goodwill of the people themselves, the town of Rugby should be lighted by gas. The Company was formed in the interests of the town itself; and its conduct had ever been in the interests, not of the Company alone, but of the people. When the Company started, it drew its coal supply from the Midland wharf, and only kept a man and horse employed to cart the coal to the old works. The Company began with a very small capital, and with gas at 13s. 6d. per 1000 cubic feet; and there was great rejoicing when there was a prospect of a reduction. For several years the Company paid no dividend, in order that they might be economical in its working, and endeavour to ensure its ultimate success. Looking at the present position, he felt sorry that many of those whose faces he remembered as pioneers of the Company and of the present prosperity were not among them that day. They had a share in the glory of its gradual progress in their day, as those who were associated with the present progress of the Company shared in its glory to-day. It was marvellous how the gas industry had increased; and it was still more marvellous how promising was its future. The industry had without interruption extended its success; and it would continue to do so. Every effort was being energetically and skilfully made by the scientific men of the industry to develop all economies in the work of the industry, in order to maintain, and raise, its position as one of the chief industries of the country, not only in lighting, but in heating, cooking, and power. It was a matter of national concern that the gas industry should prosper. He had had very great pleasure in working with Mr. Meiklejohn, who had, by his exceeding great industry and energy, developed the Company, and with a care that he had largely concealed and kept to himself. Not only had he rebuilt and remodelled the works, but he had and was extending the distribution system to the neighbouring villages, so fulfilling the duty the Company undertook when they obtained their last Act of Parliament. The Company had in its early years passed through many vicissitudes. But it had weathered them all; and the confidence in the Company was shown by the fact that, when last they went to Parliament, sanction was granted to an increase of the capital by £60,000, while the Company only began with a capital of £1500! Not only had the Directors always been full of zeal, but they had ever shown themselves willing, and wisely willing, to be guided by their engineers for the time being. They had all been engineers who had given great care and attention to the requirements of the undertaking. There were several; but he would only speak of one who was a good friend, and one whom they all loved. That was Mr. Peter Simpson—a self-made man. He lived in their memories the embodiment of uprightness, energy, and knowledge. Then they had Mr. Meiklejohn. In him, the Company had a valuable and talented engineer, as was not only shown by the success of the Company, but by the position Mr. Meiklejohn held among the gas engineers of the country. He trusted his friend might long be spared, as well as his wife and children, to enjoy the position he had gained for himself by gradually stepping up the ladder of the industry. Indeed, he firmly believed Mr. Meiklejohn had a future for yet higher things in the industry. He (Mr. Wratislaw) thanked all who had joined in this presentation. He wished he could find words with which to express his thanks, as they deserved to be expressed, for their kindness. But he did feel most sincerely the kindness to him. He wished all his friends present a happy future. And he hoped that the words of their mouths would abide in their hearts, and would always be a perpetual spring there. The happiness of that would bring greater happiness hereafter.

The VICE-CHAIRMAN remarked that the Chairman had asked him to propose the health of their Engineer. He did so with the greatest pleasure; and at the same time thanked him for the arrangements he had made for this occasion. He hoped that Mr. Meiklejohn would be long spared to the Company; and that the future of himself and his household would be richly brightened in every way.

Mr. MEIKLEJOHN, in reply, observed that having only put in rather more than nineteen years in the service of the Company, he seemed to be, in comparison with Mr. Wratislaw, a mere apprentice at the job. But the happy time and experience he had had in connection with the Company's affairs, working with Mr. Wratislaw, made him think of one or two things in contemplating that evening. He did not think they had had, during the nineteen years he had been the Company's Engineer, any serious difference. What little difference had arisen had been, he was quite sure, due to his own folly. [Laughter.] He had probably been apt to think that what was the best possible thing for himself was the best possible thing for the Company; and possibly sometimes Mr. Wratislaw—and he (Mr. Meiklejohn) thought that his friend was right—considered that what was the best possible thing for the Company was not necessarily the best possible thing for its Engineer. [Laughter.] However, the final result had been so happy that, were it in his own power to determine, he would be quite willing to give Mr. Wratislaw a renewal of his “lease” for seven, fourteen or twenty-one years at his own option. He hoped that one of Mr. Wratislaw's best recollections would be the pleasant relations that had existed between himself and the Directors and the officers of the Company. He hoped their friend would live long and die happy.

Mr. ELKINGTON proposed the health of the Chairman and the Vice-Chairman; and both gentlemen having replied, a pleasant occasion and function was brought to a close.

* The price is now 2s. per 1000 cubic feet net, and will be reduced to 1s. 10d. next January. The price for power to large consumers will be 1s. 7d.

HASTINGS AND ST. LEONARDS GAS COMPANY.

The Ordinary General Meeting of this Company was held on the 7th inst., under the chairmanship of Dr. G. G. GRAY, J.P.

The CHAIRMAN, in moving the adoption of the report and accounts, said they showed very satisfactory working for the half year to June 30; there being a profit balance of £14,559. A few months ago, he commented on the fact that the profit balance was the largest the Company had ever had; but he ventured to suggest that they could hardly expect to always obtain such a satisfactory profit balance. The profit balance on the present occasion was not quite as large—a difference of about £12—but the balance to which he had referred was on the winter work. The present profit balance was the largest ever made in the June period. Compared with the corresponding half year, the present profit balance was practically an increase of £1500. This increase was due to several causes. It was due to some extent to an increase in the amount of gas sold—about 5½ million cubic feet. This increase, he admitted, was not equal to that which they saw in some other towns, which were developing in a way in which the recent Census and other facts showed Hastings was not at the present time developing. But they had every reason to be satisfied; and their percentage of increase was equal to that of the South Metropolitan Gas Company. There had been a steady increase—almost unbroken—since they last went to Parliament; and the quantity of gas now sold compared with then showed an increase of 75 millions. Another reason for their position was the improved market for the sale of residuals; but it was really due, he thought, to the greater knowledge and observation of essentials in carbonizing, so that they obtained the greatest yield from the coal. This was a source of increase which he thought might in the future give even better results. He pointed out the improvement due to the care of Mr. C. E. Botley in the matter of carbonizing since he took over the works. The position was specially creditable to Mr. Botley as the head of the concern. Already to the revenue account there was a decrease of £348 due to the diminished quantity of gas supplied for public lamps to the Corporation. As to increases on the expenditure side, the share of the Company in promoting the Standard Burner Bill was £143. The net increased balance for the half year was £1496. They had written-off £2000 from the old works account, and £300 in respect to lamps which had been converted by the Corporation. About £100 of the £348 reduction by conversion of the lamps was profit. The cost to the town must have been £3 10s. per lamp (over £700), and an additional 3s. 6d. per lamp for light. Who benefited by the change was one of the puzzles which still remained to be solved.

Mr. A. W. OKE seconded the motion, and warmly complimented the Directors on their action with regard to the Burner Bill. Many companies, he said, now regretted they did not join in the promotion of the Bill. In commenting on the policy of the Corporation, he referred to the City of Berlin, where seven-eighths of the light was by high-pressure gas. He hoped those who had the administration of

the electric light would look carefully into the accounts and see whether they were not deceiving the ratepayers.

The report and accounts were adopted, the statutory dividends were declared, and a hearty vote of thanks was accorded to the Directors and staff.

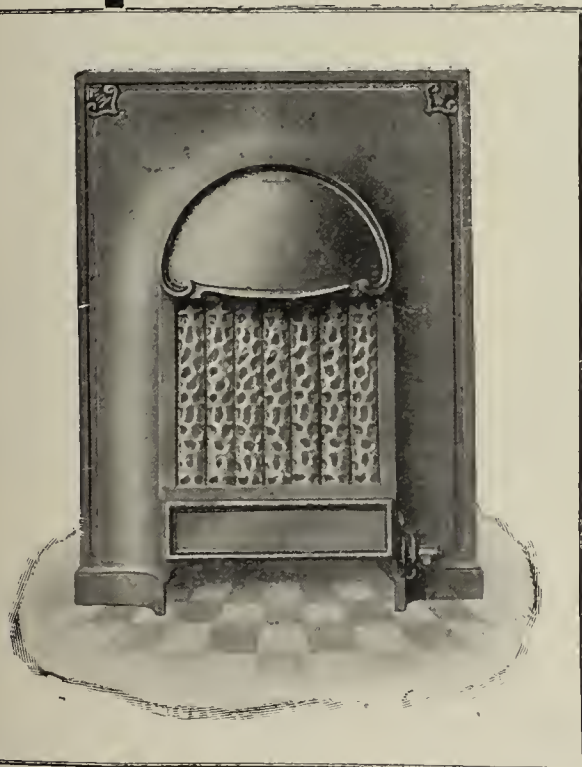
The CHAIRMAN, in his response, bore testimony to the excellent work of Mr. Botley and his staff. The chief burden, he remarked, was on Mr. Botley and his son (Mr. C. F. Botley), and those who worked under them.

Mr. BOTLEY also expressed his thanks, and said he highly appreciated the confidence of the shareholders. Such results as they had obtained could not have been secured but for the loyalty and devotion of everyone connected with the undertaking. They did not mind any competition, so long as it was fair; but they could not fight against underhand competition. He warmly acknowledged the support he received from the Directors when he initiated steps over the burner question and other matters.

DOVER GAS COMPANY.

Addressing the shareholders of the Dover Gas Company at the half-yearly meeting, the Chairman (Mr. Willsher Mannering) expressed sincere regret at the death of their esteemed Engineer and Manager, Mr. Raphael Herring. He said that though Mr. Herring had been in failing health for some time, chiefly through heart trouble, the end was somewhat sudden. He had a seizure, and passed away on the evening of the following day. During the twenty-four years Mr. Herring was in charge of the works, he carried out his duties with ability and efficiency. He was thoroughly practical and devoted to his work; and with him duty was ever foremost. Mr. Herring interested himself largely in the welfare of the men, by whom he was highly respected; and his efforts on their behalf were much appreciated. It was at his suggestion that the reading and recreation room was established at the works in 1888; and he inaugurated the benevolent and death funds, which under his presidency had proved very beneficial to the members. By Mr. Herring's death, the Company had lost a loyal and valued officer, and the men a good master and a kind friend. All would sympathize with the widow and family in their bereavement.

Proceeding to move the adoption of the report and accounts and the payment of a dividend for the half year at the rate of 7½ per cent. per annum, the Chairman remarked that the six months to June had been very successful. There had been an increase of 2·04 per cent. in the consumption of gas; while residual products had realized unusually high prices. As compared with the corresponding period of the previous year, all items of income in the revenue account showed improvement. The balance carried to profit and loss account was £5452, as against £4823. After making the necessary deductions and paying the dividend, there would be a sum of £355 to add to the surplus profit

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series of Gas Fires:—

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83, Old Market St., BRISTOL; 13, Whitworth St. West, MANCHESTER; 8, Exchange Place, Donegall St., BELFAST;
333, Queen St., MELBOURNE; and 12, Cunningham Lane, Pitt Street, SYDNEY.

balance of preceding years. He congratulated the proprietors on the result of the half-year's working, and on the strong position and continued prosperity of the concern. This depended largely on the interest, energy, and unity of the staff; and it was pleasing to testify to the satisfactory way the work had been done by one and all.

The resolution was carried, and the Chairman, Directors, and staff were thanked for their services.

The Secretary (Mr. E. C. Fielding), in acknowledging the vote on behalf of the officials, said that, on behalf of the employees, and more especially those who were under the late Mr. Herring's immediate supervision, he wished to join in with the expression of regret and sympathy at the loss of their Manager. While the late Mr. Herring's first cares had been for the prosperity of the Company, he always had a sympathetic interest in the welfare of the men under his charge.

WESTMINSTER TECHNICAL INSTITUTE.

We have received from the Principal (Mr. J. Stuart Ker, B.Sc.) a prospectus and time-table of evening classes for the forthcoming session of the Westminster Technical Institute of the London County Council, at Vincent Square, S.W. The following is the information under the heads, "Gas Engineering" and "Heating and Ventilation."

Gas Engineering.

TECHNICAL CALCULATIONS.

Mr. F. G. Steed and Mr. G. Evetts.

Tuesday, 7.15 to 9.30 p.m.

This half-session course of lessons, starting in September, is auxiliary to that of "Gas Supply and Manufacture," and should be attended by all students lacking in knowledge of the simple principles of calculation and mensuration so essential to progress in their technical studies.

Syllabus—Decimal fractions, simple rules in calculation, percentages, proportion, contracted methods, including logarithms; metric system; calculation of areas, volumes, and weights; plotting on squared paper; illumination curves; gas-engine calculations; useful mechanical formulæ; calculations in connection with lighting and heating; mantle average; candle feet, &c.

A portion of the evening will be devoted to the working of examples under the supervision of the teachers.

TECHNICAL DRAWING.

Mr. F. G. Steed and Mr. G. Evetts.

Tuesday, 7.15 to 9.30 p.m.

This course will commence on the conclusion of the "Calculations" course, and is specially arranged for those attending the gas engineering classes.

Syllabus—Simple geometrical principles; sketching from models and gas-fittings; plans, elevations, and sections; making finished drawings

from rough sketches of gas appliances; tracing and printing; rolled steel sections in use; properties of materials.

GAS SUPPLY.—I.

Mr. P. Smithers, Mr. J. Bevis, and Mr. T. Coghill.

I. (a) Monday, 7.15 to 9.30 p.m. I. (b) Thursday, 7.15 to 9.30 p.m.

Lecture Syllabus.—Governors and their uses; general principles of distribution of gas; methods of laying and testing pipes and fittings; tools and appliances used; uses of pressure-gauge; principles and construction of gas-meters, their repair, testing, and fixing; interior fittings for houses and other buildings; construction of various forms of burners and their efficiency; regulation of gas and air supply to burners; inside shop window lighting; various types of low pressure, self-intensified, and high-pressure public lamps; fixing and construction of gas fires, stoves, &c., their defects and remedies; various systems of heating water by gas, and the principles of circulation; high-pressure distribution for lighting and industrial purposes; the gas-engine, its construction and efficiency.

Workshop Syllabus.—Cutting and screwing of barrel with various types of dies; bending of pipes, using forge or machine; joint blowing in lead pipe and compo. tubing; bending of lead pipe and meter fixing; drilling, tapping, and punching holes in barrel for float making; brazing forge work and fitting copper tube for illuminating devices; making lamp irons; fitting-up small gas-engine and high-pressure plant; testing various systems of hot-water heaters by experimental hot-water supply system; drilling holes in mains; cutting out and joint making.

GAS SUPPLY.—II. (a).

Mr. J. G. Clark.

Wednesday, 7.15 to 9.30 p.m.

Syllabus.—The subjects of the elementary courses will be considered in a more advanced manner, and in addition consideration will be given to the theory and practice of the flow of gas in mains, pressure recording instruments, specifications, testing for illuminating power and effect, gas in competition for light, heat, and power, important recent developments in gas engineering, &c.

GAS SUPPLY.—II. (b).

Mr. J. G. Clark.

Thursday, 7.15 to 9.30 p.m.

The special feature of this course will be laboratory work; and the students will have ample facilities for investigating the more important practical problems which arise in connection with modern gas supply, as, for instance: Calorimetry in its relation to gas and gas appliances, fires, cookers, grillers, &c.; practical photometry, measurement of candle power, mean spherical and hemispherical values of light sources; illumination of public thoroughfares and other aspects of gas lighting; the use of reflectors and shades; meter and governor testing; experiments relevant to the flow of gas through pipes.

MAINTAINING THE LEAD.

Forcing the pace is the typical method of our American friends "on the other side" in their endeavour to secure commercial supremacy, and we in a like manner are also forcing the pace by **maintaining the lead with our Gasfires** this season.

The five new "**PERIOD**" Gasfires now introduced are the most advanced yet put forward, and will satisfy the highest æsthetic taste of the Consumer and the keenest practical requirement of the Gas Manager.

Everything has been done to enhance the appearance and increase the efficiency whilst

THE MAINTENANCE PROBLEM

is reduced to its simplest form, all parts being standardized and interchangeable fire with fire, still retaining **our original idea** of five years ago.

THE RICHMOND GAS STOVE & METER CO., Ltd.,

Gasfire Specialists.

Inventors of the Interchangeable "A.B.C." Series of Gasfires, Patent Combined Gas-Air Adjuster and Governor, Air-Pad Fire Brick, &c., &c.

Offices and Show-Rooms: 132, QUEEN VICTORIA STREET, E.C.
General Offices and Works: WARRINGTON.

Flame temperature and its relation to the efficiency of gas appliances. The gas-engine in theory and practice; the use of the indicator; gaseous explosion.

Boosting and other aspects of pressure raising. The principles of ventilation and the hygiene of gas lighting and heating.

Any important developments and most recent practice in gas supply.

An experimental gas-engine and compressor are being added to the equipment this session.

GAS MANUFACTURE.

Mr. Arthur Valon.

Tuesday and Thursday, 7.15 to 9.30 p.m.

Syllabus.—The general arrangement of modern gas-works; properties of various kinds of coal and their value for gas-making purposes; simple physical and chemical principles involved in the ordinary processes of gas manufacture and the formation of bye-products.

Construction and setting of retorts and furnaces; methods of charging and discharging.

Effects of temperature on quantity and quality of gas; principles and methods of gas condensation; the exhauster, its construction and use; methods of removing impurities after condensation; instruments for recording pressure and exhaust; methods and apparatus for testing water gas, producer gas, and waste gas.

CLASSES FOR GAS-FITTER APPRENTICES.

Mr. Stead, Mr. Jacques, Mr. Murison, and Mr. Winch.

These classes are held by arrangement with the Gaslight and Coke Company, who select a number of lads each six months to be trained as gas fitters. A workshop has been equipped at Horseferry Road for the training of the lads in workshop practice, and they attend the Institute for instruction in technical drawing, calculations and elementary science, composition and précis writing on three afternoons a week in the first year of training, and on one whole day a week in the second year. During the third and fourth years of training, attendance will be given on two evenings a week at "Gas Supply" and "English" classes.

LONDON AND SOUTHERN DISTRICT JUNIOR GAS ASSOCIATION.

President: Mr. J. G. Clark.

Arrangements have been made for the meetings of the Association to be held in this Institute on the fourth Friday of the months, October, 1911, to May, 1912, inclusive.

Papers of educational interest to gas engineers are read and discussed; visits to works being also arranged.

Particulars as to qualifications for membership, &c., can be obtained from the Hon. Secretary, Mr. E. Scears.

Heating and Ventilation.

Mr. A. H. Barker.

COURSE I.—Monday, 7.15 to 9.30 p.m.

Syllabus.—Use of slide rule or calculator; curves and their uses;

heat, work, and energy; thermometric scales and their conversion; unit of heat; specific heat; air, its weight and expansion; properties of water and steam; conduction of heat; fuels, their properties, composition, and consumption; principles of combustion; boilers and chimneys; loss of heat from buildings; practical calculations; emission of heat from radiators and pipes, and quantities of water and steam necessary; non-conducting compositions; principles of hot water and steam circulation in pipes; pipe sizes in practice; heating by high pressure hot water, hot air, and electricity; ventilation; vitiation of air tests; humidity of air; quantity of air required.

COURSE II.—Friday, 7.15 to 9.30 p.m.

Syllabus.—A more thorough treatment of the subjects of Course I., and more detailed explanations of the carrying out of the principles in practice; elementary theory of the flow of fluids, air, and steam; theory of chimneys and their capacity; theory of boilers; principles of the fan; theory of pipe sizes; theory and practice of ventilation by all modern methods; air currents and analysis; Plenum systems; sizes and capacities of fans and ducts; long distance heating.

Experiments and tests will be arranged for illustrating all the principles.

OSWALDTWISTLE GAS DEPARTMENT.

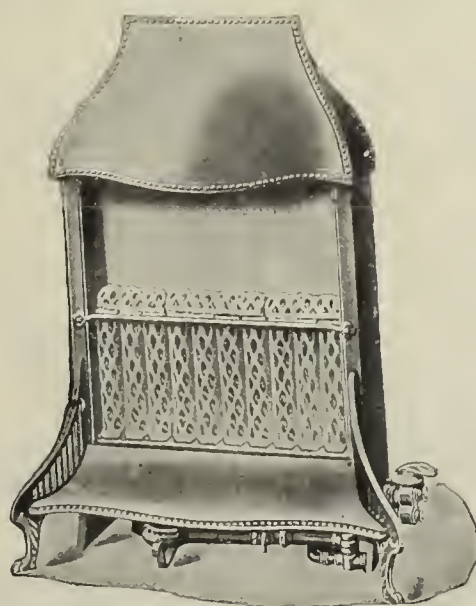
The Gas Committee of the Oswaldtwistle Urban District Council have received a very satisfactory statement from the Chairman (Mr. James Pilkington, J.P.) on the working of the Gas Department for the year ending March 31; the gross profit being £4807, and the net profit (after payment of interest on loans and sinking fund) £2873. This was the first full year in which the whole of the alterations made by the Engineer and Manager (Mr. J. H. Davies) had been operative; and considering that the net profit in 1907, when Mr. Davies was appointed, was £440, it will be admitted that the results now presented show the value of the changes made. When Mr. Davies took over the control, it is stated, Oswaldtwistle was threatened with a gas famine; but by dint of energetic effort and enterprise, he managed to steer through the winter. Since then the works have been practically reconstructed under his direction.

The gas produced was 67,058,000 cubic feet, and the coal carbonized 5698 tons; being a make of 11,759 cubic feet per ton of coal, as against 9721 feet in 1907-8. The gas accounted for amounted to 11,010 cubic feet per ton of coal; the leakage having been reduced in three years from 10.57 to 6.4 per cent. The net selling price of gas in Oswaldtwistle is 2s. 6d. per 1000 cubic feet, and 2s. for power users; and the net profit reaches the high figure of 11d. per 1000 cubic feet. The returns from residuals were 9s. 6d. per ton of coal carbonized.

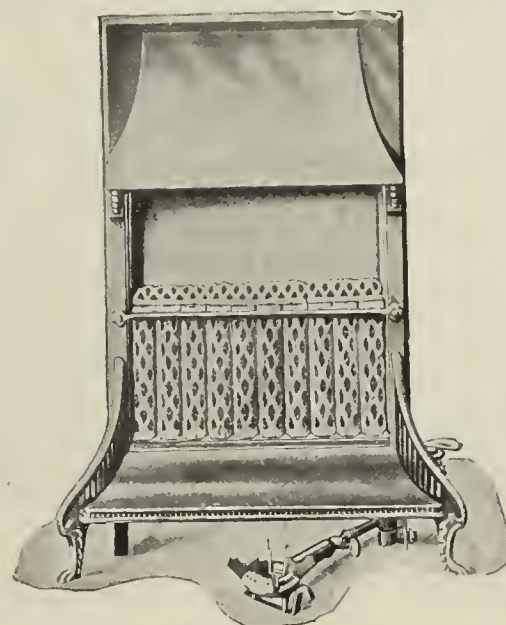
In consequence of the improved results obtained, the Council have decided to increase the Engineer's salary by £75 per annum; this being the second increase in two years that Mr. Davies has received.



THE "RENAISSANCE."



THE "FLAMBEAU."



THE "LOUIS."

Our New Season's Lists are now in your hands, further supplies are at your disposal, and our Representatives are fully equipped with our Winter's Programme which has never been excelled.

SOUTHPORT GAS UNDERTAKING.

At a Meeting of the Southport Town Council last Tuesday, Mr. Trounson, moving the adoption of the minutes of the Gas Committee, referred to the annual report of the Gas Engineer (Mr. J. Bond). He said that one of the main features of the report (a summary of which appeared in last week's "JOURNAL") was that they had been able to contribute a sum of £13,000 out of the profits in aid of rates. The Committee were highly pleased with the result of the year's working, and he hoped the Council would be.

Attention was drawn by Alderman Shuttleworth to an increase in the unaccounted-for gas compared with the previous twelve months; the figures being 20,925,000 and 13,616,100 cubic feet respectively. He suggested that a good deal of the leakage was from the mains in Lord Street. The Parks and Improvement Committee lost from six to eight trees annually in this thoroughfare; and he attributed this to the escape of gas from the mains. The Gas Committee were about to lay mains in connection with the high-pressure gas-lighting scheme, and he thought it would be well to overhaul the existing mains while the streets were up.

Alderman Griffiths pointed out that the leakage was under 4 per cent., which was not a great amount.

It was the opinion of Mr. Ellison that, as the profits had been increased from £8000 a year to £13,000, the Gas Committee should take into consideration the question of reducing the price of gas. He thought if they brought the charge down to 2s. 4d. or 2s. 6d. per 1000 cubic feet, it would be a benefit to the ratepayers, and at the same time more gas would be used for domestic and other purposes, to the advantage of the Gas Department.

In his reply, Mr. Trounson said that the increased loss of gas did look, on the face of it, a big item, but the contributory causes had been many. One was the extra laying of mains. They had laid during the twelve months between two and three miles of mains more than in the preceding year. Another troublesome matter was that of stoppages, involving the opening-up of pipes. This had also resulted in a great loss of gas; but the difficulty had now been overcome. He was not sorry this question of the increase in the leakage of gas had been brought forward, because it gave him an opportunity of presenting a statement as to their losses of gas compared with other towns. In the previous year, the loss was 2.05 per cent.; and there were only four towns in Great Britain lower than this. In his opinion, this was a credit to the management of the Southport gas undertaking. The discussion that night was in regard to a matter of 3.83 per cent.; and there were few towns in the country which could show as low a leakage. The increase on the previous year was due to causes not likely to occur again; and he did not think the matter needed further explanation. As to the suggestion about the cheapening of the gas, for the present the Committee did not contemplate any change; but he did not think the time was far distant when the position of affairs in

connection with the department would allow of a reduction. One of the reasons why they did not want to reduce the price was that their borrowing powers were nearly exhausted. This year they were paying £4000 towards reconstruction out of revenue; last year they only paid £1000; so they were gradually reducing their capital charges. The minutes were confirmed.

IRONMONGERS AND MUNICIPAL TRADING.

At Birmingham.

A lengthy discussion took place at a meeting of the Birmingham Association of Master Gas-Fitters on the 4th inst. respecting a proposal of the Gas Department to supply and fix gas-stoves in private houses free of charge, subject to a quarterly rental of 1s. per stove. Some members favoured a protest against this further encroachment on the private traders' preserves; while others, believing that the department would eventually hand over the business to private traders, as was done in the case of gas-cookers, counselled a policy of patience. It was urged by some speakers that the business given out by the department was not fairly divided among the trade; and they said if the gas-stove work was to be distributed in the same unfair manner, they would have nothing to do with it. Finally, a resolution was adopted postponing further discussion of the matter.

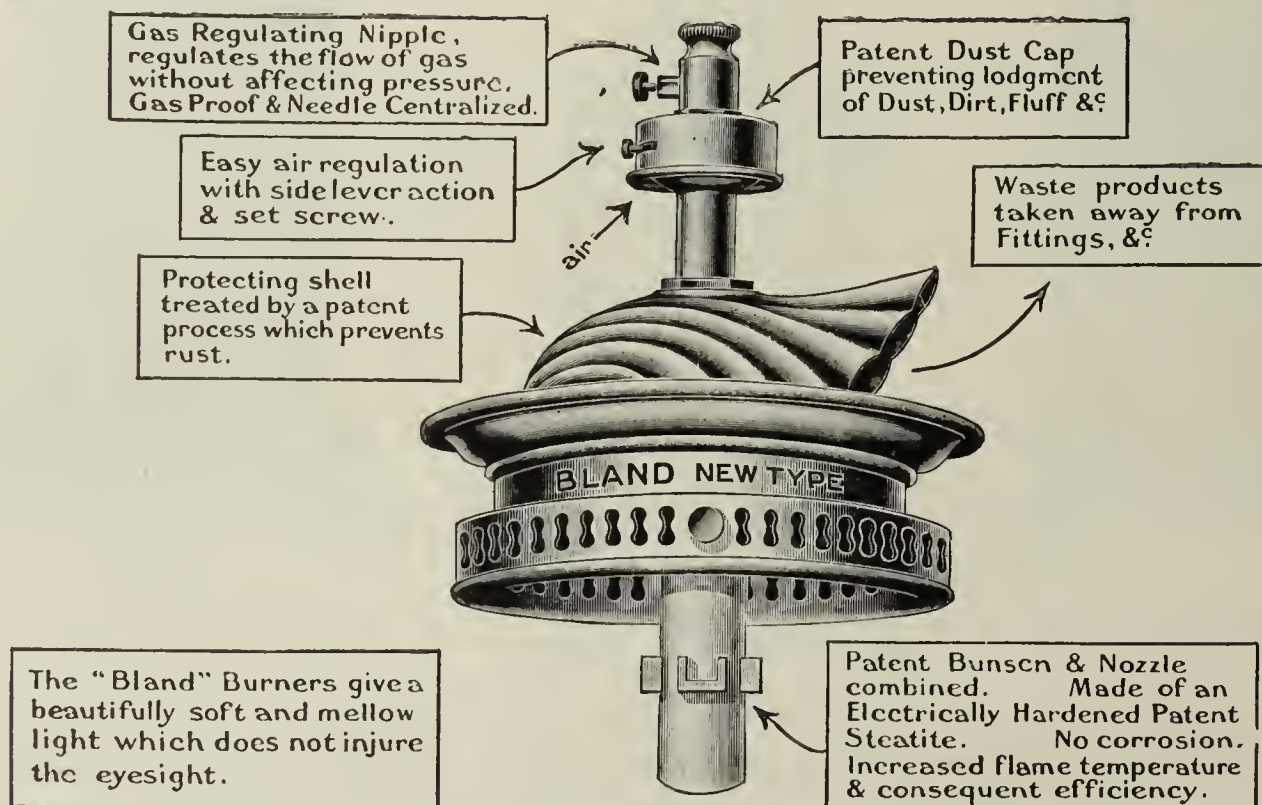
At a meeting of the Birmingham Ironmongers' Association on the following day, a resolution was passed deprecating the free fixing of gas-stoves in private houses, and expressing the hope that the practice would be discontinued. It was agreed to send copies to the Secretary and the Chairman of the Birmingham Gas Committee. Mr. J. H. Meakin (the President), in moving the resolution, said it was absurd that tradesmen should be obliged to pay 2s. 4d. per 1000 cubic feet for their gas so that the Committee might "give gas-stoves away."

The resolution was adopted after the reading of a letter sent to the meeting by Mr. Harry Smith, who was unable to be present. In the course of this communication, the writer said:—

Nearly every gas-fitter and ironmonger sells gas-fires—some more, some less; but whoever sells a stove generally gets the job of fixing it. Under the scheme now being introduced, he will be done out of his job; and a grievous wrong will be inflicted upon all tradesmen dealing in gas-fires, without benefiting anybody. It is morally certain the poorer class of citizen, whom such an arrangement might conceivably benefit, will not reap any advantage, because they are the last people to require gas-stoves for heating purposes. The ironmonger will not only lose the sale of the stove and the opportunity of fixing it, but he will lose the chance of selling the customer other things besides.

A strong reason why any further extension of municipal trading should be opposed is that it brings manufacturers too completely

This is the Burner for the Coming Season.



BRITISH MADE THROUGHOUT.

THE BLAND LIGHT SYNDICATE, LTD., 63, QUEEN VICTORIA STREET, LONDON, E.C.
20, FENNEL STREET, MANCHESTER.

Telephone: 5720 (2 lines) London Wall.

Telegraphic Address: "BLANLITE LONDON."

under the control of the municipalities, and renders them liable to a species of intimidation and blackmail. At a meeting, recently of shareholders in a company manufacturing gas appliances, the chairman asked the shareholders to confirm the purchase of certain shares from an official employed in a certain gas department at a figure considerably higher than the market value. The chairman explained that the company had been obliged to purchase the shares because the official referred to had threatened them, in the event of their refusal to do so, with a loss of business. Transactions of this sort showed that there were serious dangers for manufacturers as well as retailers in the municipal trading system.

If the scheme recently adopted by the Birmingham Corporation is carried out and adopted by other towns, manufacturers and retailers throughout the country will eventually suffer; and it behoves them in this matter to stand shoulder to shoulder and resist the infliction to the uttermost.

At Manchester.

The decision of the Manchester Gas Committee to supply and fix on simple hire, or on the three years' purchase system, gas-fires and "other gas-consuming devices"—a scheme approved by the City Council at the last meeting—has caused considerable perturbation among the ironmongers in the city and suburbs. What troubles these traders most is the possibility that the supply of "other gas-consuming devices" by the Corporation Gas Department may mean in the end an extension of municipal trading that will seriously affect their trade.

At a meeting of the Manchester, Salford, and District Ironmongers' Association, held at the Grosvenor Hotel, Manchester, last Tuesday evening, the matter was brought forward for discussion; being introduced by Alderman Wilson, who, in the course of his speech, declared that the carrying out of the Gas Committee's scheme would mean that the private trader would be seriously handicapped in his business.

After the subject had been discussed at some length, a resolution was passed protesting against the adoption of the proposal, and pointing out that, in the opinion of the members of the Association, a great injustice would be done to ironmongers, who would have their legitimate trade filched from them by the Corporation. It was stated that many ironmongers stocked gas-consuming appliances, and therefore it would be unfair for the Corporation to enter into competition with such traders, who were also ratepayers in the city. By a further resolution, it was decided that a letter embodying these views be sent to Alderman Gibson, the Chairman of the Gas Committee, and a copy of the resolution of protest forwarded to the Master Plumbers' Association, so that joint action may be taken in regard to the matter.

There is to hand from Messrs. Falk, Stadelmann, and Co., Limited, of Farringdon Road, E.C., a copy of their new "Veritas" incandescent light catalogue, which contains illustrated particulars of a large number of mantles, burners, globes, chimneys, and sundries.

NOTES FROM SCOTLAND.

From Our Own Correspondent.

Saturday.

It was a very pretty gathering which was held of the Western District of the Scottish Junior Gas Association in the Scottish Exhibition this afternoon. This was the first occasion on which I had seen ladies at any assemblage of Juniors. Of course, the business of the day suited them; and it was this knowledge which, I have no doubt, led to their being invited. There was more to be seen in the gas lighting section of the Exhibition than might have been anticipated. Of course, it is all high-pressure lighting, except the ornamental illumination; and as high-pressure lighting is a thing not to be seen everywhere, the attendance of visitors was very large. It was a happy thought which led to the opening up of a compressor, so that the members might have a better understanding of the internal arrangements of the apparatus. The description of it given by Mr. R. Milne was equal to an illustrated lecture on a scientific subject. The members got more information in the course of fifteen minutes at Messrs. Milne and Sons' stand than they would have obtained in a whole day's reading.

We are again to have a question relating to the valuation of the Edinburgh and Leith gas undertaking carried through the Valuation Courts. It was generally thought that the decision given two years ago was final and decisive; but it now appears that this was not so. The present process was first heard of in the Valuation Court for Leith, which was held on Tuesday. The Gas Commissioners sought that the valuation of their undertaking, so far as situated in Leith, should be reduced from £3303 to £3051. Mr. Duncan Millar, who represented the Gas Commissioners, said the sum involved was only £252, the rates upon which amounted to £25 5s. 10d.; but there was a much more important question affecting the valuation of the undertaking in Edinburgh, which had yet to be discussed in the Valuation Court there. The point raised was whether in applying the principles which were laid down by the Judges in the Commissioners' case two years ago, for the valuation of undertakings which were non-profit earning, the whole expenditure was to be deducted, without distinction as to what were landlords' and what were tenants' expenditure. The Commissioners maintained that all expenditure was to be deducted. The Burgh Assessor—Mr. G. Simpson—stated the method of arriving at the valuation adopted by the Assessor for the City of Edinburgh, and acquiesced in by himself and the Assessor for the County of Midlothian, to be based upon interpretations of the different decisions which had been given. From the gross revenue there was deducted the expenditure, including sums paid in respect of feu duties and landlord's taxes. An allowance of 5 per cent. was made on half of the balance, as representing working capital, and a like allowance on the value of movables, &c., as representing tenants' capital. The balance was fixed as the assessable rental. The decision in the Leith case is to be given next week. The Edinburgh case has not yet been heard, nor has that

<div>GAS</div>	<div>NOVEMBER 11th</div> <div>to</div> <div>NOVEMBER 24th</div> <div>inclusive.</div> <div>INTERNATIONAL</div>	<div>GAS</div>
<div>FROM</div> <div>START</div> <div>TO</div> <div>FINISH.</div>		<div>MANUFACTURE.</div> <div>DISTRIBUTION.</div> <div>LIGHT.</div> <div>BYE-PRODUCTS.</div>

GAS EXHIBITION

The Exhibits will cover every phase of the Gas Industry, and will be of equal interest to the Student and to the Gas Engineer.

ROYAL AGRICULTURAL HALL, LONDON.

Full Particulars as to Spaces remaining Vacant may be obtained from:

THOMAS CORDINGLEY,

11, QUEEN VICTORIA STREET, LONDON, E.C.

of Midlothian. The claim in Edinburgh will be for a reduction of the valuation by £8282, and in Midlothian by £192.

The Dunfermline Town Council on Monday resolved, in view of the litigation which is proceeding as to patent rights in vertical retort-settings, to delay consideration of a proposal to introduce vertical retorts into their gas-works. The same course was adopted with reference to the negotiations regarding the introduction of gas from Dunfermline into the town of Culross. In entering upon this matter, the Town Council had in view the supplying of gas to places *en route*. One of these places was Valleyfield, a rapidly growing village belonging to the Fife Coal Company, Limited. Negotiations were so far advanced that the Corporation of Dunfermline gave an order for the supply of pipes, and some of these have already been delivered. The difficulty which has arisen is that the Fife Coal Company are proposing to erect a small works to supply gas to their own tenants in the Valleyfield district. This proposal would detract from the profit-earning capacity of the Culross scheme, and, accordingly, the Convener of the Gas Committee sought a continuation of the remit to them of the subject. He explained that the Manager of the Fife Coal Company had declined the terms they offered. The Gas Committee, in view of the situation which had arisen, asked that the remit be continued in their hands. The suggestion of the Committee was adopted.

The Arbroath Town Council on Monday considered the report of a Sub-Committee which was appointed in June last to inquire regarding a proposal by the Manager—Mr. A. C. Young—that the illuminating power of the gas might be reduced. The Sub-Committee reported that they had received information from 14 towns in which the illuminating power had been reduced—in seven of them to 14 candles, in four to 15 candles, and in the other three to 16, 18, and 20 candles respectively. Mr. Young had pointed out to them that, as there was likely to be an increased demand for benzol, he was strongly of opinion that it was advisable to be independent of the use of it. This would save gas consumers in Arbroath about £500 a year. Mr. G. R. Wallace, the Convener of the Gas Committee, moved that a Provisional Order be applied for, to authorize the reduction of the illuminating power from 20 to 14 candles; and also conferring additional borrowing powers upon the Corporation to the amount of £15,000. Provost Alexander seconded. The proposal was opposed in the Council, on the grounds that a Provisional Order, even if unopposed, would cost £500, and that the lessening of the illuminating power would not be satisfactory in Arbroath, any more than it had been in other towns where it had been tried. The motion was carried by sixteen votes to two.

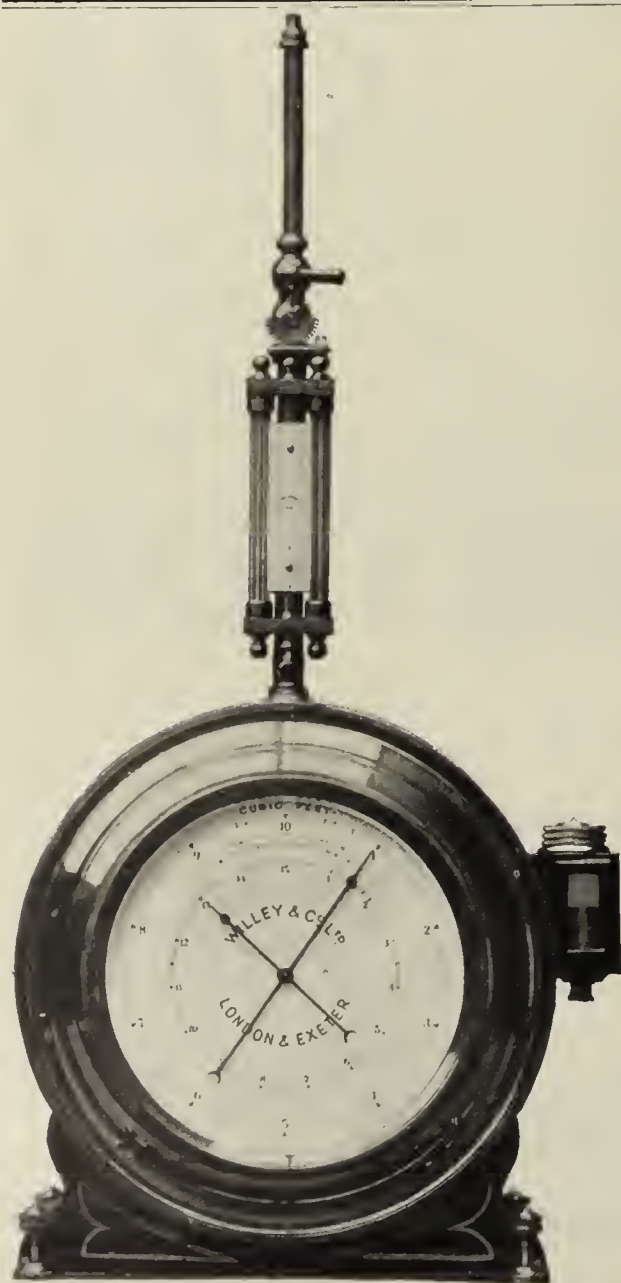
It took the Perth Town Council more than two hours on Monday to make up their minds as to whether or not they would provide stoking machinery for the gas-works. A similar proposal was rejected by the Council a year ago. Since then a change had been made in the convenership of the Gas Committee, and the new Convener—Mr. J. Clark—again brought the subject forward. The proposal of the Gas Committee was to procure a De Brouwer charging and discharging machine, to be driven by electricity. The cost of the new plant was estimated at £3900. Mr. Clark, in support of the recommendation of the Gas

Committee, said it was estimated that the gross annual saving would be £1062, of which £614 would be on account of the increased yield of gas per ton of coal, and £448 would be the saving in labour. They would also have a better yield from residuals. It would not be necessary to add to the debt of the department, as they had an emergency fund which was quite capable of dealing with the matter; and he thought that the resources of the Gas Department were such that they would be able to again build up this fund. He hoped that in the near future they would be able to reduce the price of gas to 2s. 6d. per 1000 cubic feet. The resources of the Gas Department were improving, the price of gas was cheapening, and the capital burden on the department was being gradually lightened. The party opposed to the introduction of machinery expounded at length; but the views of only one need be noticed—those of ex-Lord Provost Cuthbert, himself in his day a respected Convener of the Gas Committee. Mr. Cuthbert could not bring himself to support the introduction of stoking machinery. He was a member of the old Gas Committee. In those days it was purely hand labour, which was far more satisfactory than the mechanical labour of the present day. He was very anxious that they should have a report before they considered definitely the question of the introduction of the De Brouwer machine, or the possibilities of the vertical retort. Vertical retorts, he went on to say, could be seen in operation in Glasgow, and everything pointed in the direction of the vertical retort being the retort of the future. The Council, by 17 votes to 7, agreed to the recommendation of the Gas Committee.

The annexed advertisement has been published in several local newspapers this week: "Edinburgh School Board—Wanted, a Lecturer on Gas Lighting and Appliances, for the course to be provided in Leith Walk Continuation Classes for Gas-Fitters and those engaged in Gas Engineering and Supply. Salary at the rate of 3s. 4d. per hour." There seems to be difficulty in obtaining a lecturer upon this subject. Doubtless a better man is wanted than a three and fourpenny one. Any teaching such a man could give would be of little value; and unless the School Board are prepared to employ teachers with better standing than this advertisement seems to indicate they have in their mind's eye, had they not better leave the subject alone?

The Assessor for Kirkintilloch this year fixed the valuation of the Corporation gas undertaking at £2958—an increase of £958. Negotiation took place between the Corporation and the Assessor, as the result of which the increase was reduced to £400; making the valuation £2400—the Assessor stipulating that the valuation in future was to be on the basis he had adopted this year.

Bailie Wright, the Convener of the Gas Committee of the Kirkcaldy Town Council, reported to the Council on Monday the terms which had been agreed upon between the Committee and the General Manager of the North British Railway Company, for the supply of gas from Kirkcaldy to the railway station and yard at Thornton Junction. The Railway Company are to be supplied with gas on the same terms as consumers in Kirkcaldy, except that they are to receive less discount than is allowed to large consumers in Kirkcaldy, to the amount of 2½ per cent. The agreement is to be for ten years.



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CURRENT SALES OF GAS PRODUCTS.

[For Table of "Tar Products Prices," see p. 761.]

LIVERPOOL, Sept. 16.

Sulphate of Ammonia.

During the past week the market has been rather erratic, but on the whole the tendency has been towards an improvement in values. For the first day or two the tone continued dull, but later there was improved demand, and all available supplies found ready buyers at full prices, although the purchasing has principally been done by dealers who had previous sales to cover. The closing quotations are £13 18s. 9d. per ton f.o.b. Hull, £14 per ton f.o.b. Liverpool, and £14 2s. 6d. per ton f.o.b. Leith. There is nothing new to report with regard to future delivery; manufacturers maintaining their price at £14 5s. per ton f.o.b. at the best ports, while consumers steadily refuse to pay this figure.

Nitrate of Soda.

This article has become somewhat firmer on spot, and the quotations have been advanced to 10s. per cwt. for ordinary quality, and 10s. 3d. for refined.

LONDON, Sept. 18.

Tar Products.

The markets for tar products remain very firm. In pitch, there has been a fair amount of inquiry during the past week; but there is no change in prices. Creosote is in good demand, and prices are firm. Benzols are steady, with a fair amount of inquiry. Naphthas are steady; but business is quiet. Crude carbolic remains in about the same position; and consumers are willing to make contracts for next year's delivery at slightly under the prices mentioned to-day.

The average values during the week were: Tar, 21s. to 25s. *ex works*. Pitch, London, 40s. 6d. to 41s. 6d.; east coast, 40s. to 41s.; west coast, Manchester, 39s. 6d. to 40s. 6d.; Liverpool, 40s. to 41s.; Clyde, 40s. to 41s. Benzol, 90 per cent., naked, London, 8½d. to 8¾d. f.o.b.; North, 8d. to 8½d. f.o.b.; 50-90 per cent., naked, London and the North, 7¾d. to 8d. f.o.b. Toluol, naked, London, 8½d.; North, 7¾d. to 8d. Crude naphtha, in bulk, London, 4d. to 4½d.; North, 3½d. to 3¾d.; solvent naphtha, naked, London, 9½d. to 9¾d. f.o.b.; North, 8d. to 8½d. f.o.b.; heavy naphtha, naked, London, 10½d. to 10¾d. f.o.b.; North, 9d. to 10d. f.o.b. Creosote, in bulk, London, 2½d. to 2¾d.; North, 2½d. to 2¾d. Heavy oils, in bulk, 2¾d. Carbolic acid, casks included, 60 per cent., east coast, 2s. to 2s. 3d.; west coast, 1s. 11d. to 2s. 2d. Naphthalene, £4 10s. to £9 10s.; salts, 42s. 6d. to 45s., bags included. Anthracene, "A" quality, 1½d. to 1¾d. per unit, packages included and delivered.

Sulphate of Ammonia.

There has been a little more inquiry during the past week, although orders are reported to have been taken at slightly lower figures. Beckton prompt is still quoted £13 15s.; but outside makes could possibly be purchased at £13 7s. 6d. to £13 8s. 9d. In Hull, £14 is quoted; Liverpool, £14 to £14 2s. 6d.; Leith, £14 5s.; Middlesbrough, £14.

COAL TRADE REPORTS.

Northern Coal Trade.

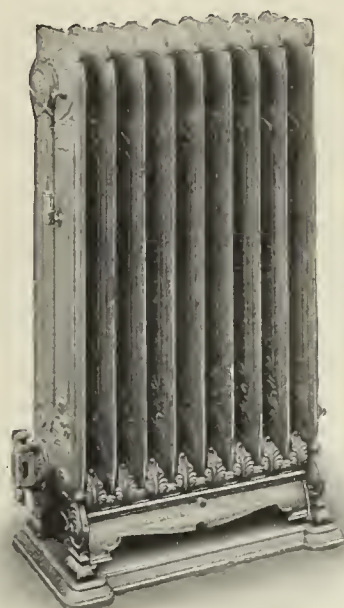
There is a very fair demand for coal from the north-eastern collieries; and though the lack of adequate steamers limits shipments, the trade is fairly good in volume and price. Best Northumbrian steam coals are 11s. per ton f.o.b., second-class steams are 9s. 6d. to 9s. 9d., and steam smalls from 4s. 9d. to 6s. The output is fair, and is well taken up. In the gas coal trade, prices do not show very great change. Best Durham gas coals are from 10s. 7½d. to 10s. 9d. per ton; second-bests are from 9s. 9d.; and for "Wear specials," about 11s. 6d. is the current quotation. As to contracts, there have been some sales of cargoes to the Mediterranean ports, at prices similar to those that have been quoted. The limited supply of steamers for the trade, which usually begins to be enlarged steadily at this season, is just at present keeping back the foreign trade, and allowing some home users to replenish their stocks. Coke is steady. Gas coke now begins to show a larger production, and is quoted from 14s. 3d. to 14s. 6d. per ton f.o.b. in the Tyne or the Wear.

Scotch Coal Trade.

Trade continues to be fairly active; the demand for export being still well maintained. Prices have kept firm. There is a good demand for small sorts. Prices are now quoted at: Ell, 9s. 9d. to 10s. 6d. per ton f.o.b. Glasgow; splint, 10s. to 10s. 3d.; steam, 9s. 3d. to 9s. 6d. The shipments for the week amounted to 390,443 tons—an increase on the previous week of 62,472 tons, and on the corresponding week of 6056 tons. For the year to date, the total shipments have been 11,221,806 tons—an increase on the corresponding period of 148,514 tons.

Price of Gas at Newport (Mon.).—A reply to the application for a reduction in the price of gas has been sent to the Newport (Mon.) Gas Consumers' League by Mr. T. H. Hazell, the Secretary to the Gas Company. In this, Mr. Hazell points out that the Company made a reduction of 2d. per 1000 cubic feet before being approached by the League; and he says that if the alterations in the process of gas making now being carried out prove effective, the Company propose to give the public the benefit.

Bognor Gas Company.—The Bognor Gas Company's dividend for the past half year is 5½ per cent., which is the full statutory payment. The revenue enabled the Directors to carry £2079 to the profit and loss account, though the capital had been increased by £4000. The new works were stated to be progressing satisfactorily, the extension mains were ready for supplying, and hope was expressed that the price of gas would shortly be reduced. Authority has been given for the raising of an additional £10,000 of capital.



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Flint Gas and Water Purchase Question.—The Flint Borough Council have decided to constitute themselves a Committee for the purpose of considering the advisability of acquiring the local gas and water undertakings. The Mayor (Major Dyson), who is Chairman of the Gas and Water Company, promised to render the Council all the assistance possible.

Concession in Price at Ventnor.—The Ventnor Gas and Water Company announce that they will allow a discount of 5 per cent. off all gas accounts of £1 and upwards as from the Michaelmas quarter, if paid within one month from the delivery of the account. This is equal to about 3d. per 1000 cubic feet, and applies to slot as well as to ordinary consumers.

Heywood Corporation and the Gas Publicity Scheme.—At last Wednesday's meeting of the Heywood Town Council, the minutes of the Gas Committee were confirmed without discussion. These included a resolution to the effect that the Heywood Corporation contribute to the Publicity Scheme of the Institution of Gas Engineers a yearly amount representing 2s. 6d. per million cubic feet of gas manufactured by the Corporation.

Cheaper Gas at Rochdale.—By a unanimous vote, the members of the Rochdale Gas and Electricity Committee have decided to recommend the Town Council to reduce the price of gas to ordinary consumers by 2d. per 1000 cubic feet, and to give users by automatic meter 27 cubic feet instead of 25 cubic feet for a penny. The charge to ordinary consumers will then be 2s. 6d., in place of 2s. 8d.; and this concession, with that to the slot-meter users, will mean a reduction of £3200 a year in the profit of the department. No alteration is suggested in the charges for gas used for power or heating purposes.

Municipal Undertakings at Salford.—Messrs. Robert Heatley and Co., professional Auditors to the Salford Corporation, in their annual report to the Council, point out that the depreciation and renewal funds have been depleted by the increased expenditure which, with the exception of the gas and water funds, is in excess of the contribution for the year. They add: "In view of the large capital outlay, we respectfully commend to the Committees the desirability of increasing the balances of these funds." The contribution from the Gas Department in aid of rates was £15,750, compared with £15,034 in 1910; and from the Water Committee the amount was £2072, compared with £953.

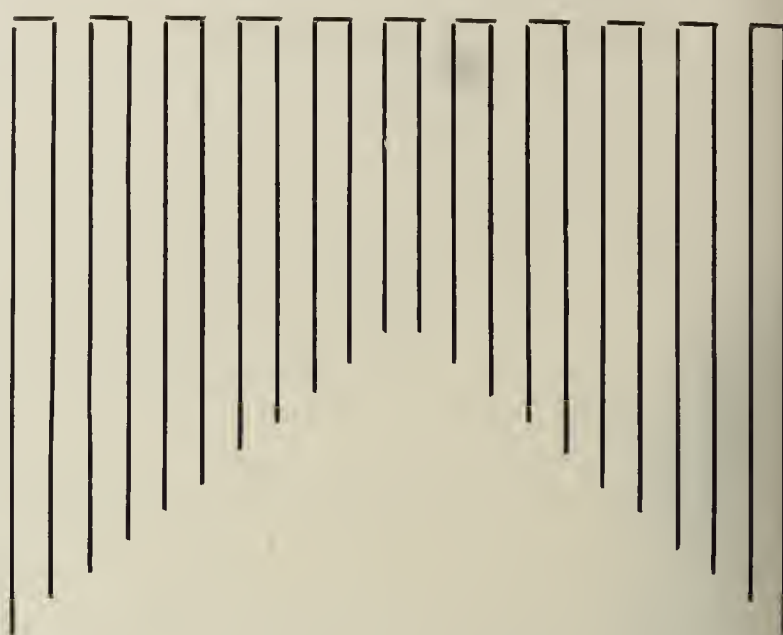
Stove-Rents at Burton.—At the monthly meeting of the Burton-on-Trent Town Council, Alderman Lowe moved a resolution to the effect that, commencing with the current quarter, no stove-rent be charged to consumers who have had the same stove on hire from the Corporation for five years or more, and that stove-rents be charged for the two summer quarters only to persons who have had stoves less than five years. After some discussion, Alderman Lowe said the Gas Committee were prepared to accept the substitution of "a" for "the same" stove, with the addition of the words "subject to a satisfactory report by the Gas Manager as to the user thereof." In this form the resolution was carried.

Strange Gas Poisoning Fatality.—A curious gas fatality was investigated some days ago by a Coroner's Jury at Derby. Florence Bray (20) was found one morning by her father in an unconscious condition near a small kitchen gas-stove, the tap of which was turned on and the india-rubber connecting tube partly broken. The girl was in her nightdress; and on recovering consciousness, she told the doctor she must have walked in her sleep. Later she became worse, and ultimately died from syncope following poisoning by coal gas. The Jury returned a verdict in accordance with the medical evidence, and added that there was no evidence to show how the deceased got into the kitchen or how the gas had been turned on. It appeared to be a mystery.

High-Pressure Lighting at Southport.—The Gas Committee of the Southport Corporation have almost completed details for the introduction of high-pressure gas lighting in the principal streets of the town; and it is expected that many of the larger business houses will take advantage of this opportunity of improving the illumination of their premises, externally and internally. Special mains are to be laid from the gas-works in Eastbank Street. The intention is to improve the illumination of streets other than where arc lamps are now used; and this will provide an excellent example of what can be done. A scale is being arranged by which shops, both inside and outside, can be lit at a fixed sum per annum; the cost being such as should induce people to discard even their present fittings.

Falmouth Gas Company.—It was reported at the annual meeting of this Company that the sale of gas had increased during the past twelve months by 2½ million cubic feet. Major Mead, the Chairman, said that with one exception the year was the best in the history of the Company since its formation in 1865. Of the increased consumption, one million cubic feet was due to ordinary consumers. As they had a strong competitor in the electric light, it was gratifying to know that the ordinary consumption was progressing in this way. The other part of the increased consumption was due to slot consumers and cookers. An interim dividend of 5 per cent. had been paid for the half year ending Dec. 31, and it was decided to pay a further dividend of 6½ per cent. for the six months ending June 30.

The Municipal Coal Supply Proposal.—When the minutes of the Gas Committee came before the Bradford City Council last week, Mr. Leach moved an amendment to one agreeing to the acceptance of tenders for the supply of house coal required by various departments of the Corporation for the ensuing twelve months. He proposed to amend this minute by adding the words "and the public" after the word Corporation. All progress which had been made in the interests of the citizens for a long time past, he said, had been in the direction of the enlargement of Corporation activities. The case for the extension of this principle had already been made out. Since he formerly advocated a system of municipal coal supply, the Bradford Co-operative Society had adopted it, with splendid results. He maintained that, in the interests of the poorer citizens, the change he suggested ought to be adopted by the Council. Mr. Geldard, in reply, argued that it was not the duty of the Gas Committee to buy coal for the people of Bradford. The amendment was defeated.



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The Directors of the Gas and Commercial Securities Corporation, Limited, have resolved to recommend a final dividend at the rate of 6 per cent. per annum, free of income-tax—making 5½ per cent. for the year to Aug. 31.

The Liverpool United Gaslight Company have made complete arrangements for the hiring-out of Richmond's "A. B. C." series of gas-fires at low rentals, to be fixed free and periodically inspected without charge to the consumer. A contract has been made with the Richmond Gas Stove and Meter Company, Limited, for the sole supply of their gas-fires for a number of years.

Under the title of "Frugals," there is being introduced on the market by Messrs. Leftwich and Co., of Camden Town, N.W., a device for assisting in economizing gas for lighting purposes. The arrangement is the subject of a patent, an illustrated abstract of the specification of which appeared in the "JOURNAL" for July 14, 1908, p. 117. The invention is also applied to gas cooking-stoves, under the name of "Gasavo."

The new water-works of the Shanklin (Isle of Wight) Council at Chillerton were opened last Wednesday morning by Colonel H. Gore-Browne, V.C., on behalf of Colonel Seely, the owner of the land. The supply is very abundant, though the source is eight miles from Shanklin. During the past few weeks, the yield has been over 24,000 gallons per hour; and there is a reservoir for storing 150,000 gallons. The mains run through several villages, which will benefit by the new scheme.

The Newport (Isle of Wight) Corporation have consented to allow the Ryde Corporation to tap their water-main at Wootton, from which water to the extent of 150,000 to 200,000 gallons per day may be taken at 1s. per 1000 gallons, in addition to which there is an unsettled claim for 6d. per 1000 gallons by the Rural District Council for allowing the water to pass through their mains, and 2d. per 1000 gallons by Sir Charles Seely as royalty. The probable supply required by Ryde will be 100,000 gallons per day; but the arrangement may be terminated at short notice if necessary.

Mr. T. H. J. Hawkins, the Electrical Engineer at Salford, has prepared a report on this undertaking of the Corporation, which includes recommendations for the spending of £85,350 in new plant. The scheme, which involves the scrapping of the greater part of the existing plant, has created some alarm in the minds of certain members of the Council. On behalf of the Engineer, it is now explained that he had no idea of recommending that the scheme should be carried out at one time, but gradually.

A successful exhibition of gas cooking and heating appliances has been held in the Town Hall at Burton-on-Trent. In addition to the cookers, fires, &c., which were shown by Messrs. John Wright and Co., there were other features which proved highly attractive to the large audiences that assembled. Mr. Frederick Dye lectured on water heating; and Mr. Keeley (who is also connected with Messrs. John Wright and Co.) dealt with the modern gas heating-stove. Then Miss E. M. Smith gave demonstrations of paper-bag cookery. Mr. R. S. Ramsden, the Assistant-Manager of the Gas-Works, in introducing Miss Smith, said the object of the demonstrations was to show by actual experiment the comfort and ease with which either simple or elaborate meals could be cooked by gas. Subsequently it was stated that only ¾d. worth of gas had been used in 1½ hours' cooking.

At the monthly meeting of the Sowerby Bridge Urban District Council, the Clerk read a communication which he had received from the Local Government Board enclosing formal sanction to the borrowing of the following sums for the purpose of the gas undertaking: £3650 for coal-hoppers, elevators, &c.; £3370 for retort-benches, arches, gas-engine, and other fittings; £2060 for retorts; £200 for alterations to station meter-house, &c.; and £3536 for other works. This makes a total of £12,816. It was further stated that no payments should be made out of the loans to workmen in the Council's permanent employ, or to any salaried officer of the Council, except in the case of payments yearly due for legal work in connection with the object of the loans and not within the scope of the Clerk's ordinary duties as Clerk to the Council.

TAR PRODUCTS PRICES.

Representative manufacturers give the following as fair current values for the week ending Sept. 16. Prices are net, and they include the usual packages and delivery f.o.b., f.a.s., or f.o.r., as customary.

Article,	Basis.	London,	North-East Coast,	East Coast, Yorks.	West Coast,		Glasgow.
					Liverpool.	Manchester.	
Tar, crude	per ton	—	20/- 25/6	21/- 25/-	21/- 25/6	21/- 25/-	—
Pitch	"	42/6	40/-	40/-	40/3	39/6	39/6
Benzol, 90%	per gallon	1/-	-/10	-/9½	-/9½	-/9½	-/9½
Benzol, 50-90%	"	—	-/10	-/9	-/9	-/9	—
Toluol, 90%	"	—	-/10 -/10½	-/9	-/10	-/10	-/10
Crude naphtha, 30%	"	—	-/4½	-/3½	-/3½	-/3½	—
Light oil, 50%	"	—	-/3½	-/3½ -/3¾	-/3¾	-/3¾	—
Solvent naphtha, 90-160	"	—	-/10 -/10½	-/10	-/10	-/10	-/11
Heavy naphtha, 90-190	"	—	-/11	-/11	-/11½	-/11½	-/11
Creosote in bulk	"	-/2¾	-/2½	-/2½	-/2½	-/2½	-/1½
Heavy oils	"	—	-/2½ -/2½	-/2½	-/2½	-/2½	-/2¾
Carbolic acid, 60's.	"	2/4	2/2	2/3	2/- 2/1	2/1 2/2	2/3
Naphthalene, crude drained salts	per ton	—	43/9	42/6	47/6	47/6 50/-	—
" pressed	"	—	60/-	63/-	60/-	60/- 72/6	—
" whizzed.	"	—	—	—	70/- 72/6	65/- 75/-	62/6
Anthracene	per unit	-/2	-/1½	-/1½	-/1½	-/1½	—

WANTED, FOR SALE, CONTRACTS, &c., ADVERTISEMENTS IN THIS WEEK'S "JOURNAL."

Appointments Vacant.

STATION ENGINEER. South Metropolitan Gas Company. Applications by Sept. 30.
GAS ENGINEER (as Representative). No. 5441.
ENGINEERING DRAUGHTSMAN. Firth Blakeley, Sons, and Co., Dewsbury.
RENTAL AND GENERAL CLERK. No. 5444.

Appointments Wanted.

MANAGER (Portugal, Spain, or South America). No. 5443.

Plant, &c. (Second-Hand), for Sale.

EXHAUSTER, &c., AND TAR EXTRACTOR. J. Hawksley, Great Yarmouth.
PURIFIERS, &c. W. J. Jenkins and Co., Retford.

Meetings.

BRITISH GASLIGHT COMPANY. London Office. Sept. 27. Twelve o'clock.
GAS AND COMMERCIAL SECURITIES CORPORATION. Offices. Sept. 27. 10.30 o'clock.

Stocks and Shares.

DARTFORD GAS COMPANY. By auction. Oct. 3.
SOUTHEND WATER-WORKS COMPANY. By auction. Oct. 3.
WESTON-SUPER-MARE GASLIGHT COMPANY. By auction. Oct. 4.

TENDERS FOR

Coal and Cannel.
BATLEY CORPORATION. Tenders by Oct. 2.
Purifying Plant and House (Alterations), &c.
ISLE OF THANET GAS COMPANY. Tenders by Oct. 5.
Sulphuric Acid.
MARKET HARBOROUGH GAS-WORKS. Tenders by Sept. 25.
Tar.
MARKET HARBOROUGH GAS-WORKS. Tenders by Sept. 25.
Tar and Liquor.
BLACKPOOL GAS DEPARTMENT. Tenders by Sept. 25.
KNUTSFORD LIGHT AND WATER COMPANY. Tenders by Sept. 30.

NOTICES TO CORRESPONDENTS, ADVERTISERS, AND SUBSCRIBERS.

No notice can be taken of anonymous communications. Whatever is intended for insertion in the "JOURNAL" must be authenticated by the name and address of the writer; not necessarily for publication, but as a proof of good faith.

COPY FOR ADVERTISEMENTS for the "JOURNAL" should be received at the Office NOT LATER than TWELVE O'CLOCK NOON ON MONDAY, to ensure insertion in the following day's issue.

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THE South Metropolitan Gas Company will shortly have a VACANCY at their East Greenwich Works for a STATION ENGINEER under 35 years of age. He will be required to reside on the Company's District within 2 Miles of the Works, must be a Competent Engineer with some knowledge of Chemistry, and a good Manager of men.
Commencing Salary, £800 per Annum.
Candidates must Apply, in writing only, to the undersigned not later than the 30th instant, giving year of birth, full Particulars of Career, with dates and present Position, together with Two copies of Testimonials.
Canvassing will disqualify.
F. McLEOD,
709, Old Kent Road, London, S.E. Secretary.
Sept. 14, 1911.

WANTED, a Gas Engineer, of Good
Address, to introduce a new Process to Gas Managers. Must be a good Chemist, Energetic, and well acquainted with Gas-Works Practice. A suitable Man will be well paid.
Apply, by letter, stating Age, Experience, and when at liberty, to No. 5441, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

WANTED, an Engineering Draughts-
MAN, preferably familiar with Gasholders and Constructional Iron and Steel Workgenerally. Able to get out Quantities for Estimates and detail working Drawings.
State Age, Experience, and Salary required, in writing, to FIRTH BLAKELY, SONS, AND COMPANY, LIMITED, Thornhill, DEWSBURY.

WANTED, for a Water and Gas Com-
pany on the East Coast, a RENTAL and GENERAL CLERK.
Salary £120 per Annum, with prospect of increase to a suitable man.
Applicants must have had Experience of the work of a Water and Gas Office and be of Good Presence and Address, and not under 25 Years of age.
Apply, by letter, in own handwriting, accompanied by copies of Three recent Testimonials, to No. 5444, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

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The Exhauster has recently been overhauled and is in good order and can be inspected at the Lowestoft Gas-Works by Appointment with Mr. JOSEPH HAWKSLEY, of 2, York Road, GREAT YARMOUTH, to whom Offers should be addressed.

FOR SALE—Two new 12 feet Square
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For further Particulars Apply to W. J. JENKINS & Co., LIMITED, Beehive Works, RETFORD.

KNUTSFORD LIGHT AND WATER COMPANY.

THE Directors invite Tenders for the Surplus TAR and AMMONIACAL LIQUOR made at the Gas-Works, Knutsford, over a period of Twelve Months ending the 30th of September, 1912.
Particulars as to Quantities and any other Information may be obtained from Mr. F. Robinson, Manager, Gas-Works, Knutsford.
Sealed Tenders, endorsed "Tar and Liquor," or separately, as the case may be, to be addressed to the undersigned and sent so as to reach him not later than Saturday, the 30th inst.
The Directors do not bind themselves to accept the highest or any Tender.
RICHARD R. ASHWORTH,
Church Hill, Knutsford, Secretary.
Sept. 12, 1911.

ISLE OF THANET GASLIGHT AND COKE COMPANY, MARGATE.

THE Directors of the above Company invite TENDERS for carrying out certain ALTERATIONS and ADDITIONS to PURIFYING PLANT and HOUSE, with Foundations, Columns, Concrete Liquor Tank, &c., &c., at their Gas-Works, Margate, to Drawings and Specification prepared for the same by the Company's Engineer and Manager, Mr. J. M. Campbell, from whom any Preliminary Particulars may be obtained on Application.
The Site may be Inspected, and the Drawings and Specification seen and copies taken, at the Gas Company's Office, Margate (by arrangement with the Engineer), on payment of Two Guineas, which amount will be returned on the receipt of a bona-fide Tender.
Sealed Tenders are to be addressed to the Chairman, endorsed "Tender for Purifiers, &c.," and delivered at the Offices not later than Thursday, Oct. 5, 1911.
The Directors do not bind themselves to accept the lowest or any Tender.

By order,
THOS. C. FULLER,
Secretary.
Offices: Addington Street,
Margate, Sept. 9, 1911.

MARKET HARBOUROUGH URBAN DISTRICT COUNCIL.
(GAS DEPARTMENT.)

SURPLUS TAR AND SULPHURIC ACID.
TENDERS are invited for the Surplus TAR produced, and also for the Supply of SULPHURIC ACID required, during the year ending Sept. 30, 1912.
Particulars may be obtained from the undersigned, to whom sealed Tenders, endorsed "Tender for Tar," and "Tender for Sulphuric Acid," respectively, must be delivered not later than noon on Monday the 25th inst.
ALFRED T. HARRIS,
Manager and Secretary.
Gas Offices, Market Harborough,
Sept. 6, 1911.

BOROUGH OF BATLEY.

TENDERS FOR SCREENED GAS COAL.
THE Corporation are prepared to receive TENDERS for the Supply and Delivery at their Gas-Works of 20,000 Tons of Screened GAS COAL.
Conditions and Forms of Tender may be obtained on Application to the Manager at the Gas-Works.
Sealed Tenders, endorsed "Tender for Gas Coal," to be delivered to me on or before Monday, the 2nd of October prox.
The Corporation do not bind themselves to accept the lowest or any Tender, and may accept any Tender for a part only of the specified quantity.
By order,
J. H. CRAIK,
Town Clerk.
Town Hall, Batley,
Sept. 13, 1911.

COUNTY BOROUGH OF BLACKPOOL.
(GAS DEPARTMENT.)

THE Gas Committee are prepared to receive TENDERS for the TAR produced during the next Twelve Months, from Oct. 1, 1911, to Sept. 30, 1912.
Particulars may be had from the undersigned.
Tenders, endorsed, to be sent addressed to the Chairman, by the 25th inst.
JOHN CHEW,
Engineer and Manager.
Gas Offices, Princess Street,
Blackpool, Sept. 11, 1911.

BRITISH GASLIGHT COMPANY, LIMITED.

NOTICE is Hereby Given, that the HALF-YEARLY ORDINARY GENERAL MEETING of the Proprietors of this Company will be held at this Office on Wednesday, the 27th inst., at Twelve o'clock precisely, to transact the usual Business; to declare a Dividend for the Half Year ended the 30th of June last; to elect Two Directors in the place of those who go out by rotation; and to appoint Two Auditors.
NOTICE is HEREBY ALSO GIVEN that the TRANSFER BOOKS of the Company WILL BE CLOSED on the 16th inst. and RE-OPENED on the 28th inst.
By order of the Court of Directors,
A. W. BROOKES,
Secretary.
Chief Office: No. 11, George Yard,
Lombard Street, London, E.C.
Sept. 6, 1911.

GAS AND COMMERCIAL SECURITIES CORPORATION, LIMITED.

NOTICE is Hereby Given, that the SECOND ORDINARY GENERAL MEETING of the Shareholders of the above Company will be held at the Offices of the Company, 39, Lombard Street, London, E.C., on Wednesday, the 27th day of September, 1911, at 10.30 o'clock a.m., for the following purposes,—viz.:
1. To receive and consider the Directors' Report and Statement of Accounts.
2. To sanction the declaration of a Final Dividend.
3. To elect a Director.
4. To elect Auditors and to fix the amount of their Remuneration.
5. To transact any other Ordinary Business of the Company.
The TRANSFER BOOKS OF THE COMPANY WILL BE CLOSED from the 13th to the 27th day of September, both days inclusive.
Dated the 14th day of September, 1911.
By order of the Board,
W. FOREMAN
Secretary.
39, Lombard Street, London, E.C.

SALES BY AUCTION OF GAS AND WATER STOCKS AND SHARES.

MESSRS. A. & W. RICHARDS beg to notify that their SALES BY AUCTION of NEW CAPITAL ISSUED UNDER PARLIAMENTARY POWERS, and of STOCKS and SHARES belonging to EXECUTORS and other PRIVATE OWNERS in LONDON, SUBURBAN, and PROVINCIAL GAS and WATER COMPANIES, take place PERIODICALLY at the Mart, TOKENHOUSE YARD, E.C.
Terms for Issuing New Capital, and also for including other Gas and Water Stocks and Shares in these Periodical Sales, will be forwarded on Application to Messrs. A. & W. RICHARDS, at 18, FINSBURY CIRCUIS, E.C.

By order of the Directors of the
SOUTHEND WATER-WORKS COMPANY.

NEW ISSUE OF 1250 £10 NEW ORDINARY FIVE PER CENT. MAXIMUM SHARES.

MESSRS. A. & W. RICHARDS will SELL THE ABOVE BY AUCTION, at the Mart, E.C., on Tuesday, Oct. 3, at Two o'clock, in Lots.
Particulars of the AUCTIONEERS, 18, FINSBURY CIRCUIS, E.C.

By order of the Directors of the
DARTFORD GAS COMPANY.

NEW ISSUE OF £5000 ORDINARY STOCK.

MESSRS. A. & W. RICHARDS will SELL THE ABOVE BY AUCTION, at the Mart, E.C., on Tuesday, Oct. 3, at Two o'clock, in Lots.
Particulars of the AUCTIONEERS, 18, FINSBURY CIRCUIS, E.C.

GAS STOCK.

SALE OF NEW ORDINARY STOCK IN THE WESTON-SUPER-MARE GASLIGHT COMPANY.

LALONDE BROS. AND PARHAM in conjunction with C. E. MASTERS AND COMPANY, have received instructions from the Weston-super-Mare Gaslight Company, to SELL BY AUCTION under the Provisions of the Weston-super-Mare Gas Act, 1901, at the ASSEMBLY ROOMS, Weston-super-Mare, on Wednesday, the 4th of October next, at 6.30 o'clock in the Evening, subject to Conditions of Sale,
£5000
NEW FIVE PER CENT. MAXIMUM ORDINARY STOCK

of and in the above-named Company, in Lots of the nominal value of £50 each.
The Stocks will be Sold and Registered in the Books of the Company free of every expense to the Purchasers thereof.
For further Particulars and Conditions of Sale Apply to LALONDE BROS. AND PARHAM, Auctioneers, High Street, and Station Road, WESTON-SUPER-MARE, and 64, Queen's Road, BRISTOL; to C. E. MASTERS AND CO., Auctioneers, 4, South Parade, WESTON-SUPER-MARE, and 12, St. Stephens Street, BRISTOL; to P. E. CULLING, Secretary to the Weston-super-Mare Gaslight Company, or to J. H. & F. W. BERE, Solicitors, WESTON-SUPER-MARE.

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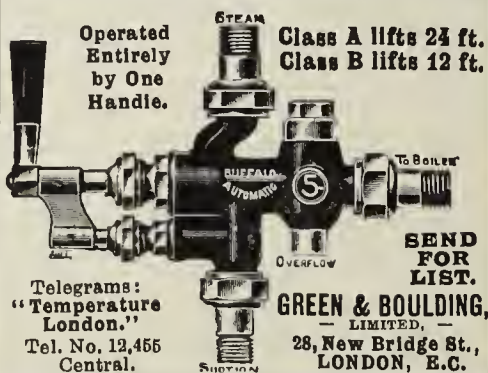
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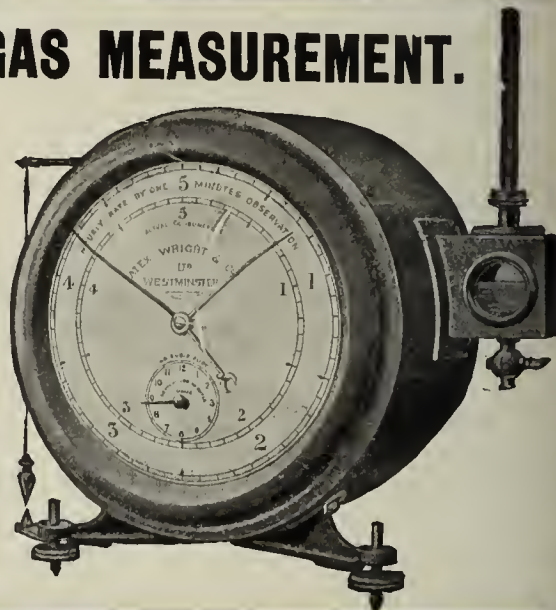
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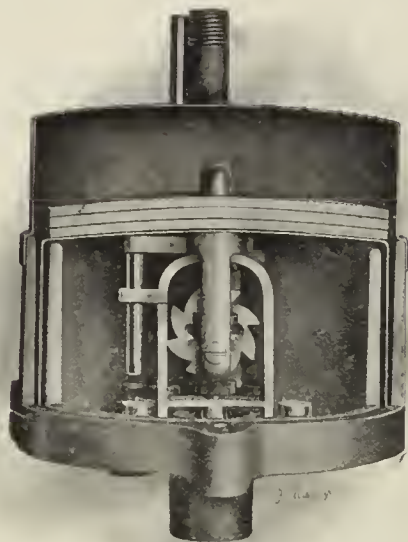
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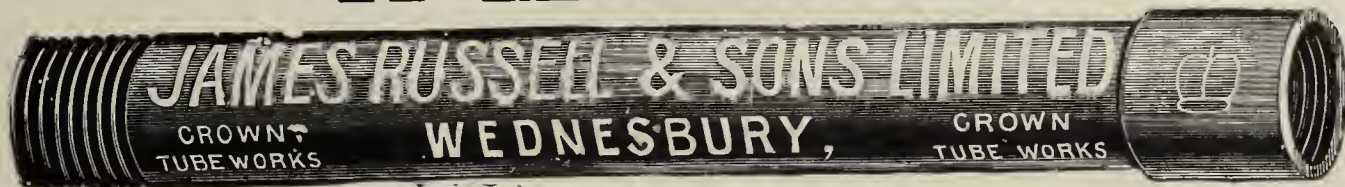
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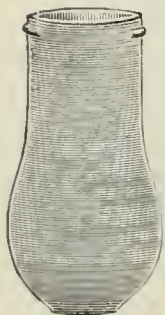


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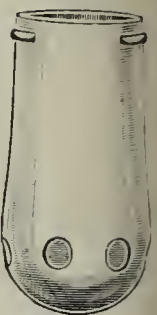
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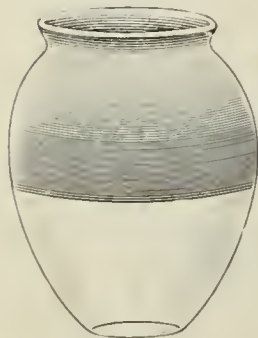
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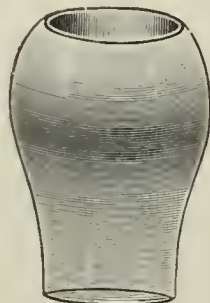
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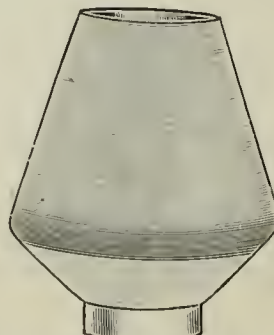
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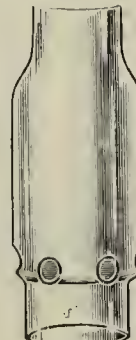
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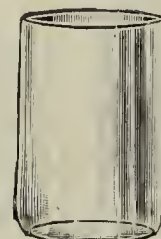
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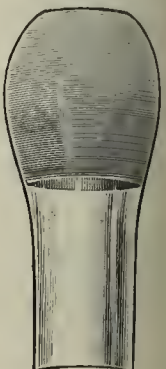
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GAS REGULATION on the TOP of the LAMP.

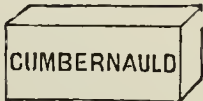
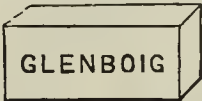
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Ask Wholesalers for Catalogue and Prices.

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Every Genuine Glenboig Brick, Block, Gas-Retort, &c., is legibly stamped with one or other of the Glenboig Company's Registered Trade Marks, as here shown.

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MARKS.

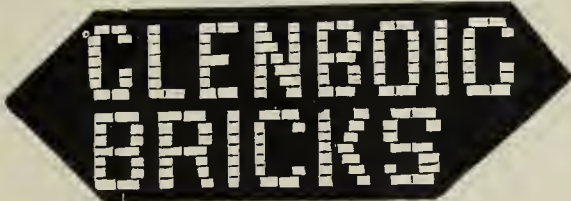


The Glenboig Trade Marks are imitated, and the Glenboig Name unfairly used by Makers of a lower Class of Goods, which, when sold under their own name, command much lower prices.

The Genuine Brand, Stamped on the Goods, is the only Reliable Guarantee to the Purchaser.

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The SPECIAL BRICKS used in the
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Highest Award wherever exhibited.

The GLENBOIG BRICKS, BLOCKS, AND RETORTS combine, in the highest degree, the qualities of not melting, and not splitting, when subjected to the highest heats and most sudden changes of temperature, and are, in consequence, found to be economical, even in districts where the local bricks can be had at half the price.

Undertaken we give a Table of Analysis and Physical Characteristics of a sample of Glenboig Fire-Clay by J. T. Norman, London; and, in submitting a report from a responsible and reliable public analyst, we would here draw attention to the unreliable character of some recently published analyses where a manufacturer selects not only his own samples, but also those of his competitor, and has them treated by a private analyst. SUCH STATEMENTS ARE ALTOGETHER UNTRUSTWORTHY.

ANALYSIS OF GLENBOIG FIRE-CLAY.

By JOHN T. NORMAN, Esq., F.C.S., &c., The City Central Laboratory, LONDON.

THE GLENBOIG UNION FIRE-CLAY CO., LTD., GLENBOIG, SCOTLAND.

29, LEADENHALL STREET,

DEAR SIR,

I have completed the investigation of the samples of Clay received from you on the 10th inst., and now beg to report the results.

CHEMICAL ANALYSIS.

	Raw.	Fired.
Silica, free	3.03	3.49
Silica, combined	43.20	49.77
Alumina	36.55	42.10
Ferrio oxide	1.80	2.08
Titanio oxide	1.30	1.50
Lime	trace	trace
Magnesia	trace	trace
Alkaline oxides	trace	trace
Sulphates as trioxides	0.92	1.06
Loss on Ignition	13.20	—
	100.00	100.00

PHYSICAL RESULTS.

Density	2.65
Volume weight	1.90
Porosity	15.4 %
Linear shrinkage at 100° C.	3.70 %
" " " 1050° C.	4.7 %
" " " Total	8.46 %
Volume shrinkage at 100° C.	10.7 %
" " " 1050° C.	12.6 %
" " " Total	23.3 %
Plasticity	20.0 %
Fire Stability	1850° C. equiv. 3362° F.

(SEGER CONE 36.) (New Scale CONE 38.)
(Signed) J. T. NORMAN.

This Clay is remarkable for its high percentage of Alumina and for the almost complete absence of ingredients tending to lower the refractory properties; its fire stability is extremely high. For some years past I have been urging clients who are working the Clays of the Coal Measures to search for such a material, but you are the first to discover a supply. The possession of this Clay places you in a unique position amongst the manufacturers of refractory goods throughout the world, and I have no doubt will, if duly exploited, enable you to drive out of the market the large quantities of foreign fire-bricks which are being poured into this country for use in the construction of bye-product ovens and for other purposes.—I am, yours faithfully.

JOHN T. NORMAN.

R. LAIDLAW & SON (EDINBURGH), LTD.

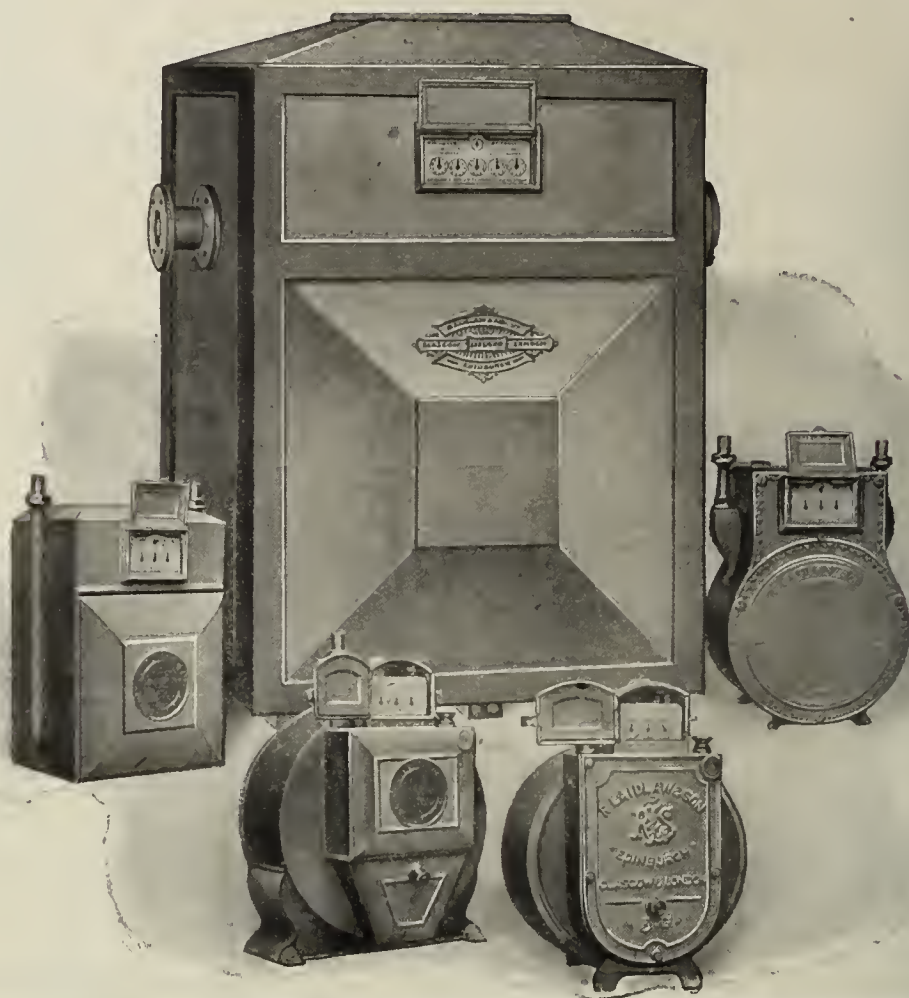
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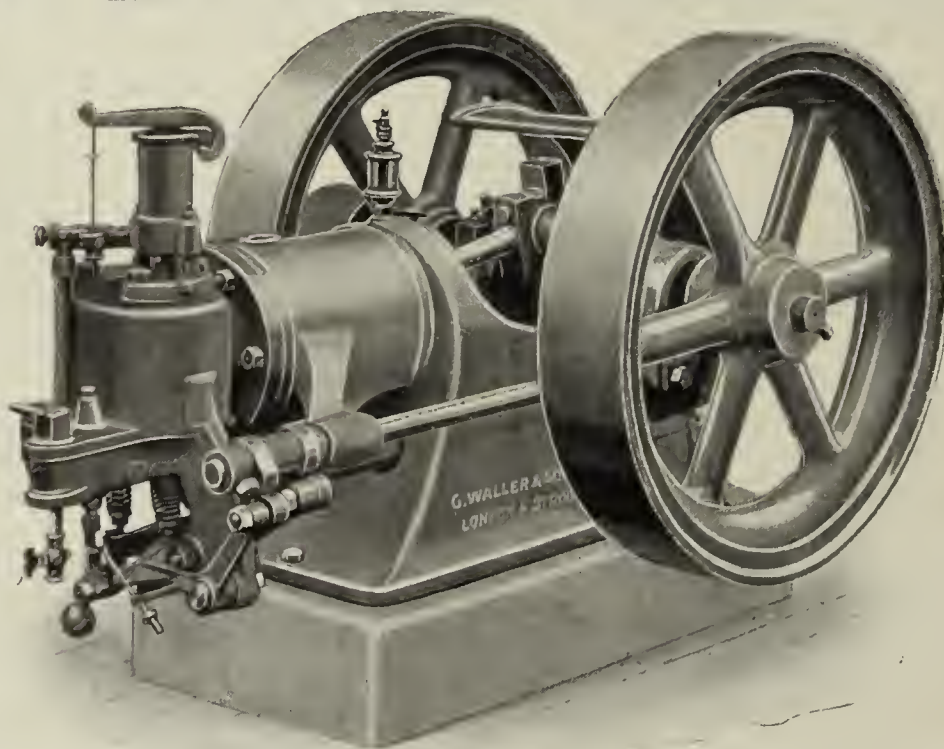
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On combination
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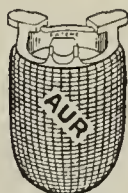
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Burners Nos. 0, 1, 2, 3 and 4.

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Double Knitted Ramie
thread for all other burners
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license by the
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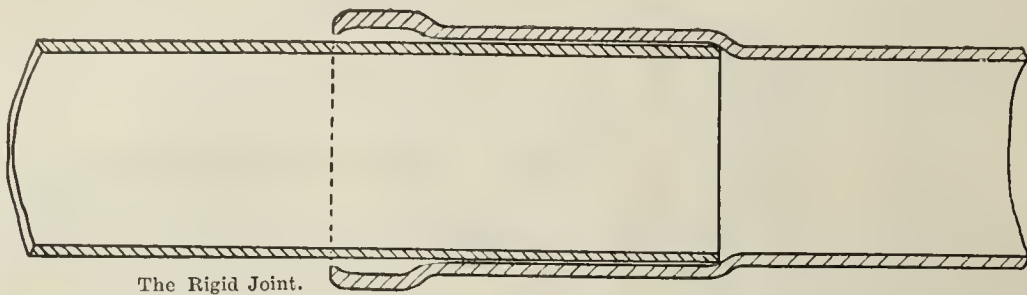
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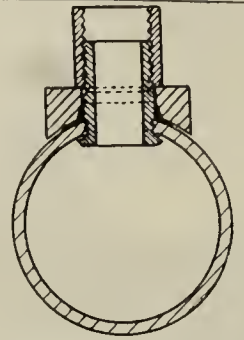
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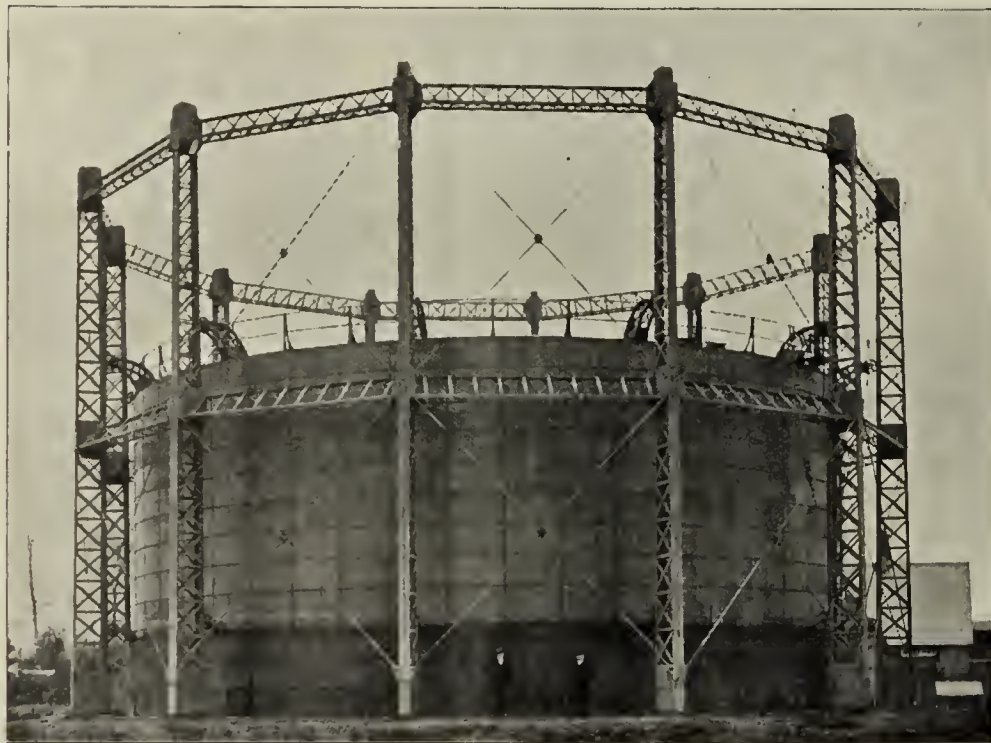
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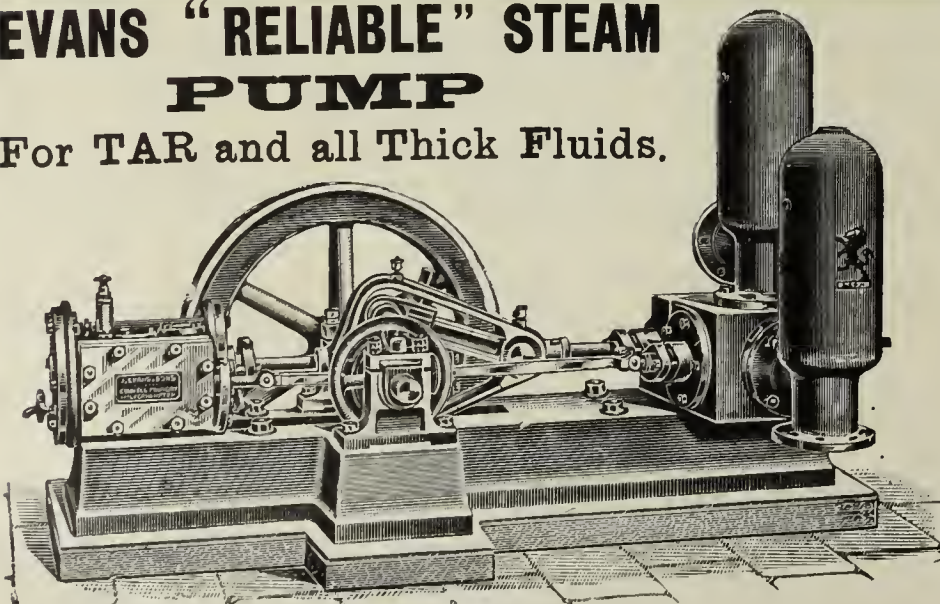
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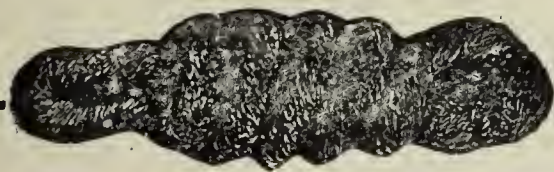
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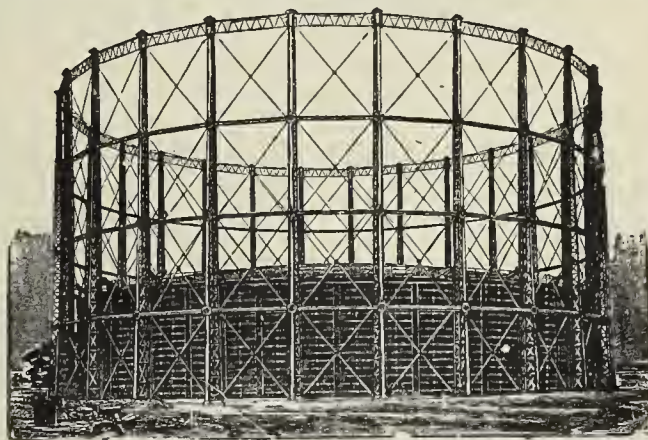
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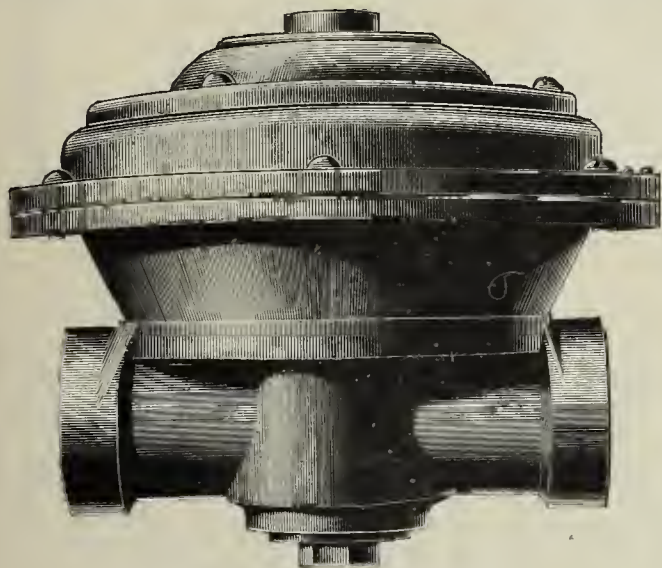
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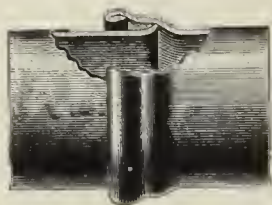
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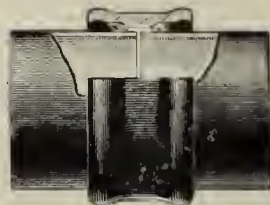
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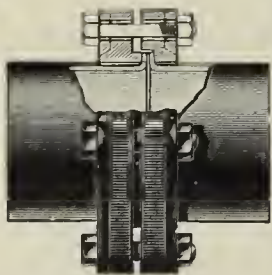


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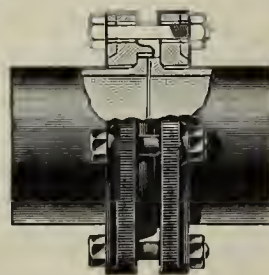
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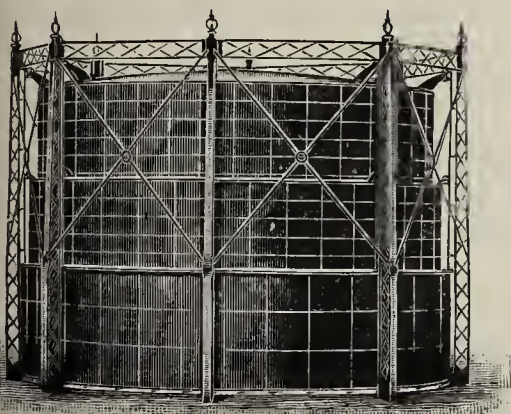
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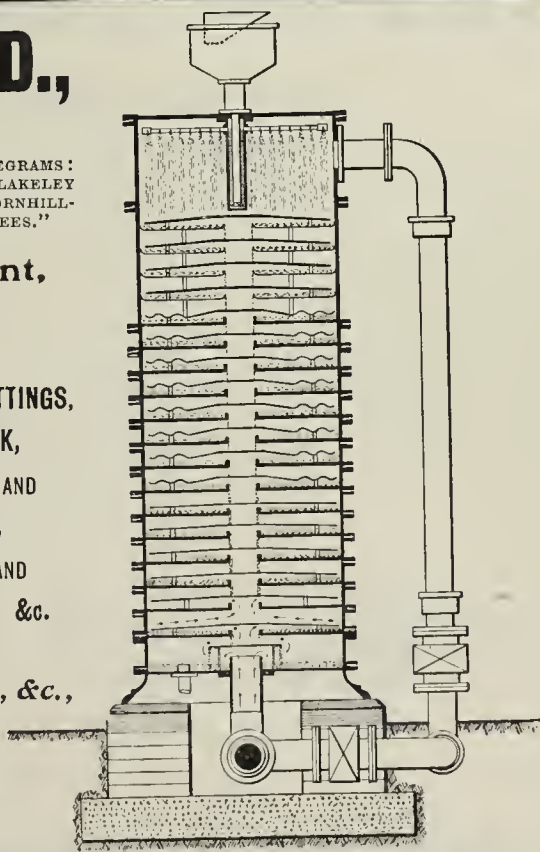
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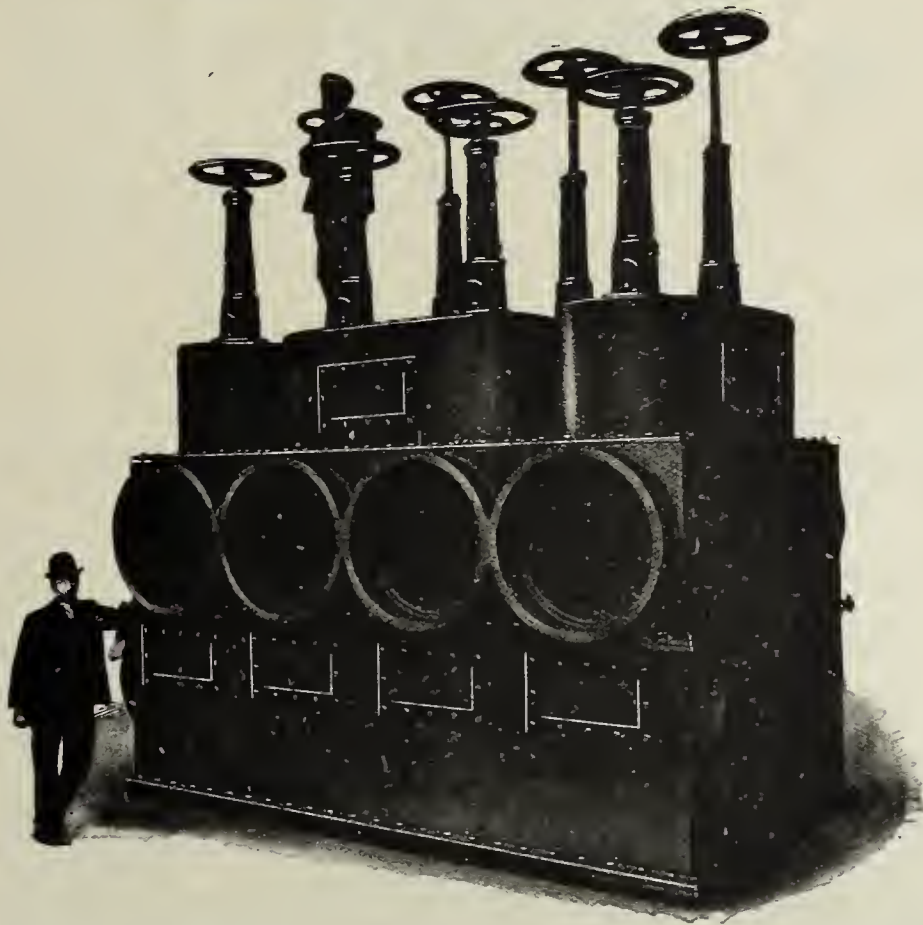
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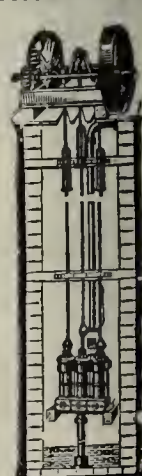
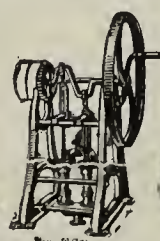
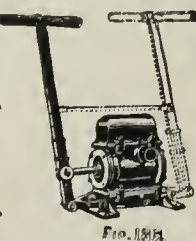
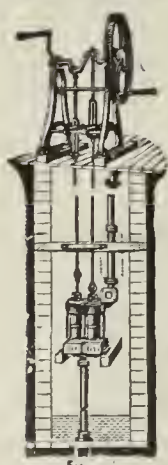
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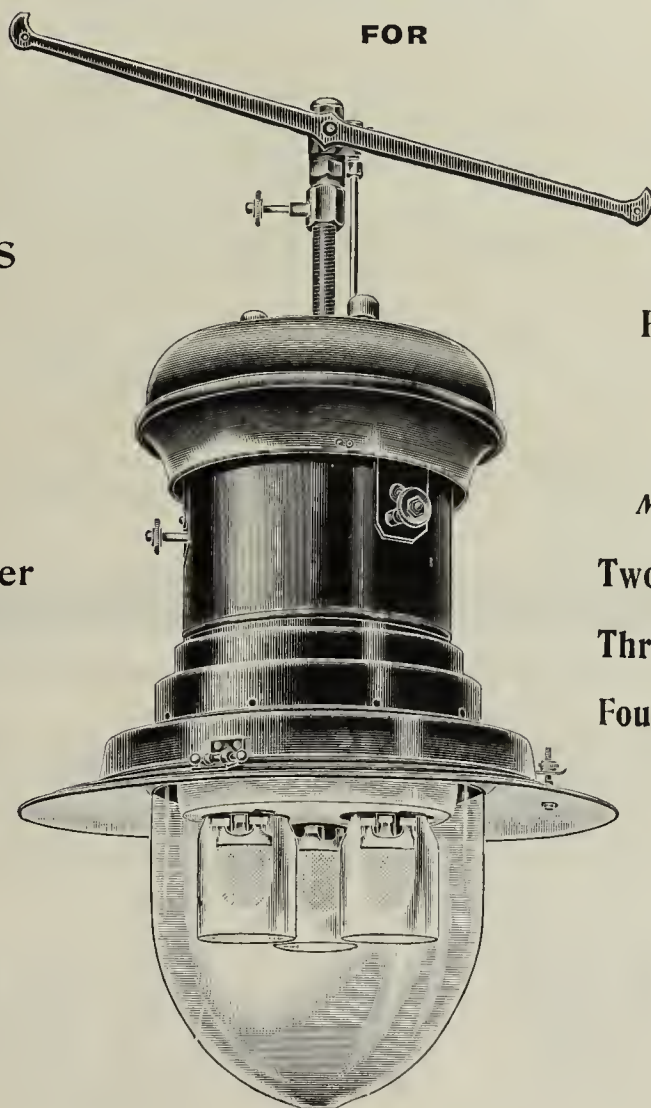
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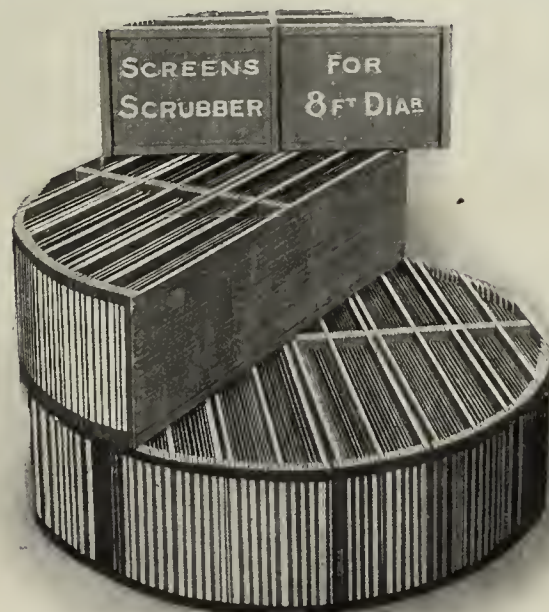
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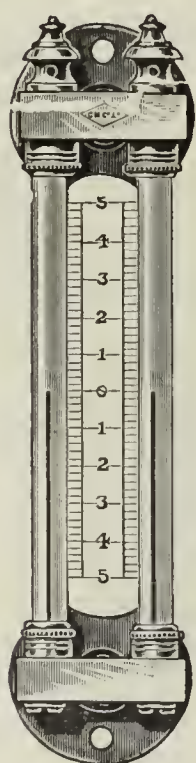
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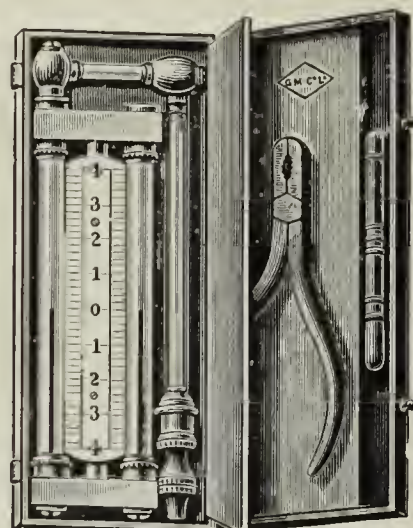
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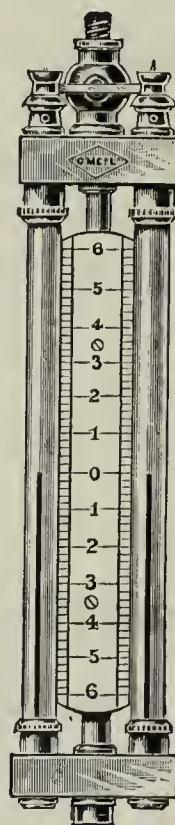
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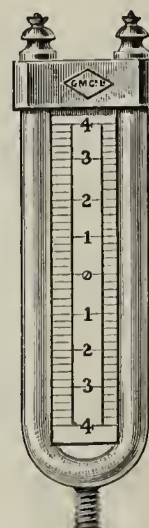
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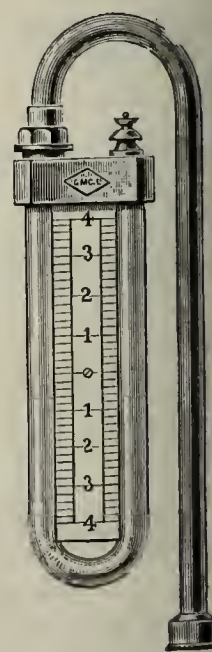
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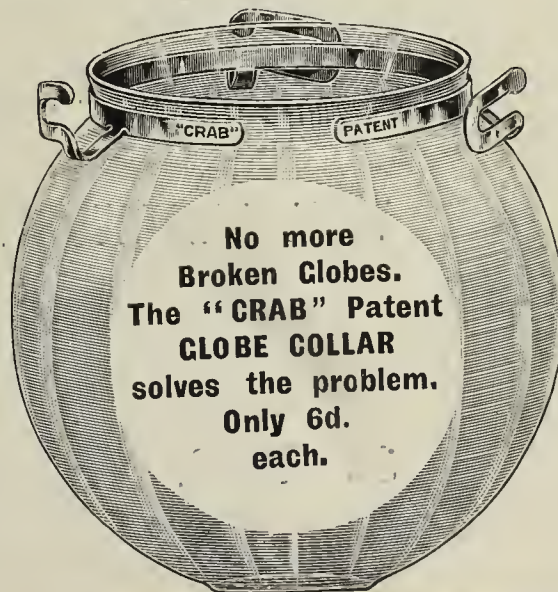
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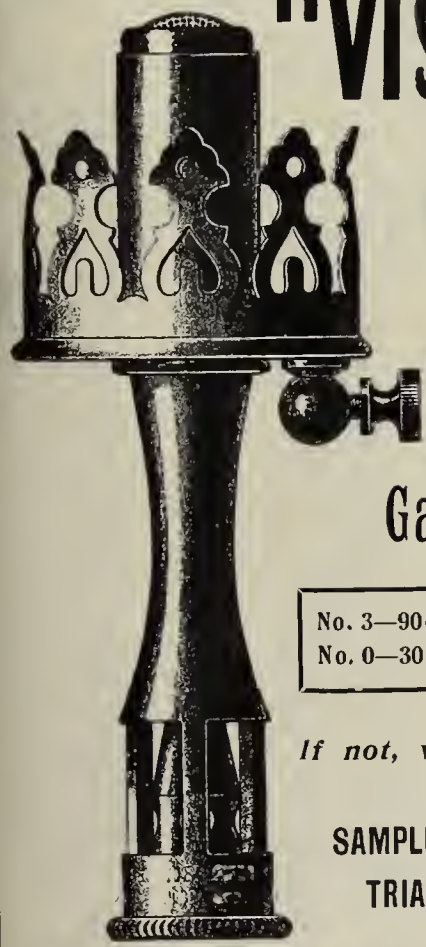
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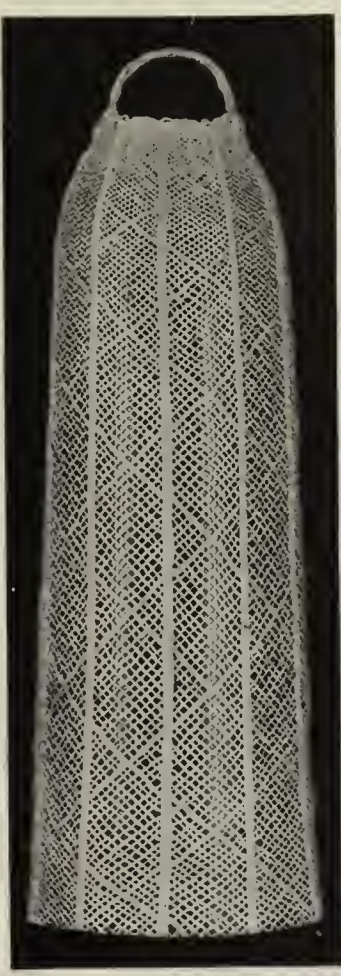
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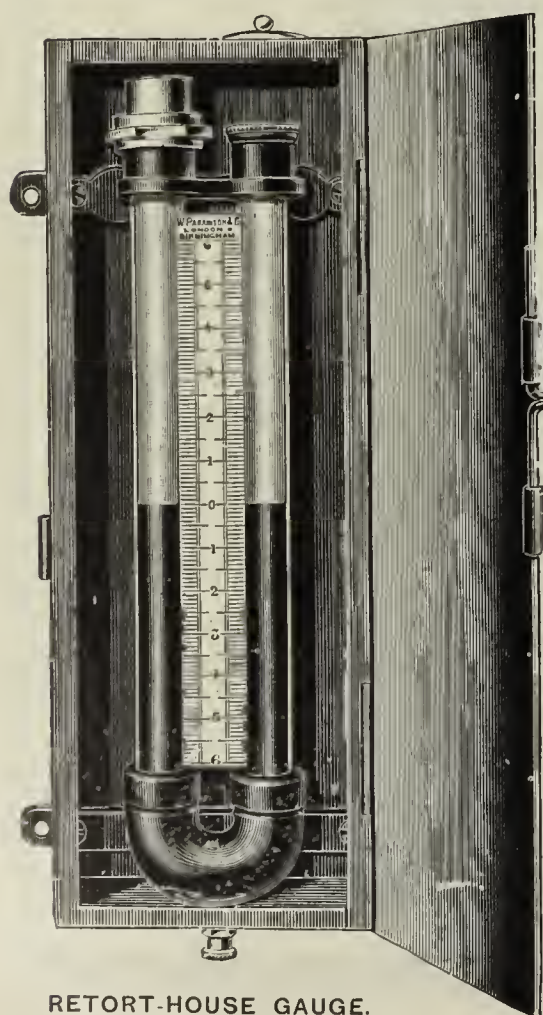
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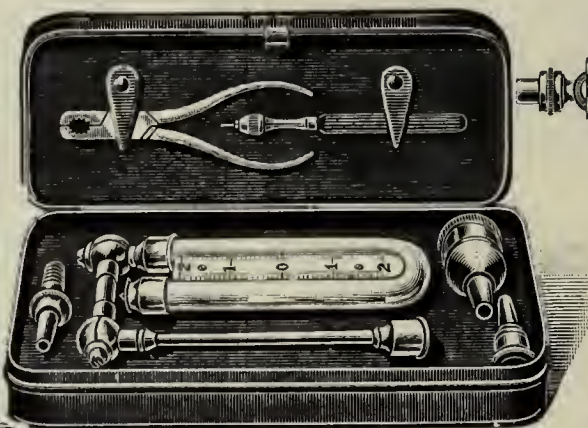
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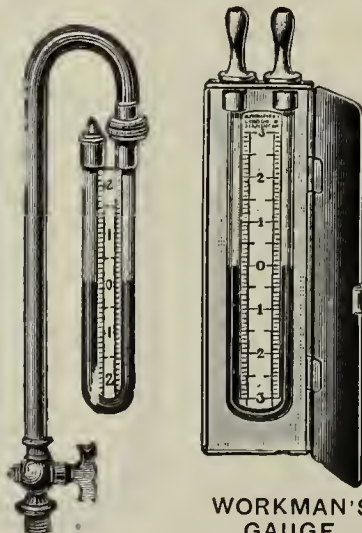
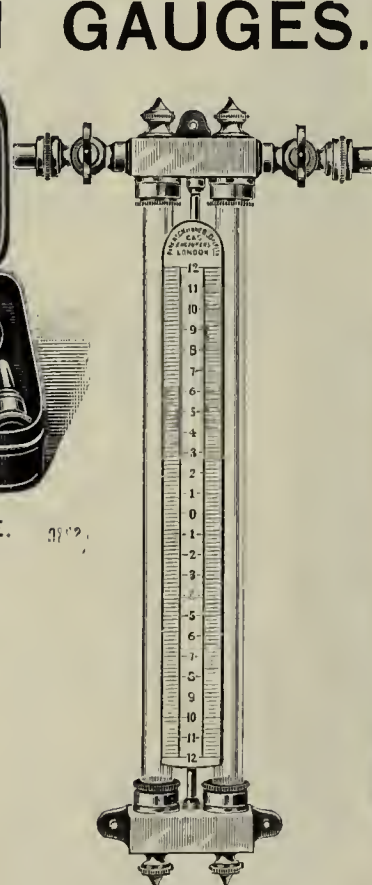


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VOL. CXV., No. 2524.—TUESDAY, SEPTEMBER 26, 1911.

EDITORIAL NOTES—GAS, &c.

Ready for the Gas-Fire Season.

SUCCEEDING torrid days, the chills of autumn weather have already come upon us with a rapidity that emphasizes the fall of the year. "Winter, lingering, chills the lap of May," says the poet. The early cold snap, say the gas-fire manufacturers and the suppliers of gas, does much more for the gas-fire business than any amount of chilling of the "lap of May" by the lingering of winter. The low atmospheric temperatures coming on top of the high ones have already given the gas-fire season a good start; and it may be taken that this excellent beginning will continue, and will do more for the selling and hiring-out of gas-fires this side of Christmas than sharp weather afterwards. The present season also commences with, in its favour, the excellent experience with gas heating of the past few years. Popular favour has during these recent years been rolling towards gaseous fuel for room heating; and the "boom" has caused the manufacturers to be better prepared than ever with stocks of fires to meet the demand that will be made upon them in the course of the next few months. Unless the public requirement exceeds estimates, there ought to be no necessity to work at such high pressure in the gas-fire factories as has been found requisite the last winter or two. But with such an extensive scope for the supersession of solid fuel, and with such a general growth of the desire for comfort where means will allow, the demand for gas-fires must in a measure be an unknown quantity, and difficult of accurate gauging. This being so, it is impossible to speak with any definiteness as to what the season holds in store in the nature of demand; but that the business will have big dimensions there is not a shadow of doubt.

The makers of gas-fires, articles and advertisements in our columns have shown, are quite prepared for the winter's trading. They recognize the vast dormant potentiality there is for them in heating; and most gas suppliers are no less keenly alive to the fact that the development of this potential business relies not only on the efforts of the producers of the fires, but on their own in providing the gaseous fuel at a fairly low price. Economy in the ordinary household has more effect than subsidiary advantages; and in this resides the reason for solid fuels having such enormous sway in domestic practice. This being the case, and a competitive price for heating being necessary, it behoves the managements of gas undertakings where gas prices are high for lighting, to consider differential charges (the discount meter comes to the aid here) to encourage what is largely a day consumption of gas. The gas-fire maker and the gas supplier must work to a single end in this matter; and we give the former (we have constantly done so the last few years) full credit for doing their part. We read about, if we do not all experience, the embarrassment of riches; and certainly, in catering for this gas-heating business, the makers, by the numerous good types of fires they present, embarrass the purchaser by the wealth of what they have, by their endeavours each to build up success, to offer. There is one good thing about this. There can be no sacrifice of business to-day through inability to meet the tastes of clients. Many people, many tastes; and with Time's advance, new ideas and new fashions, even in heating appliances. Therefore, the long range of types in external design and in details of construction is not a matter to be decried, though there is in it a certain amount of inconvenience.

For the present season, there are not the marked changes in the construction or in the detail of gas-fires that immediately preceding seasons have witnessed. Externally, there are new designs this year that are of very high merit from the artistic point of view; and some of them aim at ranking (gas-fires have ever been the superiors in the matters of economy and efficiency) equally, from the appearance point of view, with the initially costly electric radiator, while intruding less upon the householder's pocket. But for the

most part, the designs of last year (which are moderate in price, and are of an order to meet the requirements of the greater market that there is for gas-fires) are retained this. Internally, the fires have not undergone much change; and it is not easy at present to see how they can until some radical alteration comes along. We can never tell in a business such as this (in which unremitting investigation is being made by the makers to secure novelty and superiority, and through them commercial advantage) when further changes may be effected. In this year's gas-fires, there are noticeable several small internal improvements. Attention has been paid to the fuel, to its fixing, and in one case a combination gas and air adjuster and governor has been produced. The old method of having a boiling-ring at the top of the stove, which does not assist in preserving appearance, is being superseded, to a larger extent this season, by a side-swing boiling-ring, or one at bottom of the fire. There is also quite a novel idea before us in connection with a top boiling-ring.

But greatest of all has been the attention devoted to the question of interchangeability, which means (on account of maintenance) great reduction in stock parts, and a general economy in this regard. The question of constructing gas-fires on modern lines for small fire-places and small rooms has not been overlooked; and to make stoves of dimensions appropriate to their environment has been a matter upon which there has been some expenditure of thought and action, to good effect. Suitable fires to stand in front of an ordinary fire grate with the bars removed, have also been designed. Speaking of this, it is a great pity that, instead of houses being built in these times to take fixed coal-fire grates, the owners do not construct them with in the rooms tiled recesses in which either a coal dog grate or a gas-fire could be put. We can quite understand this would not accord with the views of the coal grate makers; but it would be a common sense proceeding. There is no more reason why a coal grate should be made part and parcel of the fabric of a dwelling-house or other building, than fittings for lighting. Very attractive would be the houses that were built with fire recesses as suggested; the tenant being offered gas-fires or coal or coke grates to set into them just as his fancy dictated. Builders have been shown the attraction of change in the design of their houses; but they have stuck tenaciously to the custom of the fixed grate, while the portable one offers them and their tenants so much more in the way of convenience and choice. Custom is a curious thing. It is a hard master, and a terrible sinner against the times.

However, the present gas-fire season has started well; the gas-fire makers are ready for it; and every gas undertaking that does not enjoy a successful gas-heating season will only have itself to blame. The time is ripe for pushing this business with acute activity and shrewdness.

The Next Large-Scale Gas Exhibition.

WHEN is the next exhibition on the large scale to be held in connection with the gas industry? Some people are saying that 1913, being the fiftieth anniversary of the foundation of the British Association of Gas Managers, would be an admirable occasion on which to make a striking display. The idea is undoubtedly a good one. The jubilee of our central organization in the gas industry could not be better commemorated than by making a public demonstration of the technical and commercial advances of the industry, as it would serve the double purpose of celebration and public education. By the penultimate month of the year named, nine years will have passed away since the Earl's Court Exhibition; and therefore no one can say, with such a time intervening, that there has been any undue pressure in the matter of holding large collective displays of gas appliances. There have been since then occasional local displays; but they have been mixed up with, or have had part in, multi-featured exhibitions. We are also now hard upon the Smoke Abatement Exhibition in Manchester, where gas promises to make a particularly effective showing; and it is

proposed the exhibition shall be practically reproduced in London next May. But these are altogether different from the large-scale exhibition, which should belong to the gas industry alone, which should be held before long, and which would be very opportune in the year 1913. The electrical industry are doing more than the gas industry now in the way of exhibitions. They seem to have fixed on triennial periods for exhibitions of the large order (quite apart from local displays) as the proper thing; the latest effort being inaugurated at Olympia last Saturday. The previous electrical exhibition was held in Manchester in 1908; and the one before that in London in 1905. Our competitors are quite welcome to exhibitions of greater frequency than the gas industry sees fit to hold. Their necessities no doubt demand them.

However, whether or not a gas exhibition on the large scale is held in 1913 or at some other time, the question is on the wing; and therefore it is not too early, before any promises or formal suggestions are made, to call attention to two or three points connected with organization. The conditions are altogether different to-day from those that existed at the time of the Earl's Court Exhibition in 1904. Then the Society of British Gas Industries did not exist. Now it does: and it is an active and influential body—so influential that there can be no really successful or effective exhibition on the large scale without that body has representation and voice in the matter equally with any other body. Then the next point is that, in the organization of an extensive exhibition, an altogether different process will have to obtain from that associated with the Earl's Court Exhibition. After that event, it was found that there was much discontent over the expense of the show to the exhibitors individually. The system of promotion and organization was not, from the exhibitors' point of view, the best that could be conceived. It was considered that the charges were not so reasonable as would have been the case if there had not been some intermediaries, and had the exhibitors, through a Committee composed of business men of the gas-supply and gas-apparatus sections of the industry, with the assistance of a properly remunerated manager, themselves carried through the whole project. The opinion was very general that, through the system of organization on that occasion, the exhibitors paid (according to their reckoning as men knowing something of these matters) excessively for everything—from space to stand construction and all else; and consequently, for long after, feelings were somewhat ruffled over the matter. This is a mere statement of fact; and views may, of course, vary as to what constitutes excessive payment. However, this feeling must not be aroused again. The experience then, compared with another system of organization since, has satisfied that an exhibition can be run on more moderate cost lines than the Earl's Court show, and yet not depreciate in any respect excellence of character. It cannot be overlooked that professional promoters of exhibitions of a special character—such as one applying to the science and art of gas manufacture, distribution, and utilization—cannot do much of themselves to make an exhibition itself attractive, and yet that is really the main and important part of the work of organization. If the gas industry, as represented by the Institution of Gas Engineers and the Society of British Gas Industries, determines to have an exhibition, the actual organization of the exhibition itself is a comparatively simple matter; and the services of the professional promoter would not be required. But the services of a professional manager, who knows the ropes of exhibition publicity, and the work of carrying through the details of the display, are necessary, as no Committee without an executive official of the kind could attend to all the minutiae involved.

There is another matter. If a general gas exhibition is promoted in 1913, or at any other time, the question of expense will be one that will have to be most carefully considered. The manufacturers of gas plant and appliances will not, we know, be disposed to again bear the bulk of the cost. And why should they? The cost will have to be a joint obligation on the part of the gas-supply industry and the manufacturers; and that is another reason why the method and conditions of organization will have to be vastly different from those that obtained seven years ago. It does not call for much argument or consideration to see that dual responsibility for the expense involved is the only fair course. The objects of an exhibition of the kind should really be the governing factors in the matter of obligation regarding expenditure. The primary objects of a gas exhibition on the large scale are to educate the public by

demonstrating the economic and service-rendering progress of gas, and through that to create new custom for gas, and to induce the adoption of improved gas appliances in the dwellings of existing customers. The gas-supply industry reaps benefit from the increase in the consumption of gas; the makers of appliances, from the profit on the appliances sold as a result (immediate or remote) of the exhibition. The manufacturers of plant at such an exhibition cannot hope for the patronage of the public, but they do find such an exhibition a good opportunity for making an ocular display of the character of their goods to the gas engineers who are drawn together by the show from all parts of the country. It is so easy to see that an exhibition project on a large scale is a matter for joint responsibility in all directions, and not for any unfair imposition on one side. The electrical exhibition opened at Olympia on Saturday is not being run for the purpose of making a profit; but for the benefit of the electrical industry as a whole. Should any profit accrue, it is to be returned to the exhibitors as a rebate on their rentals.

It will not—this, at all events, was settled seven years ago—be the slightest use again attempting to organize a large gas exhibition on Earl's Court terms; and the points raised in this article may as well be thoroughly appreciated in good time, if there is any serious idea of promoting an exhibition in the jubilee year of the Institution.

Dr. Fleming's Aerial Flights.

WE have now before us the full text of the last of the Cantor lectures delivered by Dr. J. A. Fleming, F.R.S., at the Society of Arts, and which lecture dealt, after a fashion, with the subject of cooking and heating by gas and electricity. We do not intend to comment upon all of the many points of the deliverance, though perhaps it deserves something exhaustive, if not caustic. Anyone, however, who reads the composition, will see the obvious criticisms to which, in its every part, it is exposed. The feature of the lecture that strikes us most is that a scientist of the position of Dr. Fleming should have delivered himself of so much that is purely theoretical, hypothetical, and postulatory. The lecture proves nothing of real practical value; but it emphasizes the well-known fact that, in its appliances for heating and cooking, and in the costs involved—initial, maintenance, and running—the electrical industry is still far behind in the race for domestic application, even on the *pseudo* assumptions adopted by the learned Doctor. The Cantor lecturer of this year does not give the gas industry credit for anything but what of an old-fashioned order is established in his mind. He takes in one instance a price for gas—viz., 2s. 9d.—that does not obtain anywhere in London to-day; he gives the gas industry no credit for making advances in its appliances that have considerably added to their practical efficiency; and he does not admit into his calculations any possibility of such a thing happening. The Doctor unconsciously declares himself to the gas industry as being lamentably in arrear in his knowledge of its technical and commercial progress.

Examine his statements in connection with the heating of rooms. He remarks that nothing could be more unscientific than the ordinary system of room warming by gas or coal fires; and, speaking specially of gas-fires, he adds "the greater part of the heat goes up the chimney with the products of combustion." A little later we see what he means by "the greater part" when he remarks: "Hence 75 per cent. of the available heat may ["may" not "does"] pass up the chimney with the products of combustion." How is it that Dr. Fleming did not, before delivering these lectures, take the trouble to study the extensive scientific tests that have been made, with the latest types of gas-fires, during the past three years or so, at the Leeds University, under the direction of the distinguished Professors there? Had he done so, he would have saved himself from slipping into such an egregious blunder as the one he was guilty of, and which sadly undermines his argument, as to the "greater part" of the heat from a gas-fire going up the chimney with the products of combustion. He would have found that, with the best of the types of gas-fires on the market to-day, taking the radiant heat, the convected heat, and the measured heat of the products of combustion, the last-named does not exceed 25 per cent. of the total heat generated by the combustion of the gas. Then Dr. Fleming bases his cost calculations on a gas-fire consuming constantly 45 cubic feet of gas per hour, for 56 hours a week, to heat a room of

2500 cubic feet capacity. He admits that it is wrong, but nevertheless he uses the result in his comparison. This consumption of 45 cubic feet per hour indicates a gas-fire that is not of the most efficient type; and it does not suggest one fitted with a duplex tap so that a number of the burners can be extinguished as required without affecting the flame efficiency of the others. Throughout this part of the lecture, there are the plain signs of the absence of modern knowledge and acquaintance with the issues of modern research, in connection with this branch of the work of the gas industry, with the result that Dr. Fleming can only accord to gas a superiority of 2s. in cost—*i.e.*, 7s. for gas, as against 9s. for electricity at 1d. per unit—for heating a room for a week under the conditions mentioned. We are not surprised at this when the circumstances are duly noted.

It is observed, however, that while the lecturer has not (unconsciously it may be) taken the best modern conditions and knowledge regarding gas heating, he applies absolutely the most favourable that his more intimate knowledge will permit him to do for electric heating. We see that "experience shows that a rate of supply of electric energy equal to 1 watt for every cubic foot of air in a room will in general [?] maintain it at a comfortable temperature in winter. Hence, in the case of a room of 2500 cubic feet capacity, it would require at least 2 kilowatts, or 2 kilowatts per hour to be supplied to keep it warm in winter." Now in making his subsequent calculation, why does Dr. Fleming depart from his theoretical standard of 1 watt per cubic foot of air? We ask the question because, taking this figure, we get $2\frac{1}{2}$ units per hour as the energy requirement for heating the room, and a cost of 11s. 8d. a week, instead of 9s., at 1d. per unit. In his figures for gas, he is careful to take the maximum throughout. We are not prepared, however, to agree with the standard of 1 watt per cubic foot of air capacity, as the result of experience in winter for information purposes with a radiator, consuming more than the lecturer's 2 units of electricity per hour, led to its abandonment as an inefficient and uneconomical heater for a room of less than 2500 cubic feet capacity. There is another point in connection with this provision of 1 watt per hour per cubic foot of air. The lecturer stated that, in the room of 2500 cubic feet capacity, it would require at least 2 units per hour to be supplied to it to keep it warm in winter by electric heating; and he added that this is equivalent to a complete renewal of the air every two-and-a-half hours. This is not very explicit. But earlier in his lecture, Dr. Fleming stated that "the air has to be renewed at least twice an hour for the removal of the carbonic acid and organic products." There is a matter here that requires explanation to show why, with electric heating, he only allows renewal once every two-and-a-half hours, while he admits the necessity for renewal twice every hour for sanitary reasons. We recommend to his careful consideration the Glasgow tests reported in the issue of the "JOURNAL" for Jan. 4 last year.

It is unnecessary to traverse the Cantor lecturer's statements as to the theoretical costs of boiling a pint of water, nor the heating of the absurd allowance of 10 gallons of water for a bath. Dr. Fleming has a wonderful electrical kettle; but even with a 80 per cent. heat efficiency, even, too, if the heat efficiency of a kettle with gas boiling-ring is only 60 per cent., and even further taking gas at 2s. 9d. per 1000 cubic feet, we have a cost, on the lecturer's own showing, between three and four times less for the latter than for the former—being an economy at which the plain man, with a limit to the depth of his pocket, does not choose to sneeze. Dealing, however, with a pint of water, and reducing the cost of so doing to the second place after the decimal point, may be to the liking of an electrical specialist of the standing of Dr. Fleming; but it does not fit the plain, practical, everyday world. Another evidence of the Doctor's inability to drop down to the practical plane is seen in the remarkable suggestion (if we appreciate correctly his meaning) contained in the following sentence: "We may say that in the public supply of hot water for domestic purposes, there is a source of revenue for electric supply stations which has hardly yet been touched upon." What does he mean by this? When he says "public supply," does he intend a distributed supply? If ever a distributed supply of hot water can be shown to be an economic proposition, then it will most certainly not be by having electricity as the heating agent.

The Doctor has not much to say about cooking by electricity. Nothing in his view appears to be right in connection with it, though he is more hopeful and confident than

we are. However, what he has to say in this connection is altogether commonplace. It has all been said before, and will doubtless often be said again by electricians. Nevertheless there are two or three points that may be extracted as having been endorsed by Dr. Fleming. He states that the advantages of low voltage are supreme in the case of electric cooking; and that "it is nothing short of a crime to place in the hands of ordinary domestic servants, electric cooking apparatus worked at 220 volts off one side of a 440-volt service. Then the chief fault of much of the present electric cooking apparatus is that it does not supply a sufficiently high temperature, or furnish heat quickly enough. . . . In cooking, it is necessary to be able to command high temperatures quickly for a short time." With gas, heat can be obtained promptly; and the range of heat regulation that it places in the hands of the user is just that which should meet all the desires of Dr. Fleming—were he not Pender Professor in Electrical Engineering in the London University. We do not think he has succeeded in doing much towards advancing the cause of electricity for domestic heating purposes; certainly he has not damaged the interests of gas as an agent in this particular direction.

High-Pressure Gas Schemes for Street Lighting.

THE report of the Commission of the Société Technique du Gaz who have been inquiring into the question of the adoption of high-pressure gas lighting in the capital and other cities of France, Germany, and England is not all that we could have wished it had been in the matters of completeness and time. But notwithstanding its defects, it is of value as indicating how rapidly high-pressure gas lighting is, in many main thoroughfares, displacing low-pressure gas lighting, as well as preventing an extension of, and superseding, electric arc lighting. This is not to be wondered at when consideration is paid to the illuminating power derivable per cubic foot of gas consumed by the employment of high pressures, and the lowness of the cost of the illumination afforded. A point that is very striking about the report is the expenditure that Berlin is, and Paris is contemplating, making annually in securing the best, the most dependable, and the most economical light for their streets. Berlin, we learn from the report before us, is spending about a million marks per year in the extension of the high-pressure gas system; and it is believed that the complete scheme allows for a length of high-pressure gas-main corresponding to a total outlay of 10 million marks. The experimental high-pressure lighting has also so favourably impressed the Municipal Council of Paris, that the Gas Company are to submit a high-pressure scheme for the main thoroughfares of the city. The complete scheme for all Paris will mean an expenditure of somewhere about 15 million francs for lamps, brackets, and service-pipes, but exclusive of the mains and compressing stations.

Is it at all conceivable that these large municipal councils would expend, or contemplate expending, such sums of money, unless they were convinced as to the superiority of the high-pressure form of lighting over all other systems of street illumination? It all shows the direction in which favour has set; and it puts a confirmatory seal upon the view that the time rolls rapidly nearer when the main streets of our principal cities and towns will be equipped from end to end with high-pressure mains not only for lighting but for other purposes. A further lesson of the figures is that Berlin and Paris are not afraid of engaging in large expenditures in order to get the superior illuminant—superior at all times and under all circumstances—for their streets. The London lighting authorities would look very much askance at anyone suggesting for street illumination expenditure on such a magnificent scale. Speaking of London, the Commission do not do it justice in the scant information afforded. Westminster is the only example quoted. Nothing is said of the City as the patron of the early forms of high-pressure lamps, and experimenter with the new; nor is anything said as to the clean sweeps that the high-pressure lamps have made in many parts of London and the suburbs for the outside lighting of shops—the latest information being as to the 111 electric arc lamps displaced in only two roads by the Brentford Gas Company.

One point of technical information appears in the report. It is that an experiment made in Paris with the use of low-pressure gas and compressed air has not proved successful, owing chiefly to the moisture contained in the latter, and the consequent condensation in the pipes.

Electrical Exhibition at Olympia.

The electrical exhibition was opened on Saturday at Olympia, and will continue until Oct. 21. A visit to it will be of interest to all our readers, if it is only to see how thoroughly well organized it has been, under a Committee and an Exhibition Manager. Any profits that may result will be distributed *pro rata* among those who have paid for space. There is also much to be seen in the exhibition; and it will portray to all gas engineers and managers visiting it, the position in the matter of equipment for attack and for defence of the most active of the competitors of the gas industry. In a special article elsewhere, we congratulate the electrical industry upon the general character of the display made; and certain other matters also receive comment.

Converting CS₂ to H₂S.

It will be remembered that, at the last meeting of the South Metropolitan Gas Company, the Chairman (Mr. Chas. Carpenter) referred to the partial reversion to the use of lime as a temporary bridge over the difficulty of an excess of sulphur compounds in the gas, until research enabled the Company to apply a less offensive and troublesome method of obtaining relief. He further said they expected to have at work shortly a large-scale plant in which would be embodied some of the latest aspects of the purification question. What the Company are aiming at is the partial conversion of carbon bisulphide to sulphuretted hydrogen by subjecting the former to heat; and that is what the large plant Mr. Carpenter spoke about is intended to test. In this connection, the abstract (published in our columns last week) of the specification of the patent of Mr. E. V. Evans, of the South Metropolitan Company, is peculiarly interesting. The heat method of transforming carbon bisulphide into sulphuretted hydrogen is not new; but there have been high-temperature difficulties. Mr. Evans has, however, found that the temperature to which the contact substance is treated need not be nearly so high as has been previously supposed, if care—this appears to be the important thing—be taken to preheat the gas before it passes over or through the heated contact substance. The mode of gas preheating, the construction of the apparatus, the character of the heated contact material were explained last week (p. 749). The whole arrangement for sending sulphur from the plant in the form of sulphuretted hydrogen appears to be simplicity itself. We are hoping to hear more of the plant when a thorough test on working lines has been made. There are many places where this or the Cheltenham method of removing or reducing the carbon bisulphide from the gas, without the nuisance created by the ordinary lime process, will be useful. But engineers with vertical retorts will say they have no use for any of these new adjuncts to purifying systems.

The Latest Co-Partnership.

As was to be expected, the employees of the Plymouth and Stonehouse Gas Company accepted, with expressions of gratitude, the co-partnership scheme which the Directors recently offered them. Their meeting last Wednesday stands out like a green island amid an ocean of labour troubles. It focussed and emphasized the good feeling which has so long existed between the Company and their workpeople. For many years past, the Directors have given tangible proofs that they are mindful of the interests of the men; and the men, on their part, appear to have been contented and loyal. The offer of co-partnership was quite a voluntary act of the Board. It supplements such other benefits as the men have hitherto received in the way of pensions and compensation allowances, and is, in fact as well as in word, a real bonus on the men's earnings. As it has been made retrospective for a year, each of the men starts with an allowance of 4 per cent. on his last year's wages, and the certainty of 5 per cent. on the amount earned this year. If, as the result of his co-operation with the Directors and officials, the price of gas is further reduced, the bonus may become 6 per cent. in future years. In its main features the scheme is on identical lines with the successful co-partnerships of other gas companies; and there is no reason why it should not prove in every way as beneficial as they have been. For the present, its application is to be limited to the men engaged in manual labour—the stokers, fitters, &c. But Sir Joseph Bellamy held out the hope that in the not distant future the clerical staff, and the rest of the employees, will also participate in its benefits. So far as it goes, it is costing the Company nearly £1000 a year; but, as Sir Joseph remarked, the money is well laid out if its only return is in good feeling.

Its Further Extension.

There is, everyone knows, a vast difference between willing and grudging service. Co-partnership tends to bring out the best there is in a man, because it ensures him a direct share of the advantage which may accrue from his extra exertions. It was said by one of the companies' witnesses before the Railway Commission last week that it had not been regarded as practicable to apply the co-partnership principle to the railways. What the difficulties are is not clear. It would, no doubt, involve a considerable amount of work; but in undertakings so highly organized as the railways, this alone would not be an insuperable barrier. Probably if it were attempted, the trades unions would be found a serious obstacle, as they have been to the carrying out of the conciliation and arbitration scheme. The experience of many gas companies, however, goes to show that, in spite of the hostility of trades unions, co-partnership schemes can be worked with benefit all round. An essential factor to success is that the men shall be made to feel that, in participating in the scheme, they are actually benefiting. They cannot be expected to be enthusiastic over co-partnership, or conciliation, or any other remedy for the grievance of a life of toil, if it is accompanied by the suspicion that what is granted with one hand is being taken away by the other. Happily there is no such fear in regard to the Plymouth co-partnership scheme, or any similar project in connection with gas companies.

Reward for Successful Candidates.

The Council of the Society of British Gas Industries are showing a very live interest in the internal affairs of the gas industry. The members are concerned equally in the progress of the gas-supply industry with the company and municipal owners of the gas undertakings. The degree of progress of the latter sets the limits to the progress of the manufacturers of plant and appliances; and thus their interest in all that appertains to the common welfare of the industry. In several ways the Society have given material expression to their willingness to work co-operatively with the gas-supply section of the industry. The part they took in the founding of the Livesey Chair of Gas Engineering and Fuel at the Leeds University is remembered; there is also the interest that is being evinced in the question of publicity; and in many other ways there has been co-operation of a valuable order. Now we learn from the Secretary of the Society (Mr. Arthur L. Griffith) that the Council have decided to give ten guineas annually in prizes on the results of the City and Guilds of London examinations in Gas Supply and Gas Engineering (Honours Grade). The amount will be equally divided between gas engineering and gas supply; in each division three guineas being the first prize, two guineas the second. This encouragement on the part of the Council of the Society to the juniors of the gas industry who submit themselves to examination will be much appreciated. It is a practical way of patting a young man on the back for success in real endeavour. This brings to mind the suggestion that Mr. T. B. Peattie made during the discussion on the paper that Mr. F. J. West read at the November meeting last year, on enlarging the scope of usefulness of the Society; and possibly the present announcement is the outcome of that proposal.

Tar Surfacing of Roads.

Kent has done more than any other county in the country in proving the efficiency of the use of tar under the modern conditions of road use for preventing dust nuisance and for maintaining the roads; and Mr. H. P. Maybury, M.Inst.C.E., the County Surveyor, has been the best of advocates, and what he has preached he has practised. The doctrines and practices of the road surveyor and engineer have been forced by current circumstances to undergo considerable revision; and "current circumstances" in this special department have found few, if any, more pliable and receptive technical natures than Mr. Maybury's. As soon as ever the old methods displayed their defects under the new conditions, he accepted the position of the need of new treatment. Thus it comes about that year by year Kent has been spending, by the thousands of pounds, money in improving their main roads by the aid of tar and pitch. Last year, as Mr. Maybury's annual report shows, the tar bill for Kentish main roads alone came to £20,594; 823,766 gallons of tar were used; and 371 miles of surface were dealt with, or nearly 5 million superficial yards. Calculation shows that the £20,594 is the over-all cost of

the tar treatment—seeing that it is equal to 6d. per gallon of tar used. The sum, however, only represents about 1d. per superficial yard treated, which, as an average for the various kinds of work done, is remarkably low. Apart from tar treatment, road maintenance charges decreased by £11·8 per mile, compared with the previous year. Maintenance costs have been receding ever since tar came into use on the roads; and we know Mr. Maybury would attribute no small part of the saving to its employment. In fact, he says in one part of his report that the roads, in consequence of this treatment, have been much improved in strength; and the dust nuisance is little more than a memory now where the work has been done. The total expenditure of the Council, however, on tar painting and cognate work during the year was £25,708. In the urban retaining districts £4855 was paid to the several authorities for painting about 120 miles of road, representing 1,344,380 superficial yards. There was also spent a sum of £258 upon bituminous binding preparation, having asphalt as its basis. Speaking generally, by the treatment, the roads of Kent have been much improved in strength. But the simpler applications of tar are not suitable for all locations. Where traction engines and commercial motor traffic is greatest, it will have to give way to granite macadam and pitch matrix.

An Industrial Board.

Another project which may have important issues—whether permanent is a matter upon which the results of certain other schemes would make one speak with reserve—has been put forward with the view of contributing to industrial peace. While we were contemplating the mischief that had been wrought by the dockers', carters', and railway men's strikes, the scheme from which great things are now expected was introduced to public notice. It emanated from the cotton industry; and Sir Charles Macara, of the Cotton Masters' Federation, appears to have been the author, or, at all events, he was the advocate. The plan, which proposes an Industrial Board, has yet to be put into practical shape. But meantime it has commended itself to the Government; and it is stated that the Board of Trade have sent out invitations to the leading representatives of masters and men in the great national trades to form an Industrial Board. The new authority, it is said, will have as its Chairman Sir George Askwith, K.C. The period of office suggested for the Board is twelve months; and the constitution of the Board, ten leading employers and ten labour representatives. The Board of Trade, while not contradicting this statement as to what is on the tapis, say it is unauthorized and premature. We shall see as to how far it is premature when an official announcement is made.

A Word of Warning.

There is time yet, before the holding of the Miners' Federation Congress, for due consideration to be given to some weighty words from the pen of Mr. D. A. Thomas, who deals, from the coalowners' point of view, with the questions of the payment of miners for working in abnormal places and the fixing of a minimum wage. The demand for a minimum payment of 8s. a day to good, bad, and indifferent workmen alike is one which, if conceded, would, in his opinion, render impossible the working of a South Wales colliery at a profit. If this expression of opinion from one who is in the best position to judge of the matter is not sufficient for the members, they can satisfy themselves by acceding to an appeal to give the experiment a trial with the funds of the Federation. They are, it may be imagined, not likely to do this; and therefore perhaps Mr. Brace, M.P. (to whom Mr. Thomas's remarks are addressed), will take heed of a warning that it will require all the tact, patience, and effort of moderate men on both sides, "if we are not to be landed in the gravest labour struggle this country has perhaps ever witnessed—a struggle the consequences of which no man can altogether foresee." It is admitted the men have legitimate grounds for dissatisfaction with the present method of fixing the payment to be made for work in abnormal places; but this, of course, is a very different thing from assenting to the proposition that all men, whether good workers or not, should be in receipt of a fixed minimum wage. Many underground men of certain classes are already on a daily wage; but Mr. Thomas has learnt from costly experience that he cannot secure a reasonable day's work from a collier underground unless his wages depend upon the quantity of work done. He says, however ready the majority of Welsh colliers are to honestly put forward their best efforts under any

condition of payment, they may not be permitted to do so by the lazy or dishonest men working alongside. In brief, though there is a legitimate grievance requiring to be removed, the argument for the coalowners is the extremely simple one that it is not advisable to ask for a remedy which would remove the stimulus now provided under the system of piece-work.

The Question of Income-Tax.

Dealing with the question of income-tax in a contribution which he termed "A Plea for Fair Play for Commercial Interests," Mr. M. J. Stapleton, at a conference of the Society of Incorporated Accountants and Auditors, made a number of recommendations, which he pointed out were substantially in accord with those embodied in the report of the London Chamber of Commerce. The first of these was that the production of balance-sheets should not be insisted upon by surveyors of taxes, and that taxpayers who object to produce such balance-sheets should not be refused the statutory allowance for depreciation or be placed under other disadvantages, provided that the ordinary profit and loss account had been certified by a professional accountant. He urged that depreciation should be allowed on buildings, furniture, fixtures, and fittings; and that the following items appearing in the profit and loss account should be allowed as charges against profits for income-tax purposes: Gifts or gratuities in the nature of payments for services rendered; accidental losses not covered by insurance; cost of removal of business from one place to another; and preliminary expenses of joint-stock companies. Another point he made was that the rates of depreciation on plant and machinery should not be left to the discretion of the surveyor of taxes, but that, if fixed scales for particular trades are deemed impracticable, the allowance agreed by the accountant who audits the accounts should be accepted. He also thought that accounts certified by professional accountants should be accepted by surveyors as correct in detail, but that it should be open to surveyors to raise questions of principle. There were other recommendations; but members in the subsequent discussion largely turned their attention to the question of the principle of furnishing balance-sheets to the surveyors of taxes. Several of the speakers appeared to be in accord with one who said he was not at all sure it was wise to oppose in principle the furnishing of balance-sheets, as their object was to get a fair and reasonable assessment, and the more information they gave the more likely it was that they would secure such an assessment.

Annual Meeting of the Michigan Gas Association.

The twentieth annual meeting of this Association was fixed to be held in Detroit (Mich.) on Wednesday, Thursday, and Friday last, under the presidency of Mr. A. P. Ewing, of that city. The papers on the programme, for reading and discussion, were:

- "The Function of Tar in the Condensation of Coal Gas," by Professor Alfred H. White and the Holder of the Scholarship.
- "Advertising: A Brief," prepared by C. A. Brownell.
- "Experiments in the Taylor System of Shop Practice," by Ben. M. Ferguson.
- "A Purchasing System for a Gas Company," by Albert G. Schroeder.
- "Use of Reinforced Concrete in Gas-Works," by H. W. Douglas.
- "A Concrete and Wood Condenser-House," by E. F. Lloyd.
- "Filament Ignition of Gas," by Professor Howard Lyon.
- "Development of Hotel and Restaurant Gas Appliances Business," by W. F. Clausen.
- "Directions for the Recovery, Concentration, and Testing of Ammonia," by James A. Brown.

The late Mr. Robert Morton.—In the obituary notice of the late Mr. Robert Morton which appeared in the "JOURNAL" last week, it might have been mentioned that the deceased left a widow, two daughters (one married), and one son—Mr. Philip Morton, who is Manager of the Genoa works of the Continental Union Gas Company, Limited. Before obtaining this position, he was with Mr. Fletcher W. Stevenson at Coventry, and previously at the East Greenwich works of the South Metropolitan Gas Company.

Glover-West Vertical Retorts for Belfast.—At their meeting last Friday, the Belfast Gas Committee had before them the minutes of a Sub-Committee with reference to the introduction of a vertical retort installation. On the recommendation of the Sub-Committee and the Gas Manager (Mr. J. D. Smith), it was decided to introduce the Glover-West continuous system of vertical retorts, and to accept the tender of West's Gas Improvement Company, Limited, of Manchester, for an installation capable of producing $2\frac{1}{2}$ million cubic feet of gas per 24 hours. In his last annual report to the Gas Committee, Mr. Smith recommended the erection of vertical retorts of this capacity, and that a number of members of the Committee should be appointed to visit several gas-works in England and Scotland where vertical retort installations were to be seen.

GAS STOCK AND SHARE MARKET.

(For Stock and Share List, see p. 827.)

LAST week was an extremely anxious period on the Stock Exchange, and at one time things looked almost as threatening as they well could be. The prolonged tension of international relations was becoming almost too much for markets, both Home and Continental; and apprehension was aggravated by popular disturbances on the Continent setting people thinking of 1848. But, happily, after some three days of alarm, the clouds grew lighter, and the week closed fairly calm. The opening day was not bad. Views regarding the Moroccan outlook and our labour troubles were easier; but Consols had no heart in them. Tuesday was, however, a day of much depression. The new factor of Spanish commotion, and the hardening of money, put everything down. Consols fell $\frac{1}{16}$, Rails were heavy and dull, Americans lower, and the Foreign Market was moved by the death of M. Stolypin. Wednesday was worse. Conflicting statements in regard to Morocco from high authorities, and conflicting interpretations even of these, were bewildering. Everything gilt-edged was flat. Consols sunk below all previous depths by marking $76\frac{3}{8}$; and all the chief departments were affected. On Thursday, the worst of the clouds were past; but business was shy and cautious. Consols were a fraction better; and Rails had some brighter points. On Friday, the chief factor was the momentous Canadian elections. More hopeful views were taken of Morocco, Spain, and our own Railway unrest. Confidence revived. Government issues were strong. Consols rose $\frac{3}{16}$, Rails made good progress, and the Foreign Market was strong. The same favouring influences were in operation on Saturday; and markets in general rose. Consols closed $77\frac{1}{8}$. The Money Market was well supplied. A remarkable incident was a rise in the Bank rate of most of the European States. The Bank of England advanced to 4 per cent. Business in the Gas Market was not abundant. But prices were firm—impervious to the assaults that beat down the more susceptible markets, and affording one more illustration of the merits of gas as a steady-going investment. In Gaslight and Coke issues, the ordinary was quiet and unchanged, with transactions ranging from $106\frac{1}{8}$ to $106\frac{7}{8}$. In the secured issues, the maximum realized $84\frac{3}{8}$ and $84\frac{1}{8}$, the preference $102\frac{1}{8}$, and the debenture 81. South Metropolitan was more dealt in; and transactions were within the close limits of $116\frac{1}{2}$ and $117\frac{1}{2}$. The debenture made $79\frac{1}{2}$. In Commercial, the 4 per cent. made $111\frac{1}{2}$, the $3\frac{1}{2}$ per cent. 106, and the debenture 76. Among the Suburban and Provincial group, Brentford old marked from 258 to 260, ditto new 199 and 202, ditto debenture $98\frac{1}{2}$, Tottenham "B" $114\frac{1}{2}$ to $116\frac{1}{2}$ (a rise of 1), ditto debenture $96\frac{1}{2}$ free, Liverpool "B" $163\frac{1}{2}$ and $164\frac{1}{2}$, and Sheffield "A" 238—a rise of 2. In the Continental companies, Imperial marked from $181\frac{1}{2}$ to 183, Union preference $136\frac{1}{2}$ and $136\frac{3}{8}$, and European $18\frac{7}{8}$ and $19\frac{1}{8}$. Among the undertakings of the remoter world, Cape Town was done at 2, ditto preference at 4, Primitiva at $7\frac{3}{8}$ and $7\frac{3}{2}$, ditto preference at $5\frac{1}{2}$ to $5\frac{1}{2}$, ditto debenture at $98\frac{1}{2}$, San Paulo at $21\frac{3}{4}$, and ditto debenture at $50\frac{1}{2}$ and $50\frac{1}{4}$.

ELECTRICITY SUPPLY MEMORANDA.

Installing Electrical Cooking Appliances—Wise Words as to Cheap and Nasty Appliances—Thermal Storage for Cooking and Heating—A Mansion Owner's Smouldering Wood Panelling—Four Years after Installation—Eccentricities of Metallic Lamps.

IF one carefully reads contemporary electrical literature on the subject of electrical cooking, considerable confusion is apt to arise in one's mind, if there is not other knowledge to guide as to the exact facts of the case. We are told, on the one hand, that initial and installation costs, running costs, and so on are all in favour of electrical cooking compared with gas cooking. But though these things are said, and said by some of the most respectable-looking of electricians, there is no reason to adopt them as coming within the bounds of veracity. We have before us various articles published simultaneously only a few days since by some electrical contemporaries. There is one by Mr. Donald Smeaton Munro on wireless connectors for cookers, in which he offers a plan to manufacturers for getting rid of "some"—"some" does not mean all—"of the chief drawbacks to electric cooking." His proposal is one that will add considerably to installation costs; and we gather that his opinion is that, unless something of the kind is done, electric cooking will suffer. We all know that flexible electric connections are a perpetual source of trouble with any form of heating appliance. When flexibles are used for cooking, the insulation is soon destroyed by the heat, grease, and water; and without these destructive agencies, the very moving about of cooking utensils, soon causes the flexible to succumb to the treatment received. Mr. Munro points out that, if the flexible does not contain an earth wire or is not armoured, the risk of accident is "very considerable," and a shock or flash may mean the abandonment of the whole electrical kitchen. When leaking utensils connected by flexible are kept on an earthed metal surface, they are comparatively safe; but when they are lifted up, and the cook is making-contact with a metal surface or stone floor, then there is likely to be trouble. Bridget would be set dancing, and something

for dinner would be spoilt. Putting together all considerations, Mr. Munro is of opinion that it is vital to the general adoption of electricity that flexible cords should be got rid of altogether. They are eliminated if ordinary utensils are set on an electrically-heated hot-plate; but such a method of heating is very wasteful. Now there is Mr. Munro's plan of wireless connection. It is not difficult to understand. Single heaters with two plugs, or triple heaters with three plugs, may be used; the heaters being fitted with standardized parallel prongs for making electrical connection. A metal or wood table or shelf may be employed, so long as the surface is faced with metal, usually zinc, and the surface earthed. On to the top of the table are screwed two lengths of grooved and polished slate, with tube-contacts fixed at intervals across the seam between the two slabs of slate. The grooves in the slate are for the purpose of carrying the wiring. We will not go into details; but such a system being imperative according to Mr. Munro to avoid accidents, and to prevent the cook being frightened nearly out of her life by electric shock, it will be observed that here we have the design for a very expensive form of installation, which will hardly fit any pocket other than that of the wealthy.

Then simultaneously we have an article in the "Electrical Times" dealing with the initial cost of appliances, which some electricians say will now compare with gas-cooking appliances? Where costs compare, what about durability? The writer of "Installation Topics" in our contemporary (which contemporary once published and wasted a lot of labour, paper, and office and printers' ink on a domestic electrification number) issues a warning against the cheap class of electrical goods. His views are strongly worded. We are almost inclined to publish them *in extenso*; but as there are other topics to be referred to, we must content ourselves with epitomizing them, while preserving our own views as to such rash remarks as "results which cannot be equalled by gas or coal." We will forgive him such breakings away from wisdom as a sort of exchange for the remainder of his monitory remarks. He submits that "it is far better to adhere to high prices and supply a thoroughly trustworthy article than to put forward a cheap device which may break down at any moment." It would be better, he asserts, for the electrical industry at large if the development of electric cooking were deferred for another generation rather than to meet the present demand for cheapness by placing in the hands of users low-priced utensils, which cannot give lasting satisfaction. "There is now no difficulty in obtaining individual electric heating utensils or complete cooking ranges which will stand the racket of continuous wear and tear in the kitchen. They will give, permanently, results which cannot be equalled by gas or coal; but although running costs are by no means excessive, the initial outlay is heavy. A contractor may be able to sell ten electric kettles at 7s. 6d. apiece, for each one he could dispose of at double or treble the price; but the chances are that he will make ten enemies for life in place of a gratified customer. To offer a complete electric oven at 40s., again, is merely to ask for trouble; and a single dissatisfied user may do a great deal to hinder the progress of electric cooking." He adds that no permanent good can be gained by rushing through cheap and untried designs for the sake of working-up an immediate business; and for the present, makers must be content to exploit the large field existing among those in a position to buy outright. To induce consumers to buy cookers by offering them rubbish at low prices, is to sow the seeds of early discontent and prejudice, which will take a lot to overcome. This is a common experience. But we see from it that, to the substantial cost of installation—in order to, as far as possible, ensure safety, and to preserve the nerves of the cook or lady of the household—must be added heavy initial costs for the cooking appliances, as otherwise they can only mean rubbish, and the rubbish early discontent.

So costs are piling up. We turn to the "Electrical Engineer," and find that some further expense in equipment is needed if the running costs are to compete with those for the like work when done by gas. In the contemporary mentioned—the issue being the same date as the paper referred to in the opening paragraph—there appears an article, with the startling heading "New Principle of Thermal Storage: Remarkable Invention by Mr. C. Orme Bastian." The worthy Bastian's accomplishments, examined through a magnifying-glass by our contemporary, are to work marvels for the electrical industry. In the opening lines of the article before us, we learn there are complex problems involved in the economical utilization of electrical energy for the purposes of heating and cooking; and one fact that had to be faced was that, "in point of cost, electricity was not yet able to compete with gas in the household." There is truth as to the complex problems and the cost. But Mr. Bastian is credited with having solved the problem as to cost. He is the inventor of what is known as the "Quartzalite" system of heating, which is airily said to constitute a vital step in the evolution of the economic cooker and heater; and "with an efficiency closely approximating 100 per cent., this must long remain an important factor in relation to the domestic applications of electricity. But he has made another "long stride" in devising an entirely new system of thermal storage. The ideal aimed at was a device which would render possible the accumulation of electrical heat up to two maxima—one for heating and one for cooking. The first named end is said to be secured by a method under which the current "leaks in," as it were to a "hot box" during the slack period; and thus gradually piles up heat, which can be utilized as and when desired, and for various purposes—the

purpose itself being more particularly regulated by the size of the thermal storage chamber.

In the new device here referred to, the "Quartzalite" glowers are used as the medium for the conversion of the current into "real red heat," as in the Bastian cookers and heaters; but the secret of the new device lies in the method adopted for retaining, and, so to speak, "piling-up" the heat until it reaches any desired maximum, while at the same time the device is so ingenious as to give enormous latitude with regard to the size of the chamber. After the gradual charging process has been in progress during the night or for any specified period, the individual units can be transported to any part of the consumer's house where they may be needed to be utilized either for heating or cooking. Another important feature is that so long as the "hot box" is kept closed, there is practically no loss of heat; but immediately the sliding doors at the top and bottom are opened, a current of air passes through, and the heat is either distributed in a room, or else concentrated in an oven for cooking purposes. In short, what the thermos flask has done for hot liquids, the Bastian "hot box" will it is said, accomplish for actual heat. This is briefly the idea; but how it is going to reduce costs to the electricity consumer, and how there is to be storage, and utilization from storage, without some loss, are matters that must be proved by time and experience. The fact remains that the thermal value of 6 cubic feet of coal gas is equal to that of a whole unit of electricity. Mr. Bastian cannot make the latter of greater thermal value. However, here we have three electrical papers in one week showing in different ways how costs must be piled upon the user of electricity for cooking and heating, in order to endeavour to obtain satisfaction.

Last week reference was made to the annoyance of electricians over the proposal of a Committee of the London County Council to make it obligatory on London hotel and lodging-house keepers where electricity is employed to have the wires encased in metal tubing instead of being boxed in by wood. Bearing upon this matter, and the comments in the "Memoranda" a week since, we have a distinctly interesting report in the "Yorkshire Post" of the 16th inst. The narrative is worth reproducing:

A fire which might have had serious consequences was narrowly averted on Thursday night [Aug. 14] at Sutton Hall, near Thirsk, the residence of Mr. J. H. Edwards. The family had dined earlier in the evening than usual; and about half-an-hour after they had left the dining-room, Mr. Edwards sent his little daughter back to the room for something. When she placed her hand on the electric light switch inside the room, she was surprised to find that the button burnt her finger. She at once informed her father; and the butler was sent to see the cause. The room is panelled in wood; and on examination the panelling near to the switch button was found to be hot and charred almost the whole distance from the floor to the ceiling. The wires, which run between the panelling and the stone wall, had apparently fused; and although no flames could be seen, the wood was smouldering for some distance. Owing to the great age and dryness of the panelling, the fire would no doubt have spread rapidly if it had not been discovered; and the house and its valuable contents might have been destroyed.

In a conversation with the Thirsk correspondent of our contemporary, Mr. Edwards said he thought the incident was deserving of the very close attention of insurance companies, as well as of the owners of old country residences, to say nothing of public institutions and the ordinary householder. The electric installation in this case had been running for four years, had never hitherto given any trouble, and had been considered perfectly safe; and in these circumstances it becomes a question of how many buildings installed with electric light may be considered safe. Mr. Edwards suggested the desirability of a public inquiry on the general subject of the precautions possible against the fusing of electric wires in buildings. The statement as to the lapse of four years before this trouble occurred, further illustrates our comments of last week. It was an ugly experience for Mr. Edwards and his family; and his confidence in the safety of electric wiring has received a rude shock.

A correspondent of the "Electrical Times," signing himself "Lucerna," has been studying the eccentricities of metallic filament lamps. In a recent letter he calls attention to one peculiarity that he has observed, and promises to mention others if someone can give him a plausible explanation of this one. His letter may be quoted:

A few months ago I arranged a 100-volt 25-candle power lamp (A) and a 50-volt 16-candle power lamp (B) in a two-holder bedroom fitting. One lamp was tantalum, the other tungsten; but both metals are doing excellently under normal conditions in the same house. The alternating current pressure was 50 volts. "B" was used for ordinary purposes; "A" and "B" were switched into series as a night-light. Lamp "A" was nearly, but not quite, new when it started. After about one month's use at this fractional voltage, it gave out. I assumed this to be accidental, and replaced it with another lamp of exactly the same kind and rating. After five or six weeks, this also yielded up the ghost. Meanwhile lamp "B," though nightly subjected to its full working pressure, continues in good health. Is there any reason why metal filaments of any known type should deteriorate rapidly on such a reduced pressure? I should have thought such a condition would ensure them a ten years' life.

The Editor of the "Electrical Times" does not offer a "plausible explanation" of the phenomenon, "Lucerna" cannot do so himself, nor are we prepared to assist him. But the point is worth investigation.

MR. J. H. BROWN, OF NOTTINGHAM, RESIGNS.

It may possibly come as a surprise to many of our readers to learn that Mr. J. H. Brown, the Gas Engineer to the Nottingham Corporation, has sent in his resignation to the Gas Committee; and he will leave their service at Christmas, if not before. The immediate cause of this step, we believe, was the refusal of the City Council to confirm a resolution unanimously passed by the Committee to increase Mr. Brown's salary by £200 per annum, in accordance with a promise made under the following circumstances: When the filling-up of the vacancy at Birmingham was under consideration, Mr. Brown was invited to appear before the Sub-Committee who had the matter in hand. Thereupon the Nottingham Gas Committee (through the Mayor) offered him an advance in his salary of the amount already named if he would agree to remain in Nottingham for at least three years more. He accepted the offer, which was unanimously endorsed by the Committee; and their resolution was placed upon the *agenda* of the Council. Its consideration had to be postponed, however, in consequence of a resolution the Council had passed deferring all advances in salaries to officials in receipt of more than £150 per annum until a Special Committee had investigated and had reported upon the possibility of paying all the employees of the Council over 21 years of age a minimum wage of 6d. per hour. The Gas Committee's resolution was held over until this autumn; and when it was again presented, with the support of the entire Committee, it was defeated, together with several other recommendations in regard to salaries. Mr. Brown will consequently leave Nottingham, and take the position of Managing-Director of Messrs. Joseph Brown and Co., Limited, Chemical Manufacturers, of Dewsbury, rendered vacant by the death of his father in May last, as the result of an illness which, it may be remembered, prevented the son attending, as President, the spring meeting of the Midland Association of Gas Managers.

The step Mr. Brown has taken will remove from the front ranks of the gas profession a member who, though young, has figured conspicuously in it. In early life he was Chemist in the firm of which he will now be Managing-Director; and his first appointment in connection with gas engineering was as assistant to Mr. Charles Armitage at Lancaster. Early in 1898, he obtained a position with the Ilford Gas Company, where he took in hand the remodelling of the distributing system. The following year, the Directors instructed him to prepare a complete scheme for the development of the whole of the land they had recently purchased for the extension of the works; and it met with the approval of Mr. Corbet Woodall, who said it reflected great credit upon the designer. The works were proceeded with; and a water-gas plant was subsequently erected. This varied experience specially qualified Mr. Brown for the position of Gas Engineer to the Nottingham Corporation, rendered vacant by the death of Mr. W. R. Chester; and soon after his appointment he presented reports on the condition of the works, which were also inspected and reported upon by the late Sir George Livesey. It is unnecessary to refer here to the discussions to which they gave rise. Suffice it to say, that Mr. Brown did not have a very comfortable time during their progress. He, however, has worked well for the gas undertaking; and he had the satisfaction a short time ago of submitting his report for the year 1910-11, which showed record carbonizing and selling results. While busily engaged in conducting the gas-works, he found time to carry out the elaborate series of experiments with low-grade mixed gases of which the results were embodied in the paper he read before the Institution of Gas Engineers in 1905, and for which he was awarded the London Gold Medal. Although his life-work in the future will not be devoted to the gas industry, he hopes to render good service to it in the capacity of consultant.

Referring to Mr. Brown's resignation, our local correspondent, writing last Saturday, said: "One of the principal provincial appointments in the gas engineering profession will shortly become vacant through the resignation of Mr. James Herbert Brown, Engineer and General Manager of the Nottingham Corporation undertaking, who at a meeting of the Committee held this week tendered his notice, which was accepted, and will take effect at the end of the present year. Mr. Brown will then have held the office for nine years, having entered upon his duties in January, 1903. The announcement of the approaching severance of his association with a Corporation, some former members of which did not at one period of his engagement appear to treat him with the strictest impartiality, has given rise locally to the rumour of there being another 'rift within the lute.' But the information is forthcoming that the resignation proceeds from Mr. Brown's desire to be free to undertake the managerial control of the extensive business established by his father, who died in May—that of Messrs. John Brown and Co., chemical manufacturers, of Dewsbury. The position vacated, though not representing one of the largest prizes in the profession, has attached to it an emolument of fairly substantial proportion. While Mr. Brown's tenure of office has not been free from controversy which at one period occasioned in Nottingham unnecessarily heated feeling, the incidents were mainly the outcome of judgments pronounced by self-constituted critics, who possessed no qualification to judge of technical detail. Results have adequately warranted the methods for which the retiring Engineer has been responsible; and for alleviation of heavy local burdens Nottingham ratepayers owe much to Mr. Brown's wise administration."

PERSONAL.

Mr. W. RAPLEY, late of Gillingham (Dorset), has been appointed Manager to the Hawkhurst Gas Company, for which position (it was advertised in the "JOURNAL" for the 5th inst.) there were a large number of applicants. He will commence his duties on the 7th of October.

From a long list of applicants, in response to the invitation which appeared in the "JOURNAL" a fortnight ago, for the position of Manager and Secretary to the Longridge Gas Company, the Directors have appointed Mr. JAMES LEE, at present Manager and Secretary of the Mullingar Gas Company. Mr. Lee was formerly at Carnforth.

OBITUARY.

Alderman JOSEPH COLLINSON, whose death, at the age of 65, was recently announced, entered the Halifax Town Council in 1891, and did a great deal of work in connection with the Gas Committee, of which he became Vice-Chairman in 1903, and Chairman in 1905. For several years he had a seat on the Council of the local Chamber of Commerce.

The death is announced as having taken place on the 16th inst., at Pudsey, of Mr. JOSEPH GAUNT, of Rodley. The deceased was a Director of the Harrogate Gas Company, and at the interment last Tuesday, at Pudsey Cemetery, the Company were represented by three of his colleagues on the Board—Messrs. S. Spencer, H. Beaumont, and J. W. Knowles. The absence from town of the Chairman of the Company (Mr. F. Barber) and some pressing engagements of the General Manager (Mr. H. Wilkinson) prevented their attendance.

Examination Prizes.

The Council of the Society of British Gas Industries have (we are informed by the Secretary, Mr. Arthur L. Griffith) decided to give £10 10s. in prizes annually on the results of the City and Guilds of London Institute's Examinations in Gas Supply and Gas Engineering (Honours Grade). The prizes will be awarded as follows: Gas Supply, Honours Grade: First Prize, Three guineas; Second Prize, Two guineas. Gas Engineering, Honours Grade: First Prize, Three guineas; Second Prize, Two guineas.

The Gas Publicity Campaign in Germany.

The German central organization for promoting the sale of gas reports that in the past winter 180 lectures on the use of gas were given by three ladies under its auspices. The lectures were undertaken—as to 78 for municipal gas-works, as to 78 for gas-works owned by companies, as to 11 for associations and exhibitions, and as to the remaining 13 for places which are not yet supplied with gas, but in which a supply is desired. The towns where the lectures have been given are fairly uniformly distributed over the German Empire, except that the Grand Duchy of Baden has so far been neglected. Having regard to the relatively small number of gas-works in Germany owned by private companies, it is pointed out, as evidence of the greater activity of private companies in promoting business, that as many lectures have been given on their behalf as on behalf of corporation gas works.

London and Southern Junior Association Programme.

The first item on the programme of the London and Southern District Junior Gas Association (of which Mr. J. G. Clark is President) for the forthcoming session is a social gathering at the Festival of Empire Exhibition at the Crystal Palace next Saturday. The members and lady friends have been invited by the Directors of the South Suburban Gas Company to take tea in the Garden Club; and the party will assemble near the large clock at the south end of the Palace at 3.45. Subsequent items on the programme are as follows: Oct. 27, an address by Mr. A. F. Browne, followed by an address by the President. Nov. 11, visit to the Old Kent Road Station of the South Metropolitan Gas Company. Nov. 24, a paper by Mr. E. G. Stewart, on "Carbonizing, with Special Reference to High Makes." Dec. 2, a visit to the works of the Gas-Meter Company. Dec. 15, a paper by Mr. S. A. Carpenter, on "Hot Water." Jan. 13, an afternoon visit to the Westminster compressing station of the Gaslight and Coke Company; and an evening visit to the printing works of the United Newspapers, Limited. Jan. 26, a paper by Mr. F. A. Frost, on "Efficient Condensation and its Advantage." Feb. 10, a visit to the Kensal Green Station of the Gaslight and Coke Company. Feb. 23, an address by Mr. W. R. Herring, on "Constructional Details," to be illustrated by lantern slides. March 2, the annual dinner. March 16, a visit to the works of the James Keith and Blackman Company, Limited. March 29, a paper by Mr. F. Caudwell, on the "Uses of Gas for Domestic and Industrial Purposes." April 13, a visit to the works of the Mitcham and Wimbledon Gas Company. April 26, a paper by Mr. N. B. Hodgkin, on the "Distribution Department." May 11, summer meeting at Margate, and a visit to the works of the Isle of Thanet Gas Company. May 24, the annual general business meeting.

THE LAW RELATING TO GAS AND WATER, BY MICHAEL AND WILL.*

[Reviewed by A. M. Paddon, Esq., Barrister-at-Law.]

EVERY branch of industry of sufficient importance is provided with its standard legal text-book; but it is rather more than doubtful if any such section is so well served as that of gas and water by the work in case.

In its inception, the duty of compiling this text-book was most fortunately committed to Counsel of the standing and capacity of William Henry Michael and J. Shiress Will. Through the successive editions issued from time to time, it has never fallen away from its high initial standard of excellence; and the sixth edition markedly supports this sustained quality.

With something like 1300 pages of closely-printed matter—the closer consideration of which will convince the reader that nothing contained therein could be dispensed with without disadvantage—anything more than a general survey is impossible.

The general introduction in itself, with gas and water legislation categorically and chronologically arranged, is of the greatest practical value. Any company official having the acquisition of further parliamentary powers in contemplation, and having satisfied himself as to his objectives, can by reference to these schedules immediately apprise himself of the attitude of Parliament in regard to what he desires. With the "Model Bill" added for the purpose of reference, his work should be comparatively easy up to the point at which it is necessary to hand it over to the Parliamentary Agents.

The arrangement of the Incorporated Acts peculiar to gas and water is excellent; and the cases appended to each important section are clearly and concisely stated up to the latest practicable dates. The Act of 1847 can always be re-read usefully, affording as it does, in the writer's humble judgment, an example of the superiority of the older and more carefully considered legislation, as against modern and more hurried enactments. Clauses 6 to 12 are so vital to the interests of gas companies, and constitute such a complete answer in themselves to any attacks on the powers they convey, that they can always be studied and restudied with advantage. Nine out of ten managers would say that they are conversant with the provisions of these sections; but not one in a hundred could support close examination as to their details. The Metropolitan Gas Acts, which, as has often been pointed out before Parliamentary Committees, are the basis of provincial legislation, are here dealt with separately and clearly. Finally, we have the Incorporated Acts of a general character—such as the Companies Clauses Consolidation Act of 1845—thus making the work absolutely compendious.

In essaying a production of this kind, laymen, however conscientious their work may be, generally fail to grasp the absolute necessity, in these days of legislation by reference, of including General Acts together with special ones; and many works are rendered nearly useless by this omission.

It may justly be said of this new edition that almost every legal problem likely to arise in practice can be completely and exhaustively inquired into between the front and back of this most excellent book. And last, but not least, that uncommon thing, a good index, is provided.

The editor of this edition is to be sincerely congratulated upon the successful way in which he has discharged the office of his distinguished predecessors.

* "Michael and Will on the Law Relating to Gas and Water." Sixth Edition. By Joshua Scholefield, Esq., of the Middle Temple and North-Eastern Circuit, Barrister-at-Law. London: Butterworth and Co., Bell Yard, Temple Bar; 1911. [Price 42s.]

STATISTICS OF DUTCH GAS-WORKS.*

WE have received a copy of the volume of statistics of the working results of gas-works in Holland for the year 1909, which has been prepared by Heer P. Bolsius, the Manager of Bois-le-Duc Gas-Works, Heer M. van der Horst of the Amsterdam Gas-Works, and Heer G. A. Brender à Brandis of The Hague Gas-Works. The volume follows the same lines as previous annual statistics; but this year Heeren Bolsius and Van der Horst, who have been solely responsible for previous volumes, have had the assistance of Heer Brender à Brandis in compiling it.

The particulars contained in the present issue relate to 138 gas undertakings, as compared with 129 and 121 in the statistics for 1908 and 1907. [See "JOURNAL," Vol. CX., p. 366.] The rapid growth in the comprehensiveness of the volumes of statistics is gratifying evidence of the appreciation of the authorities of Dutch gas-works of their utility and value. Only a few quite unimportant undertakings have not contributed the desired information.

* "Statistiek Overzicht der Bedrijfsresultaten van de Gemeentegas-fabrieken en eenige particuliere gasfabrieken in Nederland, in 1909." Bewerkt door P. Bolsius, 's-Hertogenbosch, M. van der Horst, Amsterdam, en G. A. Brender à Brandis, 's-Gravenhage. Vertrouwelijke Mededeeling. C. N. Teulings, 's-Hertogenbosch; 1911.

to the present volume. Fuller information is given in many respects than in the earlier annual volumes of statistics. The exhaustiveness of the present volume may be gathered from the following statement of the headings under which the particulars are arranged: Population of town and suburbs supplied; date of foundation of gas-works and name of present manager; amount of English and German coal carbonized, and make of gas per metric ton; quantities and nature of enriching materials used; total make of coal gas and of water gas; maximum and minimum make of gas *per mensem* and *per diem*; gas storage capacity of works; number of settings and retorts and their description, and extent of their use during year; number and description of water-gas generators, and amount and nature of materials used in water gas manufacture; illuminating power and calorific value of water gas made, and proportion of carbonic acid contained in it; consumption of gas for public lighting and by private consumers through ordinary meters and through prepayment meters, and consumption in other directions; make and quality of various bye-products; details of street lighting and of number of gas-meters employed; distributing pressure; length of mains in district; amount of oxide used in purification, and whether air is used for revivification *in situ*; average illuminating power of gas supplied and description of photometer used, and average calorific power of gas and description of calorimeter used, with number of times of testing. An appendix gives certain further particulars in regard to some of the works.

It will be seen how valuable to those interested in the gas supply of their country such a compilation is. We refrain from giving extracts from the information furnished by the statistics because the compilation is stated to be confidential. It is, we believe, primarily prepared for the use of members of the Dutch Association of Gas Engineers, which defrays the cost of its publication, but nevertheless is made accessible to any persons interested.

LABOUR DISPUTES DURING 1910.

WHILE the entire population of the United Kingdom has its attention more or less focussed upon the strike fever which has lately, and with unusual severity, attacked various sections of the working classes, there is issued the report of the Labour Department of the Board of Trade on "Strikes and Lock-Outs in 1910." It is the twenty-third volume of the series; and it bears the signature of Sir G. R. Askwith. There is also dealt with the work of the Conciliation and Arbitration Boards; but this portion may be left over for notice on a subsequent occasion.

The disputes of last year are now a thing of the past; and when later statistics come to be prepared, they will probably be found to be more serious than those for the immediately preceding twelve months. At the same time, 1910 was, as the report points out, marked by considerable industrial disturbance. The number of workpeople involved in disputes commencing during the year was the highest since 1893; while the aggregate duration of all the disputes in progress during the year has been exceeded on only four occasions within the last eighteen years. This regrettable state of affairs was caused by great disputes in the coal trade of Northumberland, Durham, and South Wales, in the shipbuilding industry in the North of England and in Scotland, and in the cotton-spinning industry of Lancashire and Cheshire. These five disputes alone affected 265,100 workpeople at the establishments concerned, and involved a loss in time of over 6½ million working days. In addition to this, of course, there has to be taken into consideration the serious consequences to many persons indirectly affected. Of the 385,085 workpeople directly involved in the disputes commenced in 1910, 114,793, or nearly 30 per cent., were engaged in disputes on questions regarding the employment of particular classes or persons. This percentage was unusually high—a fact explained by the trouble in the cotton industry, which involved 102,000 workpeople, and arose out of the discharge of one man. Next in importance as regards numbers involved were disputes on questions of hours of labour, which accounted for 91,927 workpeople, or 24 per cent. of the total. Chiefly responsible for this figure were the disputes in the coal-mining industry of Northumberland and Durham over the re-arrangement of working hours entailed by the Coal Mines Regulation Act, 1908. Disputes regarding questions of wages affected 76,474 workpeople, or only 20 per cent. of the total. This is a cause of trouble which, in relation to the total number of employees concerned in disputes in any particular year, is always of a very fluctuating character. In the past ten years the proportion of workpeople involved in wages disputes (as compared with other troubles) has ranged between 79 per cent. and 20 per cent. Disputes on details of working arrangements were more numerous in 1910 than in any of the eight previous years; and cases arising from refusals to work with non-unionists, and out of other questions of Trade Union principle, were more numerous than in the two preceding years—the coal mining industry being responsible for the great bulk of them, owing to the sustained efforts of the South Wales Miners' Federation to compel all non-unionists to join their ranks.

A table which is of general interest is that showing to what extent the disputes of the year were settled in favour of the employees or the workpeople, or else were compromised. In disputes arising out of demands for increased wages, no more than 10 per cent. of the workpeople involved obtained complete success. There were, however, compromises representing some advance in wages arranged by 74 per cent. of the workpeople; while some

14 per cent. failed to gain anything. Generally speaking, disputes arising out of resistance to proposed reductions in wages were compromised. In all the wages disputes of the year, 8 per cent. of the workpeople directly involved were successful in attaining their objects, 14 per cent. were unsuccessful, and 75 per cent. effected compromises. Hours of labour disputes over the Coal Mines Act were amicably settled at a number of the collieries concerned. As to questions of Trade Union principle (in many of which cases the disputes were between one body of workpeople and another, and not between employers and employees) most of the strikes were successful; and in connection with troubles regarding the employment of particular classes or persons, the results were about equally divided. In other classes of disputes, the balance of success was, on the whole, against the workpeople. Taking all disputes of the year together, no more than 16·3 per cent. of the workpeople directly involved were completely successful in attaining their object; and this proportion, it is pointed out, would be materially reduced if disputes concerning the employment of non-unionists (which do not usually concern the employers to the same extent as other disputes) were excluded. The proportion of workpeople who were unsuccessful was 13·6 per cent., and of those who effected compromises 69·5 per cent. In a small number of cases no settlement had been arrived at when the year closed. The proportion of workpeople successful in the previous year was about 5 per cent. smaller than on this occasion, while that in favour of employers was 9 per cent. greater—3 per cent. more cases having been compromised in 1910 than in 1909.

The total number of disputes which began last year was 531, as compared with 436 in 1909, and 399 in 1908. The persons directly and indirectly involved numbered 515,165 last year, as against 300,819 in the preceding twelve months. The employees indirectly involved are those thrown out of work at the establishments where the disputes occurred, although not themselves on strike or locked out. Workpeople indirectly involved at other establishments than those at which the disputes occurred are not included. The aggregate duration of all the disputes in progress during the year amounted to over 9½ million working days. In 1910, the mining and quarrying industries accounted for the greatest number of workpeople involved in disputes—that is to say, over 57 per cent.

The proportion of the total number of workpeople engaged in industrial operations who were involved in disputes last year (though the number of persons concerned was the highest recorded since 1893) was no more than 5 per cent.—which figure compares with 2·9 per cent. in the years 1909 and 1908. The proportion was again highest in the coal-mining industry, where it amounted to 28·9 per cent., and it was lowest in the building trades. The aggregate duration of all disputes in progress in 1910—9,894,831 working days—was about one three-hundredth of the whole number of working days available for the industrial population, exclusive of agricultural labourers and seamen. In other words, the amount of working time lost owing to disputes last year was less than one day per head of the industrial population. In the coal-mining industry the average loss of time was about five days per head of those employed; while in the metal, engineering, and shipbuilding trades it amounted to about two-and-a-quarter days per head. As is generally the case, the majority of the disputes were of short duration—259 of the 531 disputes which began in 1910, or 49 per cent., having lasted less than a week, while the proportion lasting less than two months formed 87 per cent. of the total.

Of the 9,894,831 working days lost in 1910, the mining and quarrying industries accounted for nearly 56 per cent. The amount of time lost by disputes in the coal-mining industry was 5,476,260 working days, and was, as a matter of fact, the highest figure recorded since 1898—the year of the dispute in the South Wales coalfield. This big loss of time was, of course, due to the protracted disputes in Northumberland, Durham, and South Wales. Other mining and quarrying industries accounted for only 47,900 days. Of the 224 disputes in the mining and quarrying industries which began in 1910, wages accounted for 122, hours of labour for 12, employment of particular classes or persons for 23, working arrangements for 37, Trades Unionism for 23, sympathetic disputes for 5, and miscellaneous causes for 2. Of all these questions, by far the greatest number of men were concerned in the twelve "hours of labour" disputes. The 23 trades unionism disputes ended as follows: In favour of the workpeople, 17; in favour of employers, 5. One case is classed as indefinite or unsettled. Altogether in the mining and quarrying industry, the proportion of workpeople directly involved who were successful in the disputes beginning in 1910 was 18·8 per cent., unsuccessful 14·2 per cent., compromised 65·8 per cent., indefinite or unsettled 1·2 per cent.

We have received from the Principal of the Northampton Polytechnic Institute, St. John Street, Clerkenwell, E.C. (Dr. R. Mullineux Walmsley), a copy of the recently issued "Announcements" for the session 1911-12. There are day and evening courses in mechanical and electrical engineering, electro-chemistry, and technical optics; and in the evening classes a series of lectures on illuminating engineering will be given by various specialists. These lectures constitute an important development in the work of the Institute. The evening classes commenced last night; and the day ones will start next Monday. Full details of the syllabuses of the courses and the equipment of the Institute will be found in the "Announcements."

HYGIENIC VALUE OF GAS LIGHTING.

THE current number of the "Illuminating Engineer" of New York contains an article on the above-named subject by Mr. R. F. Pierce, in the course of which he makes the following remarks.

One of the greatest advantages of gas lighting, and one that, strangely enough, has received little or no attention, is the highly beneficial effect upon the quality of the air in illuminated interiors. As this effect is not at all obvious, but on the contrary the reverse would, upon casual consideration, appear to be true, it is highly desirable that the facts in the case should be set forth in such a manner as to admit of the rational comparison of different illuminants in this respect. Many people carelessly and unthinkingly assume that because the burning of a gaslight discharges products of combustion into the room, a perceptible vitiation of the atmosphere must result. As a matter of fact, the precise reverse is the case; and this really constitutes one of the greatest advantages to gas over electricity for illuminating purposes.

The combustion of gas produces from a chemical standpoint four different effects upon the air taken from the room, mixed with the gas in the burner and discharged back into the room. These effects are: (1) The amount of oxygen is reduced. (2) The amount of carbonic acid gas (CO_2) is increased. (3) A very small amount of sulphurous gas (SO_2) is generally added. (4) Organic impurities and deleterious substances are removed by incineration. The first, second, and third effects are caused by the oxygen combining with the carbon and sulphur contained in the gas; and this oxidizing process generates heat in sufficient quantities to raise the mantle to the temperature of incandescence— 1500° Fahr., which is sufficient to produce the fourth effect.

The physical effects produced upon the air are: (1) The temperature is increased. (2) The circulation of the air in the room is accelerated, and the ventilation from the outside is increased. As the quality of the air in the room at any time depends upon the interaction of the incoming fresh air upon the products of combustion discharged from the burners and the organic matter exhaled from the lungs and skin of the inhabitants of the room, it is necessary to investigate the inter-effects of all three.

On account of the tendency of heated air to expand, become lighter, and rise, the presence of any source of heat in a room produces a certain circulation of the air, which serves a double purpose. In the first place, the heated air is cooled by contact with successive portions of the relatively cool walls; and in the second place, the temperature in the upper portions of the room tends to increase, while that in the lower portion tends to decrease below that which would prevail without circulation. This produces an unbalanced pressure from the outside, tending to draw fresh air in at the bottom of the room through crevices, joints, and other openings, and also to a greater extent than is ordinarily realized through the walls themselves. The same action tends to expel the air in the upper portion of the room in the same manner; and this tendency is, of course, greatly augmented by increased facilities for ventilation.

As a gas-lamp produces about six times as much heat as a Mazda or tungsten lamp of equal illuminating power, it follows that the ventilating effect is correspondingly greater. At first thought, it might appear that the use of gas-lamps for ventilating purposes would be very inefficient, and that their effect would be practically negligible. While positive assurance derived from actual installations is submitted later on, it may be well to call attention at this point to the fact that in many chemical laboratories, where the air is being constantly vitiated by noxious vapours, the principal means of exhausting the contaminated air is through the use of an open gas-jet placed in a suitable vent. The ventilation produced must, of course, be far more effective than that required for any ordinary purpose, as the contamination of the air is exceptionally rapid. Of course, in making use of the ventilating properties of gas-burners, a balance must be struck between the amount of radiant heat generated and the rapidity of ventilation. It does not follow that the foulness of the air is always decreased by increasing the amount of heat generated in the room. This is, of course, perfectly obvious. The writer only purposes showing that under the conditions usually met in lighting practice the substitution of gas for electric lighting will generally produce this effect—other conditions being equal.

In considering the concurrent effects of light sources and the incoming air upon the average quality of the interior air at any moment, it is necessary to inquire into the nature and effects of the vitiating substances. Generally speaking, these are divided into two classes—those emitted by the respiration, both from the lungs and the skin of the people in the room, and those emitted by the illuminants. The first class includes germs of the diseases transmitted by germs, which, when taken from the air into the system through the mouth or skin, will produce their characteristic diseases. As a matter of fact, the supposedly fresh air from the exterior is often heavily laden with germs of this character. More commonly than any other are felt the effects of the vitiation produced by the organic matter in a greater or less advanced stage of decay exhaled by the lungs. This produces the stuffiness in a poorly ventilated room which is sometimes ignorantly attributed to carbonic acid gas.

As between gas and electric lighting, the former is the only one contributing any products of combustion whatever; and these are carbonic acid gas, sulphurous acid gas, and water. Carbonic acid gas is present in the purest of outdoor air in the proportion of

about four parts in 10,000, and produces no discomfort or ill-effects if less than 225 parts in 10,000 of air are present. On account of the ability of gases to diffuse through even the tightest walls used in building construction, the proportion of carbonic acid gas in interiors rarely rises above 20 parts in 10,000, though for experimental purposes this proportion has been made as high as 50 parts in 10,000. This was accomplished only by resorting to exceptional means to secure a high percentage of this gas. Thus, practically speaking, it may be said it is impossible in practice to obtain enough carbonic acid gas in an ordinary room to produce the slightest effect upon the bodily functions, even when the most sensitive tests are employed to detect such effects.

Sulphurous acid gas when present is in such almost infinitesimal quantities that it is disregarded by investigators, so far as effects on the health are concerned, though unscrupulous or ignorant salesmen of lighting appliances frequently attempt to make capital of it. While it is in the quantities found entirely harmless to the human organism, it has a decided sterilizing effect as regards disease germs.

While it is true that carbonic acid gas artificially produced—that is, by the combustion of gas—is entirely innocuous in any quantity met with in human habitations, it must not be assumed that such quantities of this gas exhaled from the lungs may be regarded as an indication of sanitary conditions. On the contrary, even 15 parts of carbonic acid gas in 10,000, if arising from the respiration of human beings, indicates the presence of organic matter in such quantities as to be highly obnoxious or even harmful.

In this connection, it should be noted that the vitiation of air by human beings is generally expressed as a percentage of carbonic acid gas, because it indicates the amount of organic matter which has been given off in the same period; and while the latter (which is the real source of pollution) is difficult to measure, the carbonic acid gas is easily determined. From a sanitary standpoint, therefore, figures regarding the quantities in which carbonic acid gas indicates harmful conditions apply only to this gas when thrown off by the lungs, and not to the same gas produced by artificial means such as the operation of gas lights.

It is evident that the absurd practice of rating each gas-burner as equal to a certain number of human beings in vitiating the air in interiors is not only highly ridiculous, but precisely opposite to the dictates of common sense and the testimony of established facts; for the presence of gas-burners actually removes the vitiating matter.

[In order to substantiate these statements, the author summarizes very briefly the valuable paper contributed to the Royal Sanitary Institute about three years ago by Dr. Samuel Rideal, and given in the "JOURNAL," Vol. CI., pp. 613, 686.]

In the general summary, Dr. Rideal stated, first, that gas-burners give rise to stronger air currents and invariably produce a more active ventilation and diffusion of air than electric lights. Hence, along with the products of the gas-burner, the exhalations of the persons present were more rapidly removed. Secondly, the ascending currents of air from the gas lights on reaching the ceilings rapidly parted with their heat, which was conducted away by the rafters and joists. Thirdly, the electric lamps produced more heat than is commonly accredited to them; and this is the explanation of the unexpected result that the average temperature of the room was practically the same under either illuminant, and that the electric light did not show the superiority in coolness usually claimed.

While the careful and exhaustive tests of Dr. Rideal would appear to be most convincing as regards the absence of the noxious products sometimes ignorantly attributed to gas-burners, it may be worth while to note, for the benefit of the ultra-sceptical, that nearly all competent authorities agree that even if the carbonic acid gas contents of the air were increased (which is not the case) such increase could not produce ill-effects. Dr. Angus Smith shut himself in an air-tight chamber with a lighted candle, and remained until the candle was extinguished by the high carbon dioxide content produced (229 parts in 10,000); yet he felt no ill-effects. Dr. Richardson removed all the carbon dioxide from air that had once been breathed, and found that animals introduced into such air dwindled away rapidly and died. Pettenkofer found that 100 parts of carbon dioxide in 10,000 parts of air were not injurious to human beings; while one-tenth the amount of this gas derived from lung and skin exhalations rendered the air unfit for human habitation for any length of time. Proof of a similar nature from the experiments of recognized authorities might be multiplied almost indefinitely.

It would seem, therefore, that the bugbear of increased carbon dioxide content from gas-burners may not only be said to exist only in the imaginations of interested exploiters of competitive illuminants, but, furthermore, if it did exist, would be perfectly harmless. Another feature of even greater importance is the effect upon the eye. This subject has been carefully avoided by the antagonists of gas lighting with that discretion which is the better part of valour.

It would appear, therefore, that, in calling attention to the alleged shortcomings of gas lighting from a hygienic standpoint, its antagonists have only succeeded in shifting the burden of proof of the absence of unhygienic qualities on to their own shoulders.

Dr. G. Marconi has been elected President of the Junior Institution of Engineers, in succession to Sir J. J. Thomson, F.R.S.

THE ELECTRICAL EXHIBITION AT OLYMPIA.

WE can congratulate the electrical industry on the general character of their extensive exhibition at Olympia which was—following an inaugural banquet at the Trocadero Restaurant the previous evening—opened last Saturday by the veteran electrical expert (Sir William H. Preece, K.C.B., the President), and will continue open until Oct. 21. We can also congratulate the majority of the exhibitors upon the close completion of their stands by the opening day. They worked for most part zealously to that end; and their success is a pattern to others. We can further congratulate our competitors upon the interest that they managed to arouse in newspaper land prior to the exhibition. But nevertheless we cannot congratulate them upon the amount of interest that the public has shown, during the first days, in the display; but perhaps public patronage will come later, though there are groanings, sincere and deep, at the present neglect of electricity suppliers in the matter of buying admission tickets in bulk, and then distributing them gratis among the public. When a householder has to pay fares for himself and the supreme being in his domestic affairs to reach Olympia, and then to pay 1s. each for admission, for the purpose of inspecting what is purely an elaborate advertisement, he looks at the shillings to be expended, and calculates that it will go some way towards a better evening's entertainment at a theatre or elsewhere. The electrical papers have all administered to the electricity purveyors a little admonition on the subject; and the "Electrical Review" has warned them that that savage beast "the gas tiger is alert and athirst for the consumer's blood." This is strikingly characteristic; but it may serve its purpose of stimulating the apathetic suppliers.

HOPE, GLARE, AND SAFETY.

Great things are expected from the month's display, notwithstanding the inaction of the suppliers prior to the opening, and the irresponsiveness of the public on the occasion. One of our electrical contemporaries "hopes and believes that the exhibition will mark the turning-point in our industrial history;" and another says "it bids fair to mark a new era in the history of electrical progress." We shall see. Altogether the exhibition comprises some 300 exhibitors, occupying 330 stands. What they have to show proves a larger solid advance since the last exhibition on industrial rather than on domestic lines—limiting our observation to the part of the electrical industry with which we come into competition. In lighting, progress has been made in efficiency through the metallic filament lamp; but even so there is little in the exhibition of which we had not knowledge before, and nothing which (in view of the advances of gas lighting) occasions the slightest alarm. In some parts of the exhibition, the lighting is much overdone; and all the teachings of the illuminating evangelicals respecting the evils of high intrinsic brilliancy and of glare are here violated. So much so is this the case that those visitors who have any respect for their eyes had better go armed with coloured glasses. It is an instance of effect being sought by extravagance, which is altogether opposed to the rules laid down by electricians for obtaining economy. The smoked glasses are the only precaution necessary, if the visitors are endowed with sufficient nous to discriminate between the genuinely fair and the hyperbolic utterances of the stand attendants. On the ground of safety, there is as much assurance as can be given. We learn that the use of flexibles in the exhibition has been discouraged; and all wires within reach of the public, it was ruled, should be enclosed in wood casing, or other approved covering. Unenclosed conductors, too, it was ordered, should not be in contact with bunting or other inflammable material. Again, in the application forms for electricity supply issued by the management to the exhibitors, there is a most useful summary of the safety precautions necessary in wiring and illuminating stands. According to a paragraph in an electrical paper, we further observe that the Radium Fire Extinguisher Company, Limited, have made "arrangements to loan radium extinguishers to exhibitors for use on their stands during the period of the exhibition, at a nominal charge. . . . This extinguisher has proved its ability to deal successfully with fires caused by high-tension electric currents; arcs of 2000 volts having easily been extinguished under test conditions in London electric lighting works." Then Simplex Conduits, Limited (who in their advertisements appear to claim that safety in electric installation depends largely upon adopting their systems of wiring, to the exclusion of others) are showing a "Simplex" electric and petrol fire extinguisher, in which a fluid is used which is a non-conductor, and which will "therefore extinguish a fire on an electric conductor, whilst the current is on, and also a short-current in electrical machinery whilst in motion." Of course, we take it that the extinguisher is for use on systems of wiring that Simplex Conduits, Limited, do not supply. However, they particularly direct the attention of central station engineers to this fire-extinguishing appliance for use behind switchboards. The British Fire Appliances Company (whose extinguisher has been specified by the Metropolitan Police for service on electric motor buses) are also showing "efficient fire extincteurs." Further, touching the question of safety, we learn that the internal illumination of Olympia was placed in the hands of the Imperial Lighting Company, who themselves suffered from a fire recently at their works. It is also remarked that an inverted gas-lamp hangs outside the entrance hall, among the electric lamps—presumably for safety.

So far we see safety is very well provided for by rules, appliances, and experience.

A LARGE RANGE OF EXHIBITS.

It is seen by the immense flashing sign on the front of the building that the main object of the display is to demonstrate lighting, heating, cooking, and power. But the heating and cooking appliances, especially the latter, sink into insignificance amid so much else in the actual display inside. Several exhibitors are showing cooking and heating appliances; but they are not so prominent as we imagined they would be. Our province is not to survey the exhibits in detail; but to indicate the enormous range of electrical goods on view, we may mention some of the classes. It cannot be to the ease of the minds of electricity suppliers to find how extensive are the private generating sets in the exhibition; and how persistent is the information that they are more economical and safe than taking a supply for lighting and heating from an ordinary distribution system, inasmuch as the cost of distribution and the distribution losses are saved, and there is less danger of collapse than will obtain on any central station system. There are also dynamos and motors. Among oil-engines, the Diesel and the Hornsby are prominent. The gas-engine makers are not generally in evidence on this occasion—in fact, the only suction-gas plant, so far as was observed, is the Hornsby. There are electrically worked coal elevators and conveyors, electric lifts, stokers for boilers, motors, power presses, mining appliances, meters (slots are not prominent), switchboards, fool-proof switch-gears, wires and cables, batteries, electric lamps of all descriptions, electric heating and cooking appliances, electric signs, ventilating fans, switches, electric bells, hand and pocket lamps, lamp-globes, measuring instruments, medical appliances, telephones, wireless and other telegraphy, vacuum cleaners, knife-sharpeners, water-proofs, &c. It is a comprehensive and interesting show.

LAMPS AND LIGHTING.

In connection with lighting, there is not much that calls for special notice here. The flame arc lamps—the competitors of our high-pressure lamps—are there flickering and spluttering in the same old manner. Efforts have lately been directed to secure with them longer burning hours, to effect much-needed improvement in the magazine type, and to get them down (even by sacrificing efficiency) to lower powers, with the view of producing them to compete with the metallic filament lamp. But we are afraid that the metallic filament lamp has cut the ground from under their shaky feet. The predecessors in the arc lamp line do not make any bold show on this occasion; but they still hang on—possibly hoping that, by some providential interposition on their behalf, they may obtain a new lease of life. The carbon filament lamp does not make much of a show. The metallic filament is the one upon which the electrical industry has almost universally placed reliance for ordinary purposes—the units for ordinary voltages (without the use of transformers) now running from fairly low candle powers (the equivalent of the bijou inverted gas-lamp) up to 1000-candle power. But the lamp about which the makers say much is the "Mazda" (of the British Thomson-Houston Company), with drawn wire filaments, which, it is claimed, have placed pressed filament lamps in the background. The wires being in "one continuous, uniform length" are described as wonderfully strong. The lamp, it is contended (what will the many other lamp makers have to say to this?), is a great advance over the ordinary kind, "where the filaments are in a number of short lengths, and so brittle that the slightest touch will shatter them." It is difficult to get an explanation of the advertised statement as to the lamp saving 75 per cent.—of what, of the current compared with the carbon filament lamp on an illuminating power basis, or compared with other makes of metallic filament, or of the actual cost for current? Makers of Osramis have at length produced a 200-volt 16-candle power lamp; and the British Thomson-Houston Company have what is called the "Gem" metallized carbon filament lamp, of 16-candle power, and requiring 45 watts an hour (or 2·8 watts per candle), or in a 20-candle form, requiring 50 watts (2·5 watts per candle). Of course, visitors are everywhere being told by attendants that the metallic filament lamp can easily beat even the newest forms of the inverted gas-lamp. It is their day out, and so we suppose they think they may take unlimited licence in statement. We see that in the very introduction of the exhibition catalogue, one Norman Staniland, M.Inst.C.E., gives a lead to licence. He is writing on house lighting, and talks of the old inertistic, inflexible gas-fittings. He says nothing of the new. His disingenuousness extends to this: "It was of no avail putting valuable wall papers, frescoed or stamped ceilings, into a room as permanent additions, if they were to be rapidly blackened or destroyed by the gas used; and apart from this destruction, the gas-lights could never be put into the most effective positions, either for decoration, or for general effect." What about the present? Gas-lamps are now put into richly decorated rooms without the destruction spoken of; and they can be placed to get fine decorative and general effects. He also speaks of that "tyrant of position gas-lighting." In connection with lighting, there is not much decorative glassware on view. Those visiting the exhibition will see that globes are indispensable with the metallic filament lamp, and will heartily endorse the view of Mr. Frank Bailey, the Managing-Director of the City of

London Electric Light Company, as expressed in an article in the "Electrical Review": "All users of electric light are now anxious to secure relief from the glare of the metallic filament lamp; and as considerable progress has been made in the various forms of globes and shades to secure division and even distribution of illumination, the exhibition will be of great value in showing the public that a soft and subdued light can now be obtained." But at what price?

DOMESTIC ELECTRIFICATION.

The exhibition, it is hoped by some, will prove that electric cooking and the electric oven have now arrived at such a practical stage that they can enter into competition with the gas and coal heated oven in all respects. Messrs. John Barker and Co., Limited, have erected a handsome suite of rooms in the gallery; and we say, with perfect candour, that the display made is worth a visit. Everything has been arranged with exquisite taste. Here, in the kitchen, demonstrations are to be made with an electric cooker. The Berry Construction Company are also making demonstrations in the gallery. But we turn once more to Mr. Frank Bailey's article; and we read that, "as regards cooking, it is perhaps easier to show the apparatus at work than to give convincing proof that it will stand the test of time." In the, comparatively speaking, isolated cases in which electric ovens have been tried, we know how they have caused the proscription of cooks by masters or mistresses infatuated by the novelty of the thing, and believing all they have been told; we know of electric cookers having been laid aside or rarely used after a short trial; we know of electric cookers that have been discarded, and the reliable gas-cooker again fully installed in use. However, some optimistic writers think (as they thought at the time of the exhibition six years ago) that the electric cooker is the coming thing. But we are surprised, after what we had been led to anticipate by prior announcements, that the electric oven has not more prominence at the present show. Of the smaller type of domestic electric goods, there is an abundance, in the way of saucepans, grills, frying-pans, potato-steamers, toasters, hot-plates, milk-heaters, kettles, water-jugs, urns, shaving-pots, curling-tongs heaters, flat-irons, sterilizers, and so on. But the prices! Of course, different makers, different prices. But prices do not vary much between the makers where the heating elements are part of the appliance; where they are not, then, of course, the utensils for use on cookers, hot-plates, and so on, are cheaper. But experience shows that where the heating elements are apart from the utensil, trouble arises directly the bottom gets misshapen, or out of the perfect flat. We can see the housewife looking hard at a 2-pint saucepan for £1 2s. 6d., or at a 12-pint one for £2—consumptions running from $\frac{1}{2}$ unit to $1\frac{1}{2}$ units per hour; or £2 7s. 6d. for a frypan using $\frac{3}{4}$ unit per hour; or £2 15s. 6d. for an 8-pint steamer using $\frac{3}{4}$ unit per hour; or 10s. 6d. for a 2-pint tin kettle, and £1 12s. 6d. for a 3-pint copper one; or £1 5s. for a 1-pint hot-water jug, or £1 10s. 6d. for a 3-pint one. And we can see an awful rush for electric flat-irons at the prices asked for them.

ELECTRIC COOKERS AND COOKING.

As we have said, electric ovens are not so prominent at the exhibition as we expected to find them, though the makers who have had a shot at turning out cookers are many. Among them are Hawkes, Limited, the Berry Construction Company ("Tricity" cookers), Bertram Thomas, Ferranti, Limited, General Electric Company (Archer patents), Armorduct Manufacturing Company ("Therma"), British Thomson-Houston Company, Simplex Conduits, Bastian Heating Syndicate, Siemens Bros. and Co., British Prometheus Company, Eastman and Warne; and there are the "Therol" and "Eclipse" cookers. There may be other makers and other cookers. But this is sufficient to show how wide has been endeavour; how really small the practical result. At some stands, the most meagre of information could be obtained as to costs, results, life of elements, and the ovens themselves. The cost of ovens is steep. The "Tricity" single cooker is £3, to which has to be added £1 for a 12 inches square oven. A duplex cooker is priced at £5 5s.; and the addition for the oven is £2 (14 in. by 16 in. by 16 in.). There are the Prometheus ovens, which in appearance nearly approach gas-ovens. An oven 20 in. by 13 in. by 10½ in. inside dimensions, consuming 2 units per hour, is priced at £10; one 24 in. by 16 in. by 13 in., consuming 3 units per hour, is priced at £12; and one 26 in. by 20 in. by 18 in., consuming 5 watts per hour, is priced at £22 10s. Regarding consumptions of this type of cookers, it may be noted that "the power absorbed, where stated, is the actual power taken by the heaters after they have attained normal working temperature." What it is before, we have not ascertained. A Prometheus grill, 9 in. by 9 in. by 6½ in., is priced at £4; and a hot-plate, 6 in. by 6 in. by 4 in., at £3 3s. The Bastian people who run the "Quartz-alite" cooking and heating apparatus, tell us that for fully twenty-five years spasmodic attempts have been made to popularize heating and cooking by electricity; but principally for the reason that the apparatus available has been very ineffective, fragile, and costly to maintain, such attempts have met with only slight success as regards heating, and as regards cooking practically no progress whatever has been made in establishing the oven and hot-water apparatus in the domestic household." By the application of quartz, however, they claim to have now succeeded where all others have failed. And yet Mr. Bastian seems to discount what he has hitherto done in the way of producing cooking apparatus by the claims made for his "hot box," referred to in our "Electricity Supply Memoranda." From a con-

temporary, it would appear that this "hot box" is a necessary adjunct; for Mr. Bastian is credited with saying: "I am perfectly certain that electrical cooking will never become a commercial possibility on any large scale without a practical system of thermal storage. Such a system I believe that I have devised by means of my 'hot box.'" But as to Bastian prices, we see that a hot-plate 5½ in. by 17 in. by 14 in. (using $\frac{3}{4}$ to $1\frac{1}{2}$ units per hour) costs £4 4s.; and one 5½ in. by 24 in. by 24 in., £8 8s. One oven (weighing only 9 lbs.) to go over the hot-plate, measuring internally 16 in. by 11 in. by 12 in., costs 18s., while another (weighing 18 lbs.), measuring 16 in. by 20 in. by 12 in., costs £1 10s. The large Simplex electric ovens are also like gas-ovens. We take one with an oven 19½ in. by 12½ in. by 12 in., and find the cost is £8 12s. 6d. An enamelled top tray costs 3s. 6d.; and a switch-board, £1 5s. The loading is arranged as follows: Boiling-ring, 800 watts per hour (minimum 250 watts), grill, 900 watts; oven 2000 watts (medium heat 1200 watts, and minimum 800 watts). Simplex Conduits undertake to "repair or replace, free of charge, apparatus in which any electrical defect due to faulty material or workmanship is discovered; but they do not hold themselves responsible for any consequential loss arising out of such defects. . . . The guarantee does not apply to defects caused by wear and tear, accident, misuse, or neglect." There is a little reticence over the question of cooker wear and tear and maintenance costs among the exhibitors. It is difficult to get information as to the life of the heating elements. One attendant (the stand shall be nameless) gave the information that the firm he represented was the only one in the show that gave a guarantee for their cookers for as long as two years.

As to running costs, it is generally admitted, when the question is put point-blank that test costs are not likely to be the costs when in the hands of an ordinary domestic servant. There is not much information going on this point; but most of the attendants are prepared to assert that the costs under test conditions, at 1d. per unit are not more than for gas. But that is too vague for the ordinary man or woman of any intelligence; and there are many things electricians must necessarily explain in connection with the assertion. At the "Tricity" stand, three joints of meat were seen—one cooked by gas, one by coal, and one by electricity. "The very sight of that joint" (the one cooked by electricity) "tickles the palate," said the gentleman in charge. We looked at the highly coloured electro-cooked joint, and could not see anything special about it. The gas-cooked joint looked a bit over done, and the coal-cooked one—well its wasted look excited our sympathy. The loss of weight was a point. The coal-cooked joint had lost most (we were not surprised); the gas-cooked joint less (we were not surprised); the electricity-cooked one the least (again we were not surprised). The joints would not have been exhibited otherwise. But there was not such a fearful difference between the losses of the gas-cooked and the electrically-cooked joints. From a card picked up on the stand, we take the following:

Economy of "Tricity" Cookers as compared with Coal Ranges. Weight of Joints (Top Side of Beef).

	Coal.	"Tricity."
Weight uncooked ..	5 lb. 4 oz.	4 lb. 0 oz.
Weight cooked ..	3 lb. 6 oz.	3 lb. 8 oz.
Loss in cooking ..	1 lb. 10 oz. (35.75%)	8 oz. (12.5%)

Therefore with "Tricity" cookers, 4 lbs. may be purchased, instead of 5½ lbs. [There is something wrong with the arithmetic for the coal-cooked meat.]

But we got further along, and another attendant buttoned-holed us; and we learned there that the loss of electricity-cooked meat was so small that it was almost ridiculous to mention it; while gas-cooked meat gave up about 30 per cent. of its original weight—that is, as received from, and charged for by, the butcher. We went away wondering whether we should meet with an attendant who would tell us that, when a joint was put into a gas-oven, it disappeared altogether. We should not have been astonished. But, to return to the gentleman at the "Tricity" stand, he said the cost of cooking the three joints had been approximately the same—2¾d. and 3¼d. But he could not say which was the 3¼d. one. We have our suspicions. We learned of two other wonderful points about electric cooking. The "Tricity" gentleman seems to suffer from easily excited salivary glands. When he thinks of electrically-cooked food, his mouth fairly waters. As he is talking about electrically-cooked food so much, we expected to see the result about the stand, but failed. And the energy he has on electro-cooked food! His energy simply amazes him. That is the impression his information left on us. He never had so much energy when he took gas-cooked food. If loss of human energy through eating gas-cooked food is cumulative, it is marvellous that the British nation has made so much progress as it has done. We looked at ourselves and we looked at our informant. We thought of those thirty years that we have lived on gas-cooked food, and came to the conclusion that there was no particular reason for discarding our gas-oven, as he has done. He has it still in his house; but it is derelict. There is, however, not the slightest reason why we should not be the best of friends. His wares are not going to do infinite harm to the gas industry. However, we must leave electric cooking for the present; but still we cogitate on what will be the next phase in the romantic talk about electric cooking.

HEATING BY ELECTRICITY.

Radiators are well to the fore in the exhibition; but their prices do not seem to recede much, and their efficiency does not improve.

A four-lamp radiator can cost anything from £2 to £5 10s. and upwards; renewal lamps 4s. and 4s. 6d. each; and the consumption is 1 unit per hour for each four lamps. We all know these radiators; and we all know that, without more than one is in use in a decent sized room on a cold day, comfort is out of the question.

WATER HEATING.

Water heating by electricity is also represented—the “Therol” being the principal exhibit in this line. But as we can do with gas in minutes what the “Therol” takes hours to accomplish, and as we can do it far cheaper, we will not discuss the matter here. If our electrical friends desire, we will do so on another occasion.

MISCELLANEOUS.

Among miscellaneous exhibits, we notice Messrs. Alexander Wright and Co. are showing a photometer for electrical work, various forms of recorders and calorimeters, and portable photometers (Simmance and Abady’s patents). Messrs. J. W. & C. J. Phillips are exhibiting recording instruments, gauges, thermometers, and pyrometers; and Messrs. Bennis and Co. are showing recorders and calorimeters. Messrs. Falk, Stadelmann, and Co., Limited, Messrs. Everett, Edgumbe, and Co., Limited, Messrs. Wallach Bros., and the Consolidated Pneumatic Tool Company are among exhibitors known to our readers. The London and Provincial Electrical Supply Authorities (known better under the style of the Electricity Publicity Committee) have a large stand, at which they will be pleased to attempt to proselytize any number of gas consumers who may present themselves.

MANCHESTER UNIVERSITY LECTURES.

IN continuation of the movement originated by the Manchester and District Junior Gas Association, and supported by the Manchester District Institution of Gas Engineers, for promoting scientific work in the Manchester University by those interested in the gas industry, the following lectures have again been arranged for the ensuing session:—

1911.
- Oct. 7.—“High-Pressure Gas: The Theory and Practice in its Application,” by Mr. E. W. Smith, M.Sc. (Manchester), of the High-Pressure Gas Laboratory of the Birmingham Corporation.
- Dec. 2.—“High-Pressure Gas: Some Aspects of Distribution,” by Mr. E. W. Smith.
1912.
- Jan. 13.—“Radio-Activity,” by Professor Rutherford, D.Sc., Ph.D., F.R.S.
- March 2.—“The Principles and Practice of Gaseous Heating,” by Mr. Arthur Forshaw, M.Sc. (Manchester).

As was the case last session, these lectures will be given in the Chemistry Theatre of the University at 3 p.m.; and admission will be free to all who are interested in the gas industry, on presenting a ticket which can be obtained from the Hon. Secretaries of the District Associations—viz., Mr. W. Whatmough, Gas-Works, Heywood, and Mr. J. Alsop, “Laymarice,” Edgeley Road, Stockport; or from the Bursar of the University. For those who have already acquired a knowledge of gas engineering, advanced courses of six lectures each have been arranged on “Theoretical Problems Involved in Incandescent Lighting,” and “Chemical Aspects of Carbonization.” The lectures in the former course will be given by Dr. Walter Makower, M.A., and Mr. E. J. Evans, B.Sc., Lecturers on Physics in the University; and the latter by Dr. Harold G. Colman. The fee for the two courses of twelve lectures will be 10s. 6d. to members of the Gas Associations, and £1 1s. to others. These lectures will be delivered on Thursday evenings during November, December, January, and February; the first being fixed for the 2nd of November.

Mansfield's Automatic Water Finder.

Notwithstanding the investigations which have taken place in connection with the location of water by the aid of the “dowser,” there still appears to be some doubt as to the possession by this individual of any special power in the direction indicated. But admitting that he has been endowed with a particular gift, it would seem that its exercise can now likely be dispensed with, as Messrs. W. Mansfield and Co., of Liverpool, have designed a simple portable apparatus, by means of which, as they claim, “any unskilled person may readily ascertain whether a subterranean stream or body of pure water exists under a spot where boring operations are desired.” The principle on which the instrument works is the indication, by the movement of a needle, of the presence of currents which flow between earth and atmosphere, and which, seeking the path of greatest conductivity, are always strongest in the vicinity of subterranean watercourses, the waters of which are charged with electricity to a certain degree. The, presence of underground water flowing in a natural state only, and not in water-pipes or sources that have sprung up to daylight, is indicated. The instruments, which are constructed in sizes for locating water at depths up to 3500 feet, have been thoroughly tested in many parts of the world, and have always, the makers state, given the greatest satisfaction.

FRENCH COMMISSIONS' REPORTS.

(Continued from p. 734.)

COMMISSION ON DISTRIBUTION.

High-Pressure Gas Lighting.

The report of this Commission deals principally with the great progress of public high-pressure lighting; figures being given illustrating its development in Berlin and Paris, while London, Lyons, and Marseilles also come in for less detailed treatment. Observations are added on the important and auxiliary question of automatic lighting up and extinguishing of street-lamps. There may not be much (if any) information in the report that has not already been given in one form or another in the columns of the “JOURNAL;” but for our French colleagues and for ourselves, it is profitable to have attention directed succinctly to the present phases and future possibilities of public gas lighting.

High-pressure lighting enables burners of great intensity to be used, giving an excellent lighting efficiency, and therefore is naturally just now extending more and more. Eleven years ago, the Compagnie Parisienne du Gaz made the first installation of high-pressure public lighting in the Champ-de-Mars and the Trocadéro with Denayrouze and Bandsept burners, grouped in special lamps of the “Opéra” type, and supplied with gas at 200 mm. pressure. Visitors to the 1900 Exhibition will remember this. At that time the inverted burner was not known. This burner has the advantage of giving the maximum reflection from the light on to the ground, and of completely doing away with the cone of shadow. These advantages have led many towns to adopt it for public lighting, and in particular, the City of Berlin, where many tests have been made with it, both with high and low pressure gas. Such good results have been obtained, especially with the high-pressure gas, that the system has been largely extended in Berlin, as is shown by the following figures:—

BERLIN.

(A) Gas consumption for different methods of gas lighting from April 1, 1909, to April 1, 1910.

1.—Low-pressure gas—		Cubic Metres.
Vertical burners	. . . . .	11,104,975
Inverted „	. . . . .	876,077
Total	. . . . .	11,981,052
2.—High-pressure gas—		7,498,260

The consumption of high-pressure gas is, therefore, 38·4 per cent. of the total gas used for public lighting.

(B) Illuminating power in the public streets.

1.—Low-pressure gas—		Hefner Units.
Vertical burners	. . . . .	2,242,855
Inverted „	. . . . .	314,820
Total	. . . . .	2,557,675
2.—High-pressure gas—		
Vertical burners	. . . . .	594,200
Inverted „	. . . . .	3,614,400
Total	. . . . .	4,208,600
3.—Electric lighting—		
Arc lamps	. . . . .	1,207,990
Metallic filament lamps	. . . . .	15,350
Total	. . . . .	1,223,340

It is interesting to note that the lighting power of high-pressure lamps represents 52·7 per cent. of the total illuminating power, including in it that from electric lighting.

(C) The total length of streets in Berlin (not including suburbs) lighted from the municipal gas-works is about 515 kilometres, distributed as follows:—

	Kilometres.
(1) Lighted by low-pressure incandescent gas (vertical burners)	424
(2) „ „ „ „ „ „ (inverted burners)	13
(3) „ „ high „ „ „	50
(4) „ „ „ electricity	28
Total	515

These figures show in what favour high-pressure gas lighting is held in Berlin. Moreover, the City allocates every year about a million marks to the extension of the system, and it is believed that the complete scheme of it allows for a length of 130 kilometres of high-pressure gas-main, corresponding to a total outlay of 10 million marks.

At present, there are five high-pressure stations; and the lamps used are the Auer (Pharos), Graetzin, and Selas. The lighting power of the lamps is 1000, 2000, and 4000 Hefner units. For these different systems, the pressure is the same—namely, about 1·40 m. of water.

While the hourly consumption of gas for the latest types of low-pressure inverted burners varies between 0·69 and 0·77 litre per Hefner unit (7·5 and 8·4 litres per carcel), with the high-pressure lamps, the hourly consumption per hefner unit is as follows:—

	4000 Hefner Units.	2000 Hefner Units.	1000 Hefner Units.
Selas	0·57 litre	0·53 litre	0·54 litre
Graetzin	0·48 „	0·49 „	0·52 „
Auer (Pharos)	0·50 „	0·48 „	0·52 „

This is equivalent to a consumption of 5·2 to 6·2 litres per carcel-hour.

A great advantage of public high-pressure lighting is the automatic lighting up of the whole group of lamps controlled by

the compressing station. The lamps are so arranged that, on starting the compressor, the gas pressure opens a valve, allowing free passage of the gas necessary for the normal working of the burners, which are lighted from a jet. The reverse takes place on stopping the compressor—the fall of pressure shuts the valve, extinguishes the burners, and the jet alone remains lighted.

Generally each lamp has three inverted burners. Of these, two are extinguished at midnight by means of an outside lever cock, while the third remains lighted till the morning.

LONDON.

As another example of intensive public lighting at low and high pressure with inverted burners, the City of Westminster is cited in the report. Here more than 2000 lamps are provided with "Nico" low-pressure inverted burners, arranged in two's, three's, or five's in one lamp, with a total of 7000 burners. The Gaslight and Coke Company have been successful in replacing 66 electric arc lamps by 1800 to 3000 candle power high-pressure gas-lamps.

PARIS.

The Compagnie Parisienne not having adopted high-pressure gas lighting, the public lighting of Paris was quickly outdistanced by that of Brussels, London, and Berlin. With the coming of the Société du Gaz de Paris, however, new tests were made in 1910 with intensive burners, of which the following summary is given.

I. *Low-Pressure Gas*.—After a short trial with the 1000-candle power "Soleil d'Or" lamps in the Boulevard de Palais, these were replaced by high-pressure lamps of the "Colonia" type, of the Société Auer, in accordance with suggestions made by the Gas Company. In Avenue Nicolas II. are "Gobo" lamps of 600-candle power, and in Rue de Châteaudun low-pressure Graetzin lamps of 1000 candles.

II. *Low-Pressure Gas with Compressed Air*.—This test was made in the Place du Châtelet; the compressed air being taken from the town system and reduced to 1.40 metres pressure. Single-burner Pharos lamps of 1000 candles were used. So far satisfactory results have not been obtained, owing chiefly to the moisture contained in the compressed air.

III. *High-Pressure Gas*.—Without doubt this of all systems tried in Paris has enabled the most brilliant, regular, and economical burners to be used. The upkeep is not high; and if a compressing station and separate main are required, these are compensated for by the marked saving resulting from the easy adoption of automatic lighting up and extinguishing. The following tests have been made:—

(1) In the Place de la Concorde with twelve Pharos lamps of 1200 candles, with two burners, and two Pharos lamps of 2400 candles, with three burners.

(2) In the Place de l'Opéra with six Graetzin lamps of 4500 candles, one of 2000 candles, and seven of 1000-candle power.

(3) In the entrance of the Gas Offices, 6 Rue Condorcet, with six Keith lamps, of from 1500 to 4000 candle power.

A large compressing station has been installed under the Boulevard Raspail to serve a considerable district. Two Roots compressors of 400 cubic metres are worked either by a vertical engine of 10 H.P. or by an electric motor of 15 H.P. At present they supply 88 Graetzin lamps of 2000 candles, and 28 Graetzin lamps of 4000 candles. The capacity of the station can be extended to 1200 cubic metres per hour. The total length of the main will be about 4500 metres.

The special model of lamp designed by the Société du Gaz has been used for this installation, each lamp being provided with a double supply to allow of reduced lighting after midnight. The brilliant lighting of the Boulevard Raspail has been a great success, and the Municipal Council has been favourably impressed by it, so much so that the Gas Company have shortly to submit a high-pressure scheme for the principal streets of Paris. This year (1911) there will be an extension of 209 lamps of 2000 candles and 35 lamps of 4000 candles. The complete scheme for all Paris will mean an expenditure of about 15 million francs for lamps, brackets, and service pipes only, exclusive of the mains and compressing stations, which may double the cost.

The net annual cost of lighting by high-pressure gas, compared with electric lighting, is wholly in favour of gas. The price for gas per 1000 candle-hours, including everything except sinking fund, is about 0.13 fr., whereas for electricity it is about 0.39 fr., or three times as much.

The power required for compressing may be taken at the outside as 3 H.P. per 100 cubic metres of gas per hour.

As to the diameter of the pipes, the Monnier-Pole formula is always applicable:—

$$h = 660M \frac{ISO_2}{d^5}$$

where

h = loss of charge in mm.;

l = length of main in metres;

M = coefficient of friction;

S = density of the gas;

Q = output in cubic metres per hour;

d = diameter of the main in centimetres.

The coefficient M can be taken as = 0.003.

In fact, in the Lubeck-Travemuende installation (19.5 kilometres), it was found in practice that this coefficient varied, for a starting pressure of 1700 mm. and an arriving one of 50 mm., from 0.00295 to 0.0033, the diameter of the main being 80 mm.,

and the density of the gas at starting .363 to .389. In the installation from Lyons to Neuville [see paper* by M. d'Aubenton-Carafa at the 1908 Congress], the deviation between the loss of charge ascertained and that calculated after the same formula is very slight for a distance of 13,700 metres and a diameter of 150 mm. Moreover, the Monnier-Pole formula has given larger losses than actual losses; and it therefore appears that it can safely be adopted.

LYONS.

Since October, 1908, the Lyons Gas Company have had at work a public installation of the Selas light, consisting of a mixing compressor driven by a small electric motor of $\frac{1}{4}$ H.P. running at 1500 revolutions. This system uses a mixture of air and gas in the proportion of 1 volume of gas to $\frac{1}{2}$ volume of air. The gas is first of all brought to atmospheric pressure, and the mixture is then sent by the compressor to the lamps at a pressure of 240 mm. of water. A bye-pass enables only the quantity of the mixture required for feeding the burners to be sent into the distributor.

The lamps have two inverted burners, with a total consumption of 1950 litres of gas per hour, or 2900 litres of the mixture. Tests made in the street have shown a lighting power of 360 carrels per lamp—that is, 8 litres of the mixture, or 5.4 litres of pure gas to the carrel. Since its installation, the working has been perfectly regular, and the lighting has been of remarkable intensity.

MARSEILLES.

There remains to be noted the high-pressure lighting of the offices of the Société du Gaz de Marseille. The installation comprises a compressor of 10 cubic metres per hour at a pressure of 1.40 metres of water, worked by an electric motor of 2.3 amp. and 220 volts. It supplies, on the one hand, two Pharos lamps of 4500 candles, with three mantles, placed outside the offices; and, on the other hand, seven Graetzin lamps, of 100 candles, in the vestibule. The results being very gratifying, the Company have just put up, by the Bourse, six Pharos lamps of 4500 candles.

These examples of brilliant high-pressure lighting show a great future for gas lighting in spite of the competition of electricity.

Automatic Lighters.

Without considering electric or pneumatic arrangements, which are rather rare, there are two classes of apparatus for lighting and extinguishing public lamps: (1) Apparatus working at a distance by pressure; and (2) apparatus working automatically by clockwork.

In France, the latter system has been largely adopted, while very few attempts with the pressure lighters have been made; whereas it is otherwise abroad, and especially in Germany. At Newcastle (England), an interesting comparative test is being made with 500 pressure lighters (of which 250 are "Bamag" apparatus, and 250 by Messrs. Alder and Mackay), and with 250 Hortsmann clockwork lighters. The number of miss-fires has reached 3.07 per lamp and per year for the first system, against 1.68 for the second.

In principle, the pressure system has several advantages over the clockwork:

1.—It enables lighting up and extinguishing to be done at any hour.

2.—The apparatus is simpler and, consequently, cheaper.

3.—Cost of labour and maintenance is generally less.

But, on the other hand, there are the following drawbacks:

1.—Bringing about the increase of pressure which, generally, would be at the moment of maximum output, may give rise to practical difficulties—for example, momentary overcharge of a gasholder.

2.—Insecurity in the lighting up or extinguishing, because the transmission of the pressure wave does not have an equal effect over the whole of the system. Hence many miss-fires affecting an entire district might occur.

3.—The meter dips might blow and cause an escape of gas if the syphon plug were not well screwed-up.

It is difficult to foresee which of the two systems will get the better of the other; the future will show. Abroad, each has its supporters. In France, up to now preference is given to the clockwork appliances. If they are dearer in first cost, labour, and upkeep, it must be recognized, on the contrary, that they have the advantage of making the lighting-up independent of the pressure conditions of the mains.

* See "JOURNAL," Vol. CIII., p. 316.

Origin of Lamp-Chimneys.—An American journal recently had an interesting article on "Accidental Inventions," in the course of which it was recorded how Argand invented a lamp with a wick fitted into a hollow cylinder up which a current of air was allowed to pass—thus giving a supply of oxygen to the interior as well as the exterior of the circular frame. At first he used the lamp without any chimney; but one day, while he was busy in his workroom, his little brother, after amusing himself by placing a bottomless oil flask over different articles, put it upon the flame of the lamp, which immediately shot up the long circular neck of the flask with increased brilliancy. Very appropriately, the idea of a lamp-chimney flashed into Argand's mind; and after a few experiments, a new secret of great practical value was revealed.

IN THE FLETCHER-RUSSELL SHOW-ROOMS.

The Gas-Heating Season.

IN these practical days, when folks look for the highest value for money expended, any article that depends on results for its name and favour must be capable of generating a high efficiency. That is so obvious that the statement is almost superfluous, except for the fact that it presents in the briefest manner and form the policy that underlies the work of Messrs. Fletcher, Russell, and Co., Limited, in the production of heating goods, of multifarious kind, in which gas is utilized. Their London show-rooms are rich in suggestion as to the enormous scope of the gas-heating business; and, before dealing with some of the Company's new season's productions, there are a few words to say about the show-rooms,

which have been rearranged and reorganized, in order to make a compact and yet representative display, without a profusion that is often disconcerting and tiring to the purchaser. The ground floor has been arranged so that every type of goods can be readily examined; and at the rear, offices have been constructed, so that the whole of the staff is at ready command for attending to visitors and inquiries, as well as pursuing in close communication the ordinary business routine of the day.

There is an attractive new feature of this ground-floor part of the establishment, that, copied by the show-rooms of gas undertakings, would make an equally attractive and exceedingly useful feature for them. The photographs will explain it. But briefly described, it is a four-sided pedestal, with raised projecting base, tiled so that each side represents the back of a fire-place recess with hearth. The tiles are of shaded olive green, which the firm find so popular among their customers. Rising centrally from

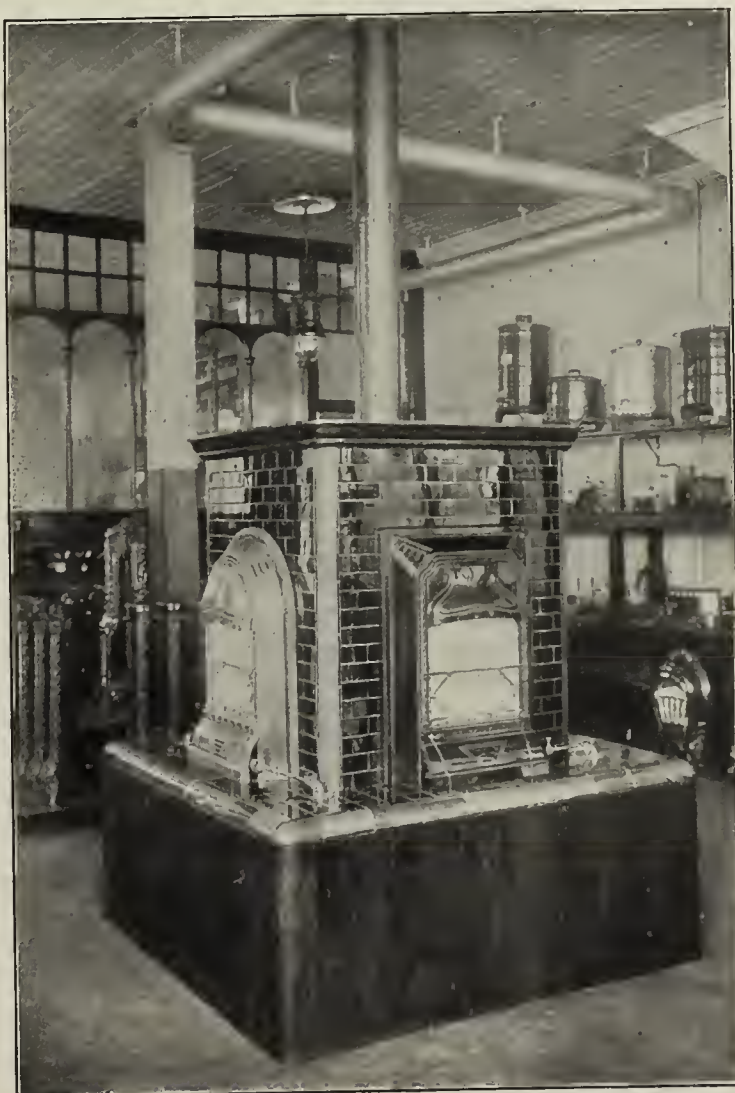


Views of the Gas-Fire Demonstration Stand in the Show-Room.

this structure is a flue leading into the permanent flue of the establishment. On this ingenious display stand, four different types of gas-fires can be shown in use at one time to the prospective purchaser, and yet without any one fire detracting from the individual examination of any one of the others. The idea may be recommended; and anyone interested connected with a gas undertaking is quite at liberty to call and inspect the actual thing for himself at Queen Victoria Street. There is another square structure in the room for the purpose of displaying fires fitted in cast-iron mantels—a class of goods for which the firm are very justly famed.

We descend to the basement, where samples of heavy and other goods not found fully represented in the show-room above are seen. There is an assortment of production, running from a gas flat-iron to the gigantic hot closets and cooking ranges for hotels and public institutions of all kinds. Here we have cookers small and large, fitted up in divers manners, hot-plates, vegetable-steamers, pot-stands, grillers (small and large), boiling-rings, and so forth. Here, too, are gas-fires—some fitted in mantels, some not; the mantels being made to imitate all kinds of woods, and fitted with a variety of tiles. Water-heating appliances for gas are exhibited in the form of geysers, boilers, coppers, and small horizontal heaters for lavatory basins, which are supplied by the firm on stands, fitted complete with mirror at the back, together with the horizontal water-heater. There are furnaces of all kinds for industrial uses. A long tube burner is seen for furnace work; and these burners can be made of any required length. There is also a bench, fitted with a hood and flues, where the use of muffles, crucibles, and other furnaces can be demonstrated. A coke stove and coke fire are also noticed; and in this connection one of the things that strikes the firm as singular is that, in these times when smokeless solid fuel is used in many dwelling-houses and other establishments, the use of coke-stoves is not demonstrated more freely by gas undertakings in their show-rooms.

Returning to the ground floor show-room, inspection is made of samples of the gas heating goods with which the firm are trading in the present season, when provision is being made for healthful comfort during the winter. Last year the firm introduced a new series of fires, in which they accumulated the good points of their old and modern experience, while conforming with the new order of principles and requirements. When we compare some of their





The "Palermo" No. 2 Fire.



The "Como" Fire.



The "Oporto" Fire.



The "Borneo" No. 2 Fire.

old types of fire with the new ones, there is found as much difference between them as there is to-day between the old horse omnibus and a motor bus. But the old types of fire had their good features—one being the firm's patent non-lighting-back burner, which for merit in efficiency takes a high place. The series that last fire season saw introduced—the "Palermo," the "Borneo," and the "Tokio" fires—were most successful, and met with a large amount of approbation, so much so, in fact, that many customers have expressed a desire that the designs shall not, for the time being, be changed, though trifling alterations in detail have been made to meet other requirements. It was also found that, with the spread of the use of gas-fires, there was a large request for fires of smaller heights, embracing modern improvements. This is one direction in which the firm have been working. In most houses there are rooms in which the fire-places are small; in the modern middle class house most fire-places are small; and the same applies to flats. In such rooms and fire-places, the normal sizes of fire look somewhat heavy, and do not in many cases fit very well in the fire-place space. Yet there is a desire that the gas-fire shall look like the proper thing, and not a mere toy. To meet this demand, the firm have made a third size of the "Palermo" and "Borneo" fires, retaining the range of heating power, but constructing them 2 inches less in height.



The "Vigo" Fire.

Both fires were produced last year in two sizes—respectively, 19 inches and 22 inches wide, 28 in. and 30 in. high, with fire openings 10 and 13 inches wide. So that the difference is in the height of last year's smaller size—that is to say, 26 inches, as against 28 inches. The "Tokio" fire has not so far been altered, except that purchasers can now have this (or any of the other types) with single or double fuel-bars just as pleases them. There is another point. Some of the fires (according to the type of casing) had no boiling-rings attached last year; others had them on the top. The present season's fires can be obtained with the boiling-ring on top or at the side, just as fancy dictates; and those that were innocent of any such provision last season can have a side boiling-burner this season. The convenience of a boiling-ring in most rooms is useful and is appreciated. In the case of this side boiling-ring, the burner is fixed, while the trivet itself is the only movable part; one effect of this being that the trivet can be swung in front of the fire for keeping anything hot without the burner being in use.

The majority of houses are rented in these days by tenants; and for this reason, and probably in some cases for pecuniary ones as well, the householders do not want to make any radical alteration in the fireplaces. In such cases, a shallow gas-fire that only requires the removal of the fire-bars of the old coal stove is a desideratum. Such a shallow fire has been introduced by Messrs. Fletcher, Russell, and Co. It is called the "Vigo;" and though small and shallow, it incorporates the modern features of an ordinary gas-fire. It is made in three sizes, for rooms up to 12, 14, and 18 feet square respectively, with 8, 10, and 12 inch fire openings. The appearance is shown by the illustration. For small offices, waiting rooms, &c., there is the "Oporto" fire (also illustrated), finished in black or aluminium. It is quite a small thing, being only 9 $\frac{3}{4}$ inches wide, 15 $\frac{1}{2}$ inches high, and 4 $\frac{3}{4}$ inches deep, with a fire opening 7 inches wide. It therefore occupies

little space, and the gas consumption is small; but the heating value is high.

Then there are two new nursery or bedroom fires. The first fire is of artistic design, and is known as the "Como." It has a removable fender, with copper reflector, and ornamental side wings. If the fender is not liked, there is an alternative in the "Como A," which is simply made with an ornamental base. It has a boiling-ring on top. The second fire is the "Palermo" 13 N fire; and with this, and the other new patterns of the present season, there is a range of bedroom and nursery fires which should meet all tastes and circumstances.

Concerning miscellaneous points, all the fires are fitted with the firm's patent non-lighting-back burners (which, naturally, they believe to be the best on the market), with gas and air adjusters, and in most cases the burners can be reversed to suit right or left hand supply. The fuel is the firm's preference. It is columnar and triangular in section; and in ordinary fires, it is inserted alternately with the broad surface and the narrow part outwards, so that a very full radiating surface is given to the fires, without any distinct break between each column. The firm does not believe in the smooth-faced finish to the fuel; their contention being that it is useless to sacrifice duty to appearance in such a detail. Generally, the firm retains, too, the egg-shell surface for their fire casings, with dull black finish; but the latter may be had in enamelled finishes of various colours, as well as in ordinary black. The various fires, too, are made, as previously stated, with single or double fuel-bars as desired. In the case of certain of the fires, the parts are interchangeable.

Regarding radiators, the firm's "Ivor" has been very popular; but in response to demand, they are now making it with plain columns, as well as in the ornamental form. This is simply a heat radiator without steam, and can be fitted up in any number of columns from two upwards. The plain form is known as the "Ivor P." It is flueless and non-condensing. Then there is the "Sypho" stove, which is condensing. This is the old No. 10 condensing stove, modified and modernized. It is very attractive, and can be fitted with a ruby chimney (which was popular last year) or a plain one, as required.



The Side Boiling-Burner, Showing Trivet Swung in Front of Fire.

To complete this notice of the firm's ability to fit any place with gas-heating appliances for any purpose, there are the water-heaters to be mentioned. The firm have been making a special line of these; and constructing them so as to give as little trouble as possible, while imparting to the user a high efficiency. Safety is provided for in every direction, metal (no leather or rubber is employed) is used throughout; and strength and durability have been the subjects of study. It is a big variety of water-heaters that the firm offers; and we cannot notice them all. But let us say that when, as, for example, with the "Ajax" and the "Hot Spring" heaters, water can be promptly delivered at, respectively, 45° Fahr. and 40° Fahr. above the temperature of the cold water supply (without trespassing upon the duty kept in reserve as a margin), then no further recommendation is required.

NEW GAS-WORKS FOR LEISTON.

Opening Ceremony.



General View of the Works.

THE town of Leiston (Suffolk), which has a population of 5000, has hitherto been supplied with gas from the private works of Messrs. Richard Garrett and Sons, Limited; but the growth of the town, and other circumstances, have rendered necessary the building of a larger gas-works. For this purpose, a Company was formed last year, with a strong local interest; and the services of Messrs. Corbet Woodall and Son, as Consulting Engineers, were engaged. The result has been the erection, for the Leiston Gas Company, Limited, of a works capable of producing 10 million cubic feet of gas per annum on land in Carr Avenue, adjoining the railway; the area of the site being about $1\frac{1}{2}$ acres. Arrangements have been made with the Great Eastern Railway Company to construct a siding for the delivery of coal and other materials direct into the works. Though gas had been supplied for about six weeks previously, the formal opening ceremony was postponed until last Wednesday. An illustrated brochure prepared for the occasion contained the following description of the buildings and plant.

All the buildings were let in one contract to Mr. A. Gibbs, builder, of Leiston. These comprise the retort-house, exhauster-house, meter and governor house, oxide-shed, store and workshop, and offices. The contract also included an underground tar-tank. The retort-house contains a bench of four arches designed to take settings of six retorts with modern regenerator furnaces. Two of these are filled with six and four retorts respectively, 21 in. by 15 in. \square shaped, by 10 feet long; and the remaining two are left for future extension. The contractors for the retort-settings and ironwork were Messrs. George Winstanley and Co., of Birmingham.

The condenser, consisting of 10-inch cast-iron pipes (together with all works, mains, and connections, 8 inches in diameter), was supplied by Messrs. Cochrane and Co. (Woodside), Limited, of Dudley. The exhauster is of the rotary type, driven by a 4-H.P. gas-engine through a countershaft. The same engine also drives a battery of three pumps for tar, ammoniacal liquor, and water respectively. The rest of the apparatus, comprising a washer, scrubber, and purifiers, was all supplied by Messrs. Newton, Chambers, and Co., of Sheffield. The washer is of the well-known Livesey type, of a capacity to pass 250,000 cubic feet in 24 hours. The scrubber is a circular vessel filled with perforated steel plates; the diameter being 4 feet, and the height 20 feet. Provision is made (and connections are laid down) for four purifiers, two only of which are at present erected. They are of the luteless type, 10 feet square, and are supplied with suitable lifting apparatus.

The station meter, supplied by Messrs. Parkinson and W. & B. Cowan, Limited, of City Road, London, is of a capacity to pass 5000 cubic feet of gas per hour. The same firm have also provided an 8-inch district governor. The gasholder, of the spiral-guided type, which was erected by Messrs. Samuel Cutler and Sons, of Millwall,

has two lifts, each 16 feet in depth; the total capacity being about 50,000 cubic feet. It works in a brick tank, built under a separate contract by Mr. Gibbs. The diameter is 48 feet, depth 16 feet. Provision is made for the building of a coal-store adjoining the retort-house; and the general arrangement of the works is such as to admit of the entire duplication of the plant, if the future demand renders it necessary.

The whole works have been built to the plans of Messrs. Corbet



An Interior View of the Works.



Steel Main Laying in Progress.

Woodall and Son, under the supervision of Mr. Charles C. Seymour. Mr. Seymour (who was formerly a pupil of Mr. Thomas Glover, of Norwich) has also superintended the laying of the mains and services in the town and district, and is retained by the Company as Manager.

The mains, about 5 miles in all, are entirely of steel, commencing with an 8-inch trunk main from the gas-works to the centre of the town, and graduating down to 2-inch. The contract for steel tubes was divided between the British Mannesmann Tube Company, Limited, and Messrs. Stewarts and Lloyds. The jointing is on the Woodall-Parkinson system, with the long rigid, or sleeve, joint for the mains, and expansion nipples for connecting the services. All main-laying was tested to 10 lbs. or more of air.

The number of consumers transferred from the old mains was 47, and new consumers are being rapidly connected. The number of public lamps transferred was 72, to which are added 34 new ones; making a total of 106. The lamps are almost entirely refitted with new lanterns and inverted burners supplied by the New Inverted Incandescent Gas-Lamp Company, Limited. For lighting and extinguishing, the Robson patent pressure-clock apparatus has been adopted throughout, as supplied by the Auto-Lighter Company, of Victoria Street, S.W. By this system, a slight alteration of pressure at the works instantaneously operates the clockwork on all the lamps; and the clockwork either turns the light on or off as the case may be.

Mr. Frank Garrett, jun., a Director of the firm of Messrs. Richard Garrett and Sons, Limited, is the Chairman of the new Gas Company. Other Directors are Mr. W. H. Carr, of Leiston, to whose enterprise the undertaking largely owes its inception, Mr. E. L. Mansergh, M.Inst.C.E., and Mr. B. de Quincey Quincey.

Over a hundred invitations to witness the opening were sent to the shareholders and friends, and to the members of the Urban District Council. The Directors were entertained at lunch by the Chairman of the Company; and they in turn provided tea in a marquee on the works ground for the visitors. Among the latter was Mr. Thomas Glover, of Norwich; while several other gentlemen from the Norwich Gas-Works also attended, as old colleagues of Mr. Seymour. Others present included Mr. Henry Woodall (of Messrs. Corbet Woodall and Son), Mr. George Winstanley, Mr. W. C. Parkinson, and all the members of the Urban District Council. The formal proceedings were very brief. The opening ceremony was performed by Mrs. Frank Garrett, jun., who unfastened the entrance gate of the works. The fastening specially provided for the purpose consisted of a gold bracelet (bearing a suitable inscription), which Mr. Henry Woodall, on behalf of the Engineers, asked Mrs. Garrett to accept as a memento of the occasion. In the course of his remarks, Mr. Woodall said the works were small, but well built; and the names of the various Contractors were known throughout the industry as being synonymous with very good work. He specially thanked their Secretary (Mr. B. R. Parkinson) and the Engineer-in-Charge (Mr. Seymour). The Company were to be congratulated upon having retained the services of the latter gentleman as Manager. The working results that he would secure from the plant would show that everything had been thoroughly well carried out under his superintendence.

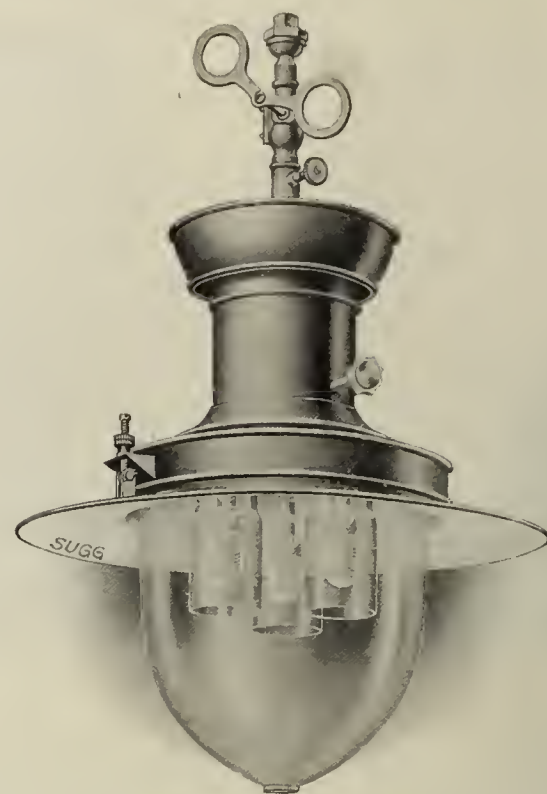
The party then proceeded to inspect the works, which were generally admired for their neat and finished appearance, and for the completeness of their equipment.

HIGH CANDLE POWER AT LOW PRESSURES.

William Sugg and Company's "1911" High-Power Lamp.

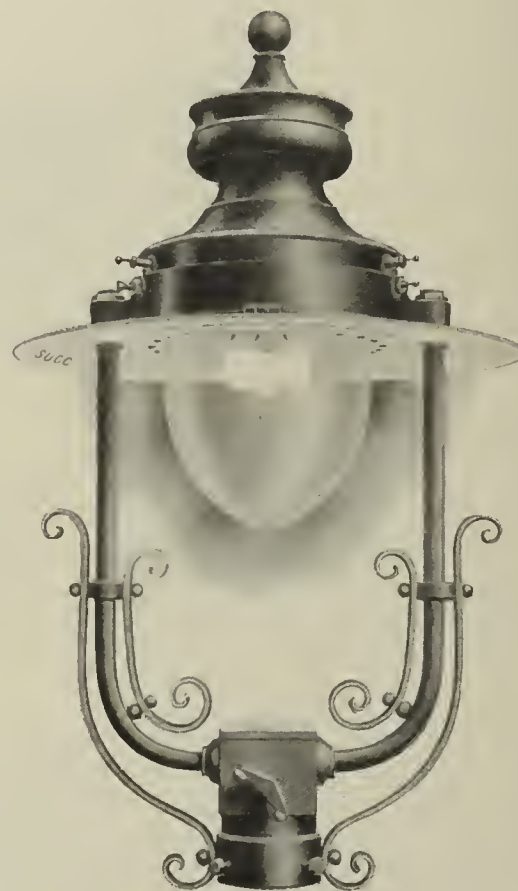
THE high efficiency lamp at low pressures for outside shop lighting, large interiors, and other suitable places, has, Messrs. William Sugg and Co., Limited, claim, been available for the gas industry for many months past in what is known as their "1911" type. It is a case of hiding one's light under a bushel when one does not make the broadest use of the means of publicity in announcing development of the kind. But we have now had an opportunity of thoroughly examining the lamp; and in it we find ingenuity and high duty combined with that high class workmanship which has assisted to make the name of "Sugg" a household word in the gas industry.

The "1911" type of lamp is made in three sizes—500, 750, and 1000 candle power; the lamps being respectively fitted with two, three, and four burners. The gas consumption of each burner is 6 cubic feet; and the efficiency, photometrically tested at 18-10ths to 20-10ths pressure, rather more than 40 candles per cubic foot. The lamp is really a development upon the previously popular "Regent" lamp. It is a lamp of exceptional strength—every part of the structure being of heavy metal, and all the vital parts so simple, so readily accessible, and so capable of replacement in a few minutes, that maintenance and renewal comprise a question about which there need be little thought. We have a strong interior cast-iron top, which carries the bunsen and the casing of the lamp. The casing is, according to the purchaser's desire, either of heavy copper or enamelled steel. The mantles are surrounded by interior glasses; and the glass bowl, which is carried on the hinged reflector, is egg-ended in shape. Incidentally, it may be remarked that the firm have a preference for this shaped globe, on the ground that it assists reflection, and affords a



Sugg's "1911" High-Power (Low-Pressure) Inverted Lamp.

better distribution of light. That is the lamp as seen externally. When, however, such high efficiency is obtained, at ordinary pressures, there must be some reason to account for it in the construction of the lamp; and in the "1911" lamp, the aim of Messrs. Sugg and Co. has been to put to the most profitable use the heat generated by the lamp itself. In preheating the gas and both the primary and secondary air to the utmost possible degree without producing trouble, they have been very successful; and, indeed, they confess that they do not well see how the point to which they have attained can be exceeded.



The "Regent" Lamp with Upright Fixing for Street Lighting.

Let us deal with the air supply first of all, as this is required for the mixture supplied to the burner as well as for the secondary supply to support combustion. The air enters from the outside of the lamp just above the reflector, passing first into an outer annular chamber formed by the central chimney and the casing. From this the air required for the secondary supply passes into a flat topped and bottomed cylindrical box, situated just above the mantles. Through this box are provided the necessary channels for the burners, and for the passage of the products of combustion. At the bottom of these channels are the supports from which the inner glasses depend. It follows from the position of this air-box that the air must get highly heated in its travel through it; and this hot air, by the draught set up and maintained by the upward heat currents from the burners, is drawn from the box-outlets near to the top of the inner

glasses, and becomes further heated by impinging on the glasses, and in its travel down the outside, and up the inside, of them. This hot air, and the velocity at which it passes up the glass and over the mantles (when once the lamp has warmed up to its work), no doubt have together an excellent effect in stimulating incandescence. By the constitution of the lamp, no air can get to its active parts, after the structure is heated up, that can have a cooling effect on either the flame or the mantle. Against this the designers of the lamp have effectively provided.

But that is not the only cause of the high duty obtained. There is the thorough admixture the gas and primary air obtain, and again it is the heat that produces the thorough intermingling. The gas has become partially heated in its descent; and after the introduction of the primary air, the mixture passes into an iron diaphragm, formed of two slightly concave plates in which it becomes further heated. The spreading of the mixture in this hot chamber has the effect of combining air and gas to such a degree that a very uniform and constant flame is obtained. The situation, however, of this diaphragm above the air-box is such that the mixture does not get so highly heated as to cause any back-pressure that cannot be resisted by the normal gas pressure. From the bottom of the thin mixing chamber, the mixture passes to the burner nozzles. Thus we see that the high efficiency of the lamp is due to preheating and thorough admixture, which are both provided for in such admirably simple and effective manner. The mantles used, which are suspended from a strong scateite nozzle, are somewhat larger than standard size. The adjustment of both gas and primary air are provided for externally.

There are a few miscellaneous points about the lamp. From the point of suspension to the bottom outer edge of the reflector, the length of the lamp is 21 inches, and the globe adds 10½ inches. The width of the reflector is 20 inches. Of the strength and the solidity of the lamp, mention has been made. But another feature is the ease with which the lamp can be taken to pieces, cleaned, and the parts reassembled. Strong screws and nuts are the main connections; and the fitter who, without previous instruction, could not see the way to separate every part of the lamp, and then to put the whole together again in a few minutes, would deserve to forfeit the title of "fitter."

Now we come to another point. As we have said, the lamp is a development on the firm's old "Regent" lamp, which has been selling in thousands to gas undertakings for hire purchase and purchase outright. The "Regent" lamp can be had fitted with the No. 6 mantle employed in the "1911" lamp; the advantage being that a more powerful light is obtainable without increasing the number of the burners or the size of the lamp. The efficiency is only slightly less than that of the "1911" lamp; and there are no inner glasses. Though no special provision is made for heating, from the very form of the construction of the lamp, it is obvious that the gas and air supply must get materially raised in temperature. Need we say, with all the experience there has been with the "Regent" lamp, it is one the firm particularly recommend for hiring-out purposes, on account of the ease of maintenance, and the cheapness of repair.

The "Regent" lamp is also made with upright fixing, as shown in the second illustration, which indicates what an excellent improvement, where adopted, it makes in the appearance of our street lamps, and consequently in that of our streets. In many places, lamps of this type have been fitted—among the localities, in Kingston and Kensington.

In connection with this and other patterns of their lamps, the firm have arranged a method of lighting by means of a flashing spirit torch, so as to obviate the necessity for a flash-light. A fixed tube, with a trumpet-shaped mouth, passes to the inside of the lamp. When the cock at the base of the lamp is turned on, the end of the flash torch is inserted in the trumpet end of the tube. A rubber ball at the other end of the torch rod is pressed lightly, and a small quantity of spirit is atomized, and blown across the permanent flame of the torch. This, becoming ignited, shoots a flame of ample volume into the lamp. It is a very effective method of ignition without opening the lamps; and it certainly saves the constant pilot.

In the lamps described, and in the other goods that were inspected, it was seen that the firm's old reputation for high-class work is being jealously guarded.

THE MIXING OF HOT GASES AND AIR IN GAS-RETORT FURNACES.

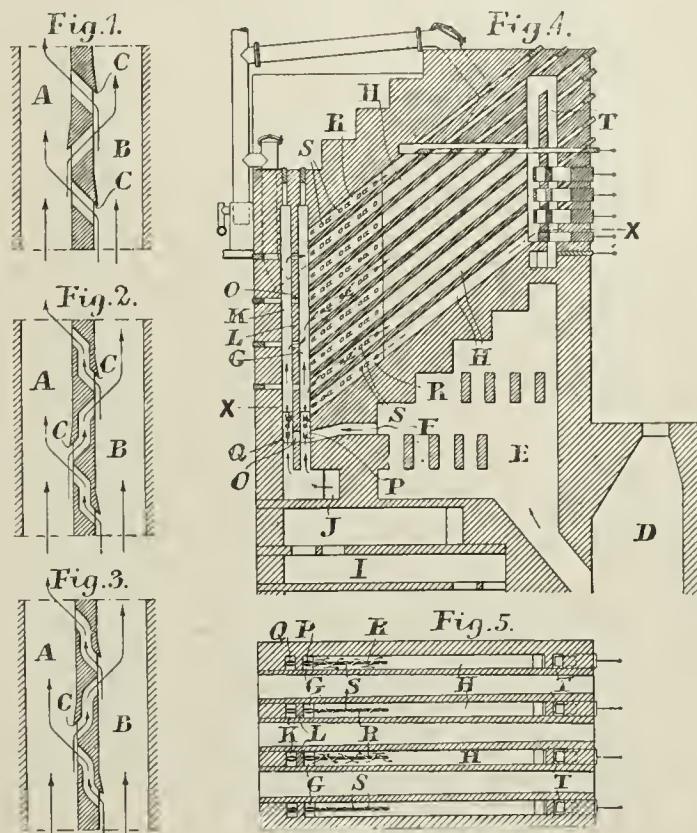
In order to heat as regularly as possible the walls of the chambers in retort-settings—for example, in chamber retorts—it is important to have the hot gases mixed as thoroughly as possible with the air necessary for combustion, and not to allow this to take place suddenly at the spot where the gases meet the air, but be produced gradually. The Ofenbau Gesellschaft have patented a device by which, as they claim, this object is attained. It consists in constructing, in the partition between the heating-flue and the air-flue, transverse channels alternately running obliquely one to the other and in a straight or broken line or a curve. Owing to the effect of suction from the chimney, there is a gradual mixing of the hot gases and the air of combustion.

The accompanying illustrations show several examples of the constructure of the device. Figs. 1 to 3 represent, in vertical

section, various arrangements of channels. Fig. 4 is a longitudinal section of a setting with oblique chambers in which the channels for the intake of the hot gas and air, as also those for heating, are constructed according to the invention. Fig. 5 is a horizontal section along the line X of fig. 4.

As shown by figs. 1 to 3, there are a number of channels in the partition between the heating-flue A and the air-flue B. These channels are oblique, and so arranged that they run alternately from right to left and left to right. As the result of this arrangement, under the influence of the chimney draught acting in the flues A and B, the hot gas is alternately drawn from A into B, and inversely the air from B into A, through the oblique channels; a gradual and complete mixing of the gas and air being thereby obtained. The orifices of the transverse channels are provided with an edge C in the form of a blade, projecting into the flues. This divides-up the relatively thin layers of the current of hot gas or air, and guides them into the channels. The oblique channels may be straight, as in fig. 1, in a broken line as in fig. 2, or in a curve as in fig. 3. They must, however, be arranged as baffles, so that the hot gases and the requisite air for combustion will be in turn conveyed from one channel to another, as indicated by the arrows.

In the setting with oblique chambers shown in fig. 4, the partitions with oblique channels in the hot gas and air intake flues produce a mixing of the hot gas and air; while, on the other hand, the channels constructed in the lower part of the heating channels running lengthwise with oblique transverse channels in their interior, produce an intimate mixture of gas and air in the heating channels themselves, and cause a perfectly uniform and gradual combustion of the mixture of gas and air.



The gas flowing from the producer D into the chamber E enters, through the channel F, the vertical channel G, where the heating channels H terminate. These are longitudinal, and are formed by two portions each near one of the sides of the chambers. The air required for combustion, having been previously heated in the regenerative furnace I, rises from the horizontal channel J into the lower part of the hot gas intake channel G and the air intake channel K, which is separated from the channel G by the partition L. In this partition there are openings O made at certain intervals, through which the gas and air intake channels G K communicate with each other. For the preliminary mixing of the hot gas and air, there are, at the lower part of these channels, portions P Q, in which there are transverse channels either oblique or in the form of baffles. The effect of this arrangement is that the mixture of gas and air which forms in the lower part of the channels G K has an alternate to-and-fro motion in the direction of the arrows, and is thus subjected to a preliminary mixing.

In order to mix the combination of air and gas as thoroughly as possible, and cause its gradual combustion in the heating channels H, partitions R are constructed at the front of these channels, and in the partitions are transverse oblique baffle channels S. Consequently the mixture of gas and air formed in the lower part of the channels G K does not burn suddenly at the place where the hot gas and air meet, but is first mixed by the perforated partitions P Q, after which it ascends in the channels G K to reach the heating channels H, where it burns gradually and uniformly. It is claimed that the retort chambers bounded on the sides by the heating channels H are heated with great uniformity.

In the type of setting shown in fig. 4, the hot gas escapes through an outlet channel T at the back of the setting.

NAPHTHALENE IN COAL GAS.

Three papers dealing with naphthalene in coal gas have appeared in recent numbers of the "Journal für Gasbeleuchtung."

Oils for Naphthalene Extraction.

The first, by Herr A. Bayer, of Brünn, deals with oils for the extraction of naphthalene from gas by washing. Two washers for naphthalene extraction were introduced at the Brünn Gas-Works in the year 1900; but they were intended to deal with a make of only 350,000 cubic feet per diem, whereas the maximum daily make of the works is about 954,000 cubic feet. Hence the washers were worked in winter above their nominal capacity, and the rate of flow of gas through them when they were worked in parallel was as high as 0.44 foot per second. In order to avoid importing the comparatively expensive heavy oil prescribed by Dr. Bueb, attempts were made to use a lighter tar oil, which was fairly free from naphthalene. This tar oil contained 68 per cent. distilling over below 180° C. and 25 per cent. distilling between 180 to 230° C. It contained 3.9 per cent. of naphthalene. After use for two months, the gas passed per cwt. of oil being approximately 300,000 cubic feet, the naphthalene in the oil had increased to 19.1 per cent.; while the oil contained 14.9 per cent. of benzol and 42.7 per cent. of heavy oil—i.e., oil distilling above 230° C. The light oil and middle oil had been reduced to 18.1 per cent. The heavy oil was no doubt largely derived from tar in the washer; but the analyses showed that a great deal of benzol had been absorbed in the washer and much light and middle oils carried away by the stream of gas. Experiments were then made with oil of the same grade, but with the washer maintained at a temperature of 46° to 50° Fahr. It was found that the benzol was extracted and the light oils volatilized from the oil, but both to a smaller extent than in the first trial. The oils after use contained from 17.5 to 28.9 per cent. of naphthalene. The gas in the distributing main was found to contain, on an average, 2.5 grains of naphthalene per 100 cubic feet.

After the washer had been in use for half-a-year, it was reported that more condensed liquor was being found in the syphon pots. Samples of the liquid were taken and analyzed. They proved to contain from 18.9 to 27 per cent. of naphthalene, probably derived from the deposits of solid naphthalene in the distributing system. The proportions of light and middle oils in the condensed liquid differed, however, according to the position of the syphon from which it was taken. In the syphons on the works the ratio of light oil to middle oil was on an average 63 : 37, while in the distributing mains, at points 500 to 3000 metres from the works, it was 77 of light oil to 23 of middle oil. The proportions correspond, however, on an average, pretty closely to the proportions of light oil and middle oil in the oil used for washing; so that it would appear that the stream of gas removes the two sets of hydrocarbons from the oil used in about the same ratio. The proportion of benzol in the condensed liquid removed from the syphons was, however, greater relatively to the light and middle oils the farther the syphons were from the works. Disregarding naphthalene and heavy oil in the condensed liquid, the constituents were in the following ratios: In the liquid from the syphons on the works, 11.7 of benzol, 63 of light oil, and 37 of middle oil; in the liquid from the syphons on the distributing main, 17.7 of benzol, 77 of light oil, and 23 of middle oil. From the differences between these figures, it appears that in the condensed liquid there is an increase in benzol of 50 per cent. between the works and the district, in the light oil of 22 per cent., and a decrease in the middle oil of 30 per cent. These figures represent the amounts of the respective hydrocarbons abstracted from the stream of gas between the works and the district. The hydrocarbons which exist in coal gas in the form of vapour or fog are, therefore, deposited in the distributing mains in amounts inversely proportional to their boiling points, as also to the friction, which depends upon the length of the main through which the gas has travelled. The quantities of condensed liquid were not determined; but so far as the works' syphons were concerned, they corresponded to about 1 cwt. per 12,000,000 cubic feet of gas, or about 3 per cent. of the amount of oil used in washing. In the mains in the district, the proportion was much smaller.

After a year's working of the naphthalene washers with light tar oils, naphthalene deposits in the distribution system ceased almost entirely, and the gas-pressure diagrams were quite satisfactory. A tar oil fulfilling Dr. Bueb's specified conditions was then used—viz., one having its specific gravity above 1, and containing a high proportion of heavy oil. Though such oil would have a lower solvent power for naphthalene, it seemed probable that it would prevent stoppages in the distributing system, and at the same time avoid the smoking of mantles in the public lamps which had occurred in a few instances during the use of the lighter oil. The oil used contained 1.4 per cent. of benzol, 7.8 per cent. of light oil, 22.2 per cent. of middle oil, 3.1 per cent. of naphthalene, and 65.5 per cent. of heavy oil. The oil after use in the washer contained 4.7 per cent. of benzol, 19.7 per cent. of light oil, 24.4 per cent. of middle oil, 6.3 per cent. of naphthalene, and 44.9 per cent. of heavy oil. There was an increase in the weight of the oil on use in the washer of about half its original weight.

The naphthalene extraction was much less satisfactory than with the lighter oil, and deposits of naphthalene in the works' plant increased. The difference from the favourable results obtained with heavy tar oils in other places may be accounted for

either by the high rate of flow of the gas through the washer or by the large quantity of water which was condensed in the washer and which floated on top of the heavy tar oil and moistened the grids of the apparatus, so that the active oil surface was diminished. As a consequence of these results, trials were next made with a mixed oil having a specific gravity below 1, and having the following composition: Benzol 1 per cent., light oil 3.3 per cent., middle oil 31.4 per cent., naphthalene 2.3 per cent., and heavy oil 62 per cent. The composition of this oil after use was as follows: Benzol 5.3 per cent., light oil 12 per cent., middle oil 28.7 per cent., naphthalene 10.6 per cent., and heavy oil 43.4 per cent. It appeared from the analyses that the light and middle oils taken up by the washing oil were in almost the same proportion as that in which they existed in the deposits in the distributing system—about two-thirds of light oil to about one-third of middle oil.

During the trials with heavy oil and the mixed oil last mentioned, tests were made from time to time of the amount of naphthalene in the gas in the distributing system, and were found to average with the heavy oil 35.3 grains per 100 cubic feet, and with the oil of specific gravity below 1, 21.2 grains per 100 cubic feet. It would appear from the results recorded that the lighter tar oils answer best for the extraction of naphthalene, because the heavy oil and the mixture of heavy oil and middle oil do not possess the requisite absorptive capacity. That the heavy oil has given satisfactory results in other places, is probably due primarily to the amount of oil used not being less than 1 cwt. per 250,000 to 300,000 cubic feet of gas. The diminution of the effective surface of the oil by the covering of condensed water is, however, of great importance in regard to the use of heavy oil.

The analyses of the tar oils and condensed liquids referred to in the foregoing were made by distilling the oils in the usual way; but the naphthalene was estimated gravimetrically. The fraction distilling between 180° and 230° C., after being measured exactly, was exposed for four to six hours to a temperature of 0° C. The naphthalene which had then crystallized out was brought on to a small tared and cooled porcelain filter, completely extracted by means of an air-pump, and weighed. For the naphthalene remaining dissolved in the liquid a solubility coefficient of about 10 per cent. was adopted, and introduced in the calculation. This was substantiated by determinations of the proportion of naphthalene in the oil by means of picric acid. The method of working was rapid and convenient; and, if not absolutely exact, it gave comparable results.

Tars for Naphthalene Extraction.

Herr Zwarg, the Manager of the Elbing Gas-Works, has made experiments on the use of the tar produced in the manufacture of carburetted water gas for washing coal gas for the extraction of naphthalene. The oil used in the carburetted water-gas plant was Galician oil having a specific gravity of .87. The tar produced therefrom somewhat resembles in composition that made in vertical retorts, as is shown from the following statement of their respective compositions:—

—	Oil-Gas Tar.	Vertical Retort Tar.
	Per Cent.	Per Cent.
Water	1.0	2.17
Light oil distilling below 170° C.	6.5	5.85
Middle oil distilling between 170° to 230° C.	9.0	12.32
Heavy oil distilling between 230° to 270° C.	18.5	11.95
Anthracene oil distilling above 270° C.	42.0	15.96
Specific gravity	1.068	About 1.1

On cooling the middle and heavy oils to 10° C. naphthalene amounting to about 6 per cent. of the tar separated, as compared with about 10 per cent. in the vertical retort tar. The solvent power of the oil tar for naphthalene at 77° to 86° Fahr. was determined, and it was found that 28 to 30 per cent. of naphthalene was dissolved. The behaviour of gas free from naphthalene with the oil-gas tar containing 6 per cent. of naphthalene was ascertained by passing gas through a wash bottle containing 5 per cent. of oxalic acid, then through two cylinders charged with saturated solution of picric acid. The gas thus freed from ammonia and naphthalene was next passed through a bottle containing the oil-gas tar, after which it was passed through a bottle containing 5 per cent. of oxalic acid and two cylinders charged with picric acid. The naphthalene absorbed from the oil-gas tar was removed in the latter cylinders and determined by titration with decinormal solution of caustic potash. The amount of naphthalene in the gas was thus found to be 2.3 grains per 100 cubic feet. When the gas, however, after passing through the oil-gas tar, was passed through a bottle containing clean anthracene oil, most of the naphthalene was retained by the latter, and the gas then contained only 0.175 grain of naphthalene per 100 cubic feet. The temperature of the gas and tar in these experiments was kept at 59° Fahr. It thus appears that naphthalene washers cannot be charged with oil tar alone if the proportion of naphthalene in the gas is to be kept below 2 grains per 100 cubic feet.

In working on the large scale, the first or inlet chamber of the washer was charged with oil tar and the second or outlet chamber with anthracene oil. It was found in practice that it was best to renew the oil-gas tar when a sample, on distillation, gave about 21 per cent. of naphthalene in the fraction distilling between 200° and 270° C. The anthracene oil from the outlet chamber was pumped into the inlet chamber when 1 to 2 per cent. of naphtha-

lene separated from the fraction distilling between 200° and 270° C. upon cooling for one hour. The method of working has been to start with oil-gas tar containing 5 per cent. of naphthalene in the inlet chamber, and anthracene oil free from naphthalene in the outlet chamber. The oil-gas tar in the inlet chamber has been renewed when the amount of naphthalene in it has risen to 24 per cent. When the second charge of oil-gas tar has subsequently been exhausted, the anthracene oil in the second chamber has contained 2 per cent. of naphthalene, and has been pumped into the first chamber, while fresh anthracene oil has been put into the second chamber. When the anthracene oil in the first chamber has contained 22 per cent. of naphthalene, it has been replaced by oil-gas tar, which, in turn, has been replaced by the anthracene oil from the second chamber when the latter has acquired 15 per cent. of naphthalene.

By this method of working, it has been possible to maintain the proportion of naphthalene in the washed gas at about 1 grain per 100 cubic feet. It has thus been found that the anthracene oil could not continue to be used up to a content of 28 per cent. of naphthalene, because in that case the anthracene oil in the second chamber acquires more than 1 per cent. of naphthalene. The trials showed broadly that oil-gas tar is not applicable by itself for the extraction of naphthalene if the proportion remaining in the gas has to be maintained below $1\frac{3}{4}$ grains per 100 cubic feet, and that with a washer containing only two chambers the anthracene oil cannot be used long enough to allow it to become completely saturated.

Determination of Naphthalene in Crude Coal Gas.

The last of the three papers is by Herr A. Albrecht and Dr. F. Müller, of Fürstenwalde on the Spree. It relates to the determination of naphthalene in crude coal gas. The authors state that they have used picric acid for the determination of naphthalene in gas by the following method. First, 2.5 grammes of picric acid are divided nearly equally between two wash bottles, each of 110 c.c. capacity; and 25 c.c. of water is added to each, with vigorous agitation. A second quantity of exactly 2.5 grammes of picric acid is dissolved in water, and made up to 250 c.c. in a measuring flask. This corresponds approximately to a saturated aqueous solution at 50° to 54° Fahr.; so that it can be used in a cold room without depositing picric acid. The gas containing naphthalene is passed at the rate of 40 to 50 litres an hour through the wash bottles, which are connected with butt glass joints. The passage of the gas is continued till between 0.05 and 0.2 gramme of naphthalene has combined with the picric acid. The contents of the two flasks are then washed into a 250 c.c. measuring flask and warmed for half an hour (with frequent agitation) to 104° to 122° Fahr. in a water bath, so that all the free picric acid is taken into solution.

After cooling to the temperature of the control solution, the flask is filled up to the mark; the solution filtered through a dried filter; and 100 c.c. of the clear filtrate is titrated with decinormal solution of caustic potash with lacmoid as indicator. The control solution of picric acid is similarly titrated, and the titration in both cases is repeated. The difference in the number of cubic centimetres of solution of caustic potash required for 200 c.c. of the two solutions is multiplied by $\frac{5}{4} \times 0.0128$; and the result is the quantity of naphthalene, in grammes, retained in the two wash bottles, and therefore the amount present in the volume of gas passed through them. The accuracy of the method has been checked by passing dry nitrogen over a weighed quantity of naphthalene and determining the naphthalene in the nitrogen. The results have shown fairly close agreement with the loss of weight of the naphthalene over which the nitrogen has been passed.

The examination of crude coal gas by this process gave such low results that their correctness seemed doubtful. Sawdust, dried ferric hydrate, and dilute sulphuric acid had been used to retain the tar, cyanogen, sulphuretted hydrogen, and ammonia in the crude gas. The vessels charged with these purifying materials were placed in a drying oven, which was kept at a temperature of 95° to 104° Fahr., while the gas was passed through them. Nevertheless, the purifying materials must have retained the greater part of the naphthalene. This was proved by passing nitrogen containing naphthalene through purifying apparatus which had been previously used, but was otherwise unchanged. On warming to 104° to 122° Fahr., the amount of naphthalene found in the nitrogen was at first considerably higher than that in it before its passage through the purifier, but subsequently considerably lower. Thus the nitrogen had in the first instance taken up naphthalene which had been retained in the purifier from the gas previously passed through it; but subsequently the purifier retained about 40 per cent. of the naphthalene in the nitrogen.

In order to clear up this point, a number of tests were made on various purifying materials, by passing nitrogen containing naphthalene through them while maintained at a temperature of 104° to 122° Fahr. The result showed that the only materials applicable for the purification of the gas were sulphuric acid and caustic alkali. Small quantities of tar passing through did not affect the sharpness of the colour change at all. New india-rubber tubing, as has already been pointed out, gives rise to errors. Consequently, the rubber tubing used must be old, and in as short pieces as will suffice.

The author gives tables showing the results of determinations of the naphthalene contained in crude coal gas from horizontal and from vertical retorts. The gas from the horizontal retorts

was tested at a point in the foul main of a setting of eight retorts about 40 inches from the hydraulic main. A thermometer was placed in one arm of a T-piece and the gas for testing taken off from another arm. With short rubber connections, the crude gas was led through a purifier in a heated oven; the purifying train consisting of three wash bottles containing dilute sulphuric acid and two wash bottles containing a solution of caustic potash. It was then passed, in the manner already described, into the picric acid solution contained in 100 c.c. flasks, and then through a gas-meter to the suction pump. The vertical retort gas was taken from the gas take-off pipe directly behind the tar-receiver or the hydraulic main of a bed of ten vertical retorts. The rest of the arrangement was the same as for the examination of gas from horizontal retorts. The gas volumes were corrected to normal.

The crude gas from the horizontal retorts contained, when English coal was being carbonized, 350 grains of naphthalene per 100 cubic feet (the temperature of sampling being 129° Fahr.), and the same amount when Upper Silesian coal was being carbonized and the temperature of sampling was 140° Fahr. The vertical retorts, at an average sampling temperature of 160° Fahr. gave gas containing 436 grains of naphthalene per 100 cubic feet. It should be pointed out that the amount of naphthalene in the crude gas is probably somewhat higher than the figures given, because the tar which separates in the purifying liquids certainly contains some naphthalene. The amounts of naphthalene found by the authors may appear to be high; but the figures for the quantity of naphthalene required to saturate gas at the temperatures stated (deduced from determinations of its vapour tension by Messrs. Barker and Allen) show that they are quite probable. Gas, according to their determinations, is saturated at—

131° Fahr.	by	395	grains of naphthalene per 100 cubic feet
140°	"	587	" " " "
158°	"	1161	" " " "

The higher proportion of naphthalene found in the crude gas from vertical retorts must certainly be attributed to the higher temperature at which the sample of gas was drawn off, and is not due to the system itself. Three different descriptions of coal which were carbonized gave practically the same amount of naphthalene in the crude gas.

In order to ascertain how much naphthalene condensed in the mains with vertical retort gas, and how the naphthalene washers worked, determinations of naphthalene were made before and after the washers. The gas before the washers had normally a temperature of only 50° Fahr.; so for these experiments the condenser was by-passed in order to bring the gas to the washers at a higher temperature. The average temperature before the washer then became 70° Fahr., and the average amount of naphthalene was 11 grains per 100 cubic feet, and after the washer 4.1 grains per 100 cubic feet. At 68° Fahr., the gas would be saturated by 20 grains of naphthalene per 100 cubic feet. The washer was filled with Galician gas-oil, and at the beginning of the tests about $3\frac{1}{2}$ million cubic feet of gas had already passed through it. The washing oil, which originally was free from benzol, contained in the first chamber of the washer after 212,000 cubic feet of gas per diem had been passed through it, 15 per cent. by volume of benzol and 9 per cent. of naphthalene. The results of the investigation show that in the warm season of the year the naphthalene washer may be by-passed.

Meeting of the American Commercial Gas Association.

We learn from the "American Gaslight Journal" that considerable interest is being shown throughout the American gas industry in the seventh annual meeting of the National Commercial Gas Association, which is to be held in Denver (Col.) from the 23rd to the 28th of October. The list of papers has been compiled with a view to offering as wide a range of subjects as possible. The following are the titles:

- "An Equitable Sliding-Scale for the Sale of Gas." (Editor not selected.)
- "Up-to-Date Advertising Methods," by T. R. Elcock, jun., of Philadelphia.
- "Illuminating Engineering and its Application to the Gas Industry," by E. L. Elliott, Editor of the "Illuminating Engineer," of New York.
- "Exhibit and Description of Model Glass Gas-Works," by A. F. Traver, of Denver.
- "The Modern Gas-Fixture," by Charles Ummach, of Chicago.
- "The Designing and Construction of Gas Appliances," by R. E. Clark, of Chicago.
- "Increased Efficiency in Scientific Office Accounting," by P. R. Jones, of New York.
- "Practical Demonstration Work," by Mrs. Anna A. Carroll, of Philadelphia.

The attendance is expected to be exceptionally large; and the success of the exhibition of gas appliances in connection with the meeting is regarded as assured—every space in the hall having been taken.

We have received from the Hon. Secretary (Mr. Ernest Secars) the "Transactions" of the London and Southern District Junior Gas Association for the past session. In addition to the papers and discussions, reprinted from the "JOURNAL," the pamphlet contains a short account of the joint meeting of the English Junior Gas Associations at Birmingham in May last, lists of the officers and members, and the accounts. A portrait of the President (Mr. L. F. Tooth) forms a frontispiece.

INDIRECT LIGHTING.

The "American Gaslight Journal" for the 11th inst. contains the following article on this subject by Mr. Francis H. Gilfin, of the photometrical laboratory of the United Gas Improvement Company of Philadelphia.

In the development of the illumination of various types of interiors, much stress is now laid on, and attention directed towards, the elimination of bright light-sources from the field of vision, and to the reduction of glare, while at the same time securing a proper distribution of light. But the mere choice of illuminant, its size, and location, should not be the final goal of the illuminating engineer. Efficiency of illumination should not be based solely on lumens per watt or per cubic foot, nor on the basis that makes the investment commercially profitable—the one of dollars and cents per unit of illumination. There is a sounder and more humane basis—that of the ultimate physiological effect, which, as related to the energy used, may be called the practical, or human, efficiency of an illumination scheme. More variables enter into this than as yet can usually be measured by scientific means; for the field is new and but little known. Many of the laws and rules for direct lighting are understood and practised; but the laws governing the ultimate physiological effect are more varied and indefinite. In the physiological field lie the problems of finding what amount of reduction in visual sensibility is due to bright spots of light in the line of vision, and how great is the glare effect caused by a background lighter in colour or brighter in illumination than the object observed.

When there is illumination by direct light, either from a large central source or scattered smaller sources, the first of these problems is rarely absent. The physically measurable amount of light is, in many cases, out of all proportion to the measure of the ability to readily read or distinguish detail. The sources themselves, if not in the direct range of vision, are often so nearly specularly reflected by adjacent objects that the glare effect is only in a measure reduced. Where it is necessary to use a number of sources hung low, enveloping shades or globes of diffusive quality must be used to mitigate the frightful eye strain. Often, where the diffusing medium is made large or selected unusually dense, in the attempt to reduce intrinsic brilliancy, it nearly defeats the purpose of its use by making either an unsightly or a very inefficient installation.

In a large number of cases, the use of a single properly designed indirect or semi-indirect unit would obviate a great deal of the difficulty. Much has been said for and against this system of illumination, with a great deal of truth on both sides. Indirect lighting will never be a panacea to cure all the ills of "glare;" but, if judiciously chosen and properly used, there are many excellent opportunities for its application. Probably the use of a single source, reasonably high, with its light reflected and diffused so that the secondary source, so to speak, becomes the lighting unit, would prevent a great deal of ocular discomfort. In rooms with low ceilings, it has many times been proved in various installations, both of gas and electricity, that this form of illumination has been successful far beyond the expectations of those who devised and installed it. In spite of all that has been said against it, both with, and more often without, proof, its use will increase with a better understanding, especially in the semi-indirect forms of units.

In the use of indirect, or semi-indirect, lighting, the two chief points of discussion are: (1) The loss of perspective, due to the absence of shadows; (2) the so-called "trying effect" on the eye, due to the peculiar method of redirection of the light.

As to the first point, while shadows are not entirely absent, they may be obviated if desired in certain cases where their presence is objectionable, as, for instance, in drafting-rooms. The presence or absence of shadows depends much upon the design of the installation. Where a single indirect unit is used in place of a single direct unit, as in small rooms, the shadows are softened, and the distribution of illumination is made much more uniform. Probably nothing is more trying to the vision than a sharp contrast of light and dark colour, such as deep shadows on a bright sunny day, inasmuch as the persistent straining of the eye to see what lies in the dark places is counteracted by an opposite strain to protect the visual organs against high illumination of bright spots.

Monotony of illumination is sometimes charged to indirect lighting; but this is due not merely to the uniformity of the illumination falling on the surface viewed, but to the uniformity of objects themselves and their almost uniform specific brightness. The eye does not see by a light falling on an object; but, instead, all detail and variation are judged by the effect produced on the retina by the specific brightness, colour, and extent of the object viewed.

It seems unfortunate that many indirect illumination installations have been located in places where simplicity of decoration and multiplicity of similar objects are the rule. Unfortunately, too little attention is paid to the combination of the artistic and the lighting effects. Light ceilings—such as pale yellows, greens, and white—are essential to the efficiency of the system; but walls of similar colour are not essential, especially in a large installation. Even the use of a high dado, of some dark or medium colour, would not seriously affect the efficiency, while it would materially help the æsthetic effect; and this would be true also in direct lighting schemes.

The use of an indirect gas system is still as economical in cost

as the most efficient direct electric installation. Generally from indirect gas installations some 50 to 60 lumens per cubic foot may be obtained; while on similar electric tungsten installations from 2.5 to 2.9 lumens per watt may be expected. As the relative selling price of the cubic foot and watt is generally as 10:1, the indirect gas installation gives double the cost efficiency of the electric one, and is equal to a direct electric installation.

DETERMINING THE TOTAL SULPHUR IN COAL GAS

Herr M. Dickert, Chemist to the Eschweiler Mining Association, has reported in the "Journal für Gasbeleuchtung" on a new method for the determination of the total sulphur in coal gas. He points out that existing methods fall into two classes—viz.: (1) Those in which a measured quantity of the gas is burned, the products of combustion absorbed, and the sulphuric acid formed determined as barium sulphate or volumetrically; (2) Winkler's method, in which the sulphuretted hydrogen is absorbed by ammoniacal solution of silver nitrate, and the organic sulphur compounds are converted, by passage over heated platinized asbestos, into sulphuretted hydrogen, which is then absorbed in the same way. [The latter method is, of course, very similar to Harcourt's method, in which the sulphuretted hydrogen is absorbed by a syrupy solution of lead acetate; but this method is not mentioned by the author.] The combustion method, however, involves the use of a meter, the water or glycerine in which has to be previously saturated by the gas, while the widely different quantities of precipitate obtained from the sulphuretted hydrogen and from the organic sulphur contained in the same quantity of gas, render Winkler's method troublesome for the determination of the total sulphur, although it answers well for the determination of organic sulphur alone.

The author adds to 10 c.c. of Merck's perhydrol 75 c.c. of a solution of caustic soda of 30° Baumé. A thick crystalline precipitate (which remains suspended in the liquor) is formed, having probably the composition $\text{Na}_2\text{O}_2 + 8\text{H}_2\text{O}$. This substance has a powerful oxidizing action, and converts all the sulphur compounds, except thiophene, into sulphuric acid. The quantity of thiophene in gas is so small that the error due to its non-oxidation is of no importance. The gas to be tested is passed through the liquid, holding the crystals in suspension, contained in a Drehschmidt's washing-bottle. Even if only one bottle is used, the gas can be passed without risk at the rate of 100 litres per hour. After the passage of gas has been stopped, the contents of the bottle are washed into the beaker, acidified with hydrochloric acid, which decomposes the sodium peroxide, and boiled to effect the removal of the resulting hydrogen peroxide. The sulphuric acid is then either precipitated as barium sulphate or determined volumetrically. Results of determinations made in this manner show an agreement within about ± 1 per cent. of the results obtained by Winkler's method.

The author claims for the method that it occupies less time than the older methods, does not entail the combustion of the gas—and therefore may be carried out in any place on a gas-works—and may be applied, by the use of an aspirator, to apparatus in which the gas is under a vacuum.

Photometric Tests at the Imperial Physical Technical Institute at Charlottenburg in 1910.

The report of work done at the Physical Technical "Reichsanstalt" last year, as given in the "Zeitschrift für Instrumentenkunde," states that 127 Hefner lamps were certified, the majority of which were fitted with the optical flame measurer. This makes a total of 1832 of these lamps certified by the Laboratory since the examination of them was undertaken in the year 1893. There were also examined 190 carbon filament and 375 metallic filament electric lamps, all intended to serve as standards for photometrical purposes. Other electric lamps were tested for durability, as were also a number of incandescent gas burners and mantles. Tests were also made with a number of glass chimneys for incandescent gas-burners; the object being to compare the effect of clear glass chimneys with those of chimneys of Euphos glass, having a greenish tint. The Euphos chimney proved to give a 6 per cent. lower average horizontal illuminating power than a clear glass chimney. It is reported also that the British Committee of the International Electro-Technical Committee have suspended their endeavours to introduce the new so-called "international" candle as a unit of light. The Austrian technical bodies have decided to retain the Hefner lamp as a standard of light for the present, and to remit the consideration of the question to the next meeting of the International Photometric Committee—i.e., the meeting which was held at Zürich in July last.

A Gas-Engine Handbook.—We have received from Messrs. Crosby Lockwood and Son "A Handbook on the Gas-Engine." It is a practical treatise on internal combustion engines, written for the use of engine builders, engineers, and others, by Herr Herman Haeder, of Wiesbaden. The work just published (of which a more extended notice will appear later) is a translation from the German by Mr. W. M. Huskisson, who has edited the text, and added numerous useful tables and other matter. The price of the book is 18s. net.

THE CALIBRATION OF HIGH-TEMPERATURE THERMOMETERS.

A paper by Dr. Arthur L. Day, Director of the Geophysical Laboratory of the Carnegie Institution of Washington, on "Recent Advances in High-Temperature Gas Thermometry," which was read before a meeting of the Faraday Society a short time ago, describes the progress made in recent years in extending the range of the air or gas thermometer to temperatures at which it overlaps the region in which radiation pyrometers are available. The calibration of radiation and thermoelectric pyrometers has by these advances been rendered much more exact and trustworthy. Incidentally also, a number of melting points of importance have been determined with greater precision than hitherto. The following is a summary of the contents of Dr. Day's paper.

Relative measurements of temperature can be made with comparative ease with the thermo-element and the resistance thermometer or the radiation pyrometer; but the measurements so made are dependent absolutely upon fundamental measurements with the gas thermometer for their evaluation in terms of the generally accepted Centigrade degree. Until recently, however, the range of the gas thermometer was limited upwards at about 1150° C., and radiation pyrometers are ineffective below 900° C.; so that it was only in the interval between 900° and 1150° that comparison was possible for the purpose of calibrating the scale of the radiation instrument. The scale was commonly extrapolated much beyond 1150°; but such a procedure was obviously very uncertain. It was therefore eminently desirable that the scope of the gas thermometer should be extended 200° or 300° farther, so that the radiation pyrometer might be compared and accurately calibrated over a wider range. The thermo-element overlaps both the gas thermometer and radiation pyrometer. It likewise depends for its calibration directly on the gas-thermometer scale, and there is uncertainty about its extrapolation beyond 1150° C.

The author refers to the attempts made in the present century to measure temperatures above 1000° C. with the gas thermometer. There have been four such attempts—viz.: (1) By J. A. Harker at the National Physical Laboratory in 1904, in which the thermometer used had a porcelain bulb, and was filled with nitrogen. Very little new information resulted from this investigation. (2) By Jacquerod and Perrot in 1905, with a bulb of "quartz glass," and with, successively, nitrogen, oxygen, air, carbon monoxide, and carbon dioxide as the contained gases. They determined thus the melting point of pure gold, but made no effort to extend the measurements above 1150° C., and indeed the

silica bulb would have precluded any considerable extension in this direction. (3) By Holborn and Valentine in 1906, using a bulb of platinum containing 20 per cent. of iridium, and a bulb of pure iridium, both with nitrogen as the expanding gas. With the pure iridium bulb, temperatures of nearly 1700° C. were several times reached. (4) By Day and Clement in 1908, and Day and Sosman in 1910, using bulbs of platinum containing 10 per cent. of iridium and 20 per cent. of rhodium respectively, with nitrogen as the expanding gas.

The author proceeds to discuss the conditions which were observed in the last-named series of investigations. Nitrogen was chosen as the expanding gas because it may be used up to 1600° C. without any appearance of irregularity in its expansion or evidence of dissociation. Porcelain bulbs were avoided, because porcelain cannot hold the expanding gas without some absorption or loss, and it is not absolutely uniform in its own expansion and contraction. A bulb of platinum containing 20 per cent. of rhodium was ultimately selected for use at the Geophysical Laboratory in preference to a platinum iridium alloy, because the thermoelements are liable to contamination if exposed to the vapour of iridium. The furnace was electrically heated, and the bulb and heating coils were enclosed in an air-tight bomb, by the use of which the gas pressure outside the bulb could be controlled and kept equal to the pressure of the expanding gas within. This avoided risk of diffusion of the gas through the wall of the bulb, and relieved the bulb from mechanical strain at the high temperatures at which the metal is soft.

The temperature differences in different parts of the bulb were diminished in these researches to about 2° in the region 1500° to 1600° C. The manometer was of the open U-tube type, the capillary connection between it and the bulb being reduced in capacity as far as possible. It is not, however, practicable to restrict the diameter of the connecting capillary in the portions which are heated below 0.8 mm, because the increased viscosity of the gas at high temperatures would otherwise cause equilibrium to be established very slowly. The auxiliary thermo-elements placed in the furnace with the bulb were used afterwards for the determination of a series of standard fixed temperatures, such as the melting points of metals, minerals, or salts. The melting temperature of three or four of these substances thus determined may now be used for the calibration of other thermo-elements and for checking the calibration of existing thermo-elements, which may have been exposed in use to contamination from metallic vapours. The following are a few of the standard melting points, &c., found by Day and Sosman, placed side by side with the standard melting points published by the Reichsanstalt in 1900, which are those now generally used:

Table of Melting Point Determinations.

Substance.	Atmosphere.	Crucible.	Melting and Freezing Point Temperature (Day and Sosman). (1910)	Reichsanstalt Scale. (1900)
Cadmium	Air	Graphite	320.0° C. ± 0.3	321.7° C.
Zinc	"	"	418.2° " ± 0.3	419.0° "
Antimony	Carbon monoxide	"	629.2° " ± 0.5	630.6° "
Aluminium	" "	"	658.0° " ± 0.6*	657.0° "
Silver	" "	"	960.0° " ± 0.7	961.5° "
Gold	" "	"	1062.4° " ± 0.8	1064.0° "
Copper	" "	"	1082.6° " ± 0.8	1084.1° "
Diopside	Air	Platinum	1391.2° " ± 1.5†	..
Nickel	Hydrogen and nitrogen	Magnesia and magnesium	1452.3° " ± 2.0	..
Cobalt	"	Magnesia	1489.8° " ± 2.0	..
Palladium	Air	Pure Magnesia	1549.2° " ± 2.0	1575.0° "
Anorthite	"	Platinum	1549.5° " ± 2.0	..
Platinum	"	..	1755.† | 1752.‡ |	..
			± 5.0†	

* Freezing point.

† Melting point.

‡ Extrapolation optical.

§ Extrapolation thermo-electric.

The estimates given of the melting point of platinum were obtained: (1) By adding the difference observed by radiation methods between the melting points of palladium and platinum to the melting point of palladium as determined by the gas thermometer; (2) by extrapolating the curve of thermal electromotive force from the palladium melting point to the point at which the platinum wire of the thermo-clement melts. The two estimates—viz., 1755° and 1752° C.—are in excellent agreement, and are 50° above the previously accepted temperatures ascertained by extrapolating the parabolic curve of electromotive forces from the temperature of 1150° C. The researches carried out at the Geophysical Laboratory at Washington have opened the way for direct and accurate calibration of radiation pyrometers throughout the range 900° to 1550° C., and afford a more certain basis for extrapolation to higher temperatures.

STANDARDS OF LIGHT & THEIR APPLICATIONS.

Dealing with this subject in a recent number of "Engineering Record," a writer points out that, considering the enormous amount of money that is annually spent for public and private lighting, the standards and methods by which light is evaluated have until recently been in a shockingly crude condition. The fundamental trouble with getting a standard of light is the difficulty of finding any light-moving body which can be trusted to

operate uniformly, and is at the same time a thing which can be reproduced with concordant results. The practical standards which have been employed are flames from the combustion of some substance of definite composition burning under carefully specified conditions. The trouble began with the candle, of which several kinds, specified with more or less lack of precision, have been employed as legal and official standards of light. Three other flame standards—the Careel, the Hefner, the Pentane—have been, and are, widely used; and all of them have proved much more reliable than any candle. They are frankly empirical; but the labour of many years has enabled them to be evaluated with respect to each other with a high degree of precision. The world's measurements of light arc, therefore, practically tied up to these three lamps.

The present standard of luminous intensity is the so-called international candle, which is the formally recognized standard in the British Empire, France, and the United States. It was the result of a call for international action on the part of the Illuminating Engineering Society, followed by the active co-operation of the national standards laboratories of the three countries concerned. The value set for the international candle was practically a mean between determinations based on the intercomparison of the Pentane, Careel, and Hefner lamps. Its general acceptance involved some slight changes in the values hitherto assumed. But these have been fully accepted by the technical bodies representing the lighting interests of all three countries, and by the Government service as well; so that now a candle power means

the type of kettle or boiler which contains in itself a heating resistance of some kind, and therefore is a special article. Yet another mode of electric heating for water-boiling or cookery is to employ an ordinary kettle or saucepan over an electric hot-plate or incandescent radiator. But the class of kettles which are most efficient with gas-rings are not most efficient with electric hot plates.

In the case of ordinary coal gas employed as a heating agent with the usual gas-rings, we may reckon that each cubic foot of London gas at 60° Fahr. and 30 inches barometer, has in it potential energy available for heating equal to about 550 B.Th.U. This calorific capacity varies somewhat from day to day according to the chemical constituents of the gas. Since 1 B.Th.U. equals 0.294 watt-hour, we may say that the intrinsic or gross calorific capacity of London gas is about 162 watt-hours per cubic foot, or 162 kelvins per 1000 cubic feet. The question then arises: How much of this 162 kelvins can we utilize in water-heating? I find much depends upon the kettle and the gas-ring. For each kettle there is an appropriate size of gas-ring and a certain rate of supply of gas, which gives the best efficiency. Taking an enamel iron kettle holding one quart, and putting it over a large gas-ring, it was found that it required 0.9 cubic foot to raise one pint of water to the boil. This means that energy equal to 146 watt-hours was supplied as gas burnt to impart 55 watt-hours to the water. The efficiency, therefore, is only 34 per cent. Using a smaller gas-ring, the gas burnt was only 0.67 cubic foot for the same duty—equivalent to an efficiency of 53 per cent. If a bright tin kettle was employed, the consumption was 0.61 cubic foot—an efficiency of 58 per cent.; and if a "kwik" kettle, or one having water-tubes in the base, was used, the gas consumption fell to 0.55 cubic foot, and the efficiency rose to 61 per cent. Using three pints of water in a bright tin saucepan over a small gas-ring gave a consumption of 0.62 cubic foot per pint, and an efficiency of 58 per cent.

It is clear, therefore, that when using an ordinary tin or iron kettle over a suitable gas-ring, we cannot obtain a much higher efficiency than 60 per cent. On the other hand, with the electric kettles we can obtain an efficiency of 80 per cent. or more. The ultimate question, however, is one of cost. If electrical energy is supplied at 1d. per unit, then the best electric kettle will take 60 watt-hours to boil the pint of water, costing 0.06d. The best ordinary kettle and gas-ring takes 0.55 cubic foot of gas, which, at 2s. 9d. per 1000, will cost 0.018d. Accordingly, for the small operation of boiling a pint of water, the gas has the advantage in mere cost, but many disadvantages from other points of view. If, however, we take into account the fact that gas-burners in the hands of domestic are nearly always lit before they are wanted, and left burning after they have been used, the practical ratio between the cost of small water-boiling by gas at 2s. 9d. per 1000 cubic feet and electric energy at 1d. per unit is not nearly so large as 1:3. It is more like 1:2, or even 1:1. As regards larger quantities, it is easy to show that to provide 10 gallons of hot water at 110° for a bath, raising it from 60°, requires the expenditure of 2 kelvins. This, at 1d. per electrical unit, costs 2d. My experience is that to do it by gas requires 30 to 40 cubic feet of London gas, costing 1d. to 1½d. It must be remembered, however, that each cubic foot of gas requires, roughly speaking, two cubic feet of air to burn it, and that the products of combustion and imperfectly burnt gas have to be got rid of. This renders the use of gas-geysers, gas-kitcheners, and gas-heaters generally, except on a very small scale, impossible without adequate ventilation, and therefore the comparison of the two agencies merely on the basis of cost of gas and of electric energy is unfair.

As a final result, we may say that water heating by electric current is not only practical on a large or a small scale, but that, even at the present cost of electric energy, it is not at much disadvantage compared with gas at 2s. 6d. per 1000 cubic feet, while if electric energy can be generally supplied at a cost of ½d. per unit for domestic heating, as it is in some places, the advantages will be all on the side of the electric heater. Furthermore, we may say that in the public supply of hot water for domestic purposes there is a source of revenue for electric supply stations which has hardly yet been touched.

We have in the next place to consider electric heating for other culinary purposes. A large part of the operation of cooking consists in exposing the edible material to such a temperature that, if of animal nature, the albumen in the flesh is coagulated, but not at such a temperature as to render it insoluble in the gastric juices. Also other operations involve the partial conversion of starches into dextrine, as well as the softening of animal or vegetable tissues by heat. The heat for the purpose must be capable of ready variation over a range of temperature from 100° to 500° Fahr. In many operations, such as baking meat, the temperature has to be high at first and somewhat reduced later; but every oven should be capable of attaining and keeping a temperature of 400°.

The electric ovens in use may be of two types: One which consists of an iron chamber heavily insulated with non-conducting material, in the walls of which coils of wire are embedded, which are heated by the current sent through them, the other being nothing more than a light sheet-metal box (highly polished on the outside to prevent loss by radiation) placed over a hot plate in which heat is generated by passing a current through resistances. For frying or grilling, we have the option of using the type of electric saucepans or grillers in which heating wires of a special alloy are embedded in enamel; this enamel being so composed that it

has the same coefficient of expansion as the wire, and does not, therefore, tend to break away from the wire when hot. Or we may use ordinary saucepans or grillers on an electric radiator in which some resistance material is heated to incandescence—this radiator taking the place of the coal-fire. Broadly speaking, we may say that, when we use the special electrical vessel with embedded resistances, we can obtain the highest energy efficiency, because we can most perfectly insulate it, and prevent the heat from escaping in directions where it does no work. On the other hand, such vessels are bound to be more expensive, heavier, and more fragile, or easily injured, than the ordinary culinary vessels. Hence they have less durability in ordinary domestic use. Those systems in which an electric heater or radiator is employed to take the place of the ordinary fire or gas-ring, and on which an ordinary saucepan, kettle, or a similar class of vessel, is used, may give less efficiency, in an energy sense, because there may be a greater wasteful loss of heat.

The cost of cooking, apart from the cost of materials and wages, is made up of the cost of energy or fuel and of the apparatus distributed over its useful life. Thus, if an electric kettle costs 15s. to begin with, and has to be repaired even only once a year at a cost of 5s. each time, and lasts (say) three years, we should have to consider the cost of the appliance as 10s. per annum. On the other hand, if an ordinary gas-ring and enamel iron kettle cost 6s. to begin with, and need no repairs, but last six years, the cost of the apparatus is 1s. per annum. Hence the initial outlay and the cost of repairs and life of the appliance are very important elements, and have to be taken into consideration as well as the cost of electric energy as compared with gas or coal. The electric oven has the great advantage over the gas oven that the interior is free from the products of combustion.

There is, however, a large field for improvement still open in these appliances. As regards electric cooking apparatus generally, the following qualities are essential. Anything required in ordinary domestic use has to be strong, simple, and quite easily managed; and in the present state of the domestic labour market, the less cleaning required the better. Again, the advantages of low voltage are supreme in the case of electric cooking. It is nothing short of a crime to place in the hands of ordinary domestic servants electric cooking apparatus worked at 220 volts off one side of a 440-volt service. In the case of cooking by electricity, just as in the case of lighting by metallic filament lamps, the advantages are all on the side of alternating current supply, as then the voltage can be reduced to 50 or 25 volts, and be made safe in the hands of a child. The chief fault of much of the present electric cooking apparatus is that it does not supply a sufficiently high temperature or furnish heat quickly enough. In cooking, it is necessary to be able to command high temperatures quickly for a short time. This is why such a simple operation as making a piece of toast is better carried out by an ordinary coal-fire than by most of the electric toasters. It is necessary to be able to force or delay the process of heating at pleasure; and the present electric cooking appliances are deficient in this respect. Furthermore, many of those in the market are either too costly or too flimsy. Cost, however, is a matter of production.

We are at present in the condition, as regards electric heating, in which we were in 1883 or 1884 with regard to electric lighting. The price of the electric energy cannot be reduced until the demand is greater and the cost factor improved. The demand cannot arrive until the facilities for using the current are given; and it will therefore only at first appeal to those who can make the necessary expenditure in wiring. What is now chiefly required as a preliminary condition is that the ordinary speculative builder, when erecting houses, shall provide separate and proper electric wires for heating circuits. Experience, however, shows that electric cooking is on a different basis, as regards cost, from electric water heating. When once an oven has been brought up to the cooking temperature, the only reason for supplying more energy is to make up the losses by radiation and convection. It is possible to reduce these losses to a very small amount, and yet to maintain the required cooking temperature. In electric cooking, the food is not contaminated with the products of combustion. Ovens can have a more uniform temperature in them than when heated by gas or coal; and also food, such as meat, wastes less or loses less in cooking by electricity than by gas, and has also a better flavour. As regards the cost of it, a rough-and-ready rule appears to be that when the cooking of a household is conducted entirely by electricity, it requires one unit (one kelvin) per day per person, plus one or two units for energy losses. Thus six kelvins per day should do the cooking for four persons, taking the usual three meals, provided they are not elaborate.

We have, in the third place, to consider the question of air-heating or house-warming by electric heating. In addition to food required for the sake of maintaining animal heat, we find ourselves under the necessity of maintaining a certain internal air temperature if we are to be thoroughly comfortable; and the limits of this are rather narrow. We may say that 60° to 65° is the normal healthy room air temperature. If it falls below 45° or 50°, we feel it cold; and if it rises to 70° or 75°, we feel it to be warm. Hence, for comfort and health, the air in which we live should be maintained as far as possible at 60°. But more. We are acutely sensitive to the hygrometric condition of the air, or to the percentage of water vapour in it. If it is very dry, we experience sensations of enervation, and also if very moist. About 10 litres of water vapour per cubic metre of air, or about 1 per cent. of water vapour by volume in the air, appears to be a comfortable

amount. Also health and comfort are greatly determined by the organic matter in the air. The ordinary methods of house heating are acknowledged to be extremely unscientific and wasteful; yet nevertheless there is something to be said in favour of them, as they at least produce some degree of ventilation necessary to renew the air in our rooms and carry away the products of organic contamination. And it is not only necessary that the temperature and moisture should be kept within limits, but equally so that the organic contents of the air and its carbonic acid contamination should be kept below a certain amount. We all know that a room without a fireplace and chimney is never so healthy as one in which there is a fireplace. We shall not be able to afford time to discuss the advantages or disadvantages of heating by coal-fires, anthracite-stoves, gas-fires, or hot-air heating, but must confine ourselves to the problem of electric room heating. There are two systems of doing this—one by luminous radiators and the other by non-luminous heaters or convectors. Lately, however, these systems have been combined.

It is important, as a preliminary to further discussion, to consider the amount of heat required to raise a given volume of air to a given temperature. At ordinary temperature and pressure, 12·35 cubic feet of air weigh 1 lb. Hence 1000 cubic feet of air weigh nearly 80 lbs. The specific heat of air is ·2375. Hence to raise the temperature of 1000 cubic feet of air 1° Fahr. requires $80 \times \cdot 2375$ B.Th.U., or 19·24 B.Th.U. = 5·65 watt-hours. Supposing the air is raised from 32° to 65° Fahr., or through 33°, then to raise 1000 cubic feet of air from 32° to 65° requires 186·45 watt-hours, or 0·186 kelvin, or roughly one-fifth of a Board of Trade unit of electric energy. Supposing the room to be heated is one of about 2500 cubic feet. Then to heat the air in the room from the freezing-point to a comfortable temperature of 65° would theoretically require only 0·5 kelvin. The air has, however, to be renewed at least twice an hour for the removal of carbonic acid and organic products; and hence it would require at least one kelvin even for the mere air-heating. Practically, it would require far more than this; and even a good deal more if the doors and windows are closed and there is no renewal of the air. The reason for this is that the walls, window, floor, and ceiling absorb heat at a very considerable rate; and as it is not possible to raise their temperature sensibly, we may say that heating the air of a room is an operation like pouring water into a leaky vessel, or trying to fill a bath when the waste-plug is open. In this last case, in order to raise the level of the water at all, we must let in the water faster than it runs out; and the depth to which we can fill the bath depends on the ratio of the rates of inflow and outflow. So in the case of room heating, the demand for heat does not arise nearly so much from the heat capacity of the air itself as from the heat escape through the walls and windows.

If our houses were only constructed on scientific principles so as to be heat-tight, or at least less diathermous than they are at present, we should be astonished to find how little energy expenditure would keep us warm. The house of the future will have double walls, double windows, no chimneys, ventilation by electric fans, the incoming air heated electrically, and all the cooking and warming provided without any form of combustion or necessity for chimneys requiring constant sweeping. As constructed at present, however, experience shows that a rate of supply of electric energy equal to one watt for every cubic foot of air in a room will in general maintain it at a comfortable temperature in winter. Hence, in the case of the room of 2500 cubic feet capacity, it would require at least 2 kelvins per hour, or 2 kilowatts, to be supplied to it to keep it warm in winter by electric heating. This is equivalent to a complete renewal of the air every 2½ hours. Since electric heating does not vitiate the air, and does not require any chimney, the ideal method of heating and ventilating a room would be to exhaust or draw out the vitiated air, and heat the incoming air at the point where it is drawn in. It is clear, however, that nothing could be more unscientific than the ordinary system of room warming by gas or coal fires. The greater part of the heat goes up the chimney with the products of combustion. The incoming air is not warmed, but makes draughts along the floor; and the utmost that can be said is that the fire looks cheerful and ventilates the room.

Experience shows that a gas-stove, as usually employed, suitable for warming a room of 2000 to 2500 cubic feet capacity, takes 50 cubic feet of gas per hour. This amount of gas contains about 25,000 B.Th.U. total calorific energy, equivalent to about 8 kelvins. Thus, since about 2 kelvins per hour supplied to electric radiators will warm the room at the same rate, the average gas-fire may be sending up the chimney energy equal to 6 kelvins per hour. Thus, 75 per cent. of the available heat may pass up the chimney with the products of combustion, and 100 cubic feet of fresh air has to be drawn in merely to burn the gas. As only 0·5 kelvin is required to heat the air itself from 32° to 65°, the true efficiency of the gas-fire can only be determined when we know how many hours' burning it would require to bring the air in the room up to 65°, and keep it at this temperature. Electric room heating may be conducted by several kinds of heater—viz., the luminous radiator, the non-luminous radiator or convector, the electrolyt or hot oil-radiator, and the combined luminous and convector heater. [The lecturer described these appliances.]

From a sanitary point of view, electric heating is everything that can be desired. The glow-lamp heaters are suitable for occasional use, but need outlay on lamp or spiral renewals. An excellent plan is to combine the luminous and the non-luminous systems, ventilating the room by an electric fan, exhausting the

air from the room at a point rather above the middle of the room, and then arranging three non-luminous heaters round the room, and a fourth luminous one for appearance.

As regards cost, I have made some experiments in my own home on the relative cost of coal, gas, and electricity as heating agents. Taking a room about 14 ft. \times 20 ft. \times 9 ft., having about 2500 cubic feet capacity, I find that if a coal-fire is kept running all day—say, for 12 or 14 hours—it will use about 40 lbs. of coal per day, or one-eighth of a ton per week. At 28s. per ton, this will cost 3s. 6d. per week, or ½d. per hour for coal only, exclusive of wood or lighters, labour, and chimney sweeping. I find that a gas-fire of a good kind suitable for warming such a room takes 45 cubic feet per hour, and at 2s. 6d. per 1000 cubic feet, the cost is 1½d. per hour, or 7s. per week, running eight hours a day. As a matter of fact, such a gas-fire will really cost somewhat less, because in the generality of cases it can be put out for some hours in the day without inconvenience, and lit again at a moment's notice. To do the same heating by an electric convector with electric energy supplied at 1d. per kelvin will cost about 2d. per hour, or about 9s. per week. Hence, even at 1d. per unit, it is not to be denied that electric room heating costs more than coal but not much more than gas; while it has unquestionable advantages over either.

When a sufficient demand springs up for electric energy for heating to enable the price to be lowered to ½d. per kelvin, it will prove a most formidable competitor to each of the older forms of heating, and in time will no doubt replace them both. Even now there is a large demand for electric radiators and convectors for heating ships' cabins and saloons, motor-houses, small offices, bedrooms, and any places where flame-heating cannot be used on account of danger of explosions. The present hindrances to its progress are, first, the want of proper electric heating wires in private houses. Electric heating circuits must be run to convenient points on the wainscot of kitchens, sitting-rooms, and bedrooms, with appropriately placed fuses and switches. Then, in the next place, there must be a wider diffusion of the knowledge of how to use electric heating to the best advantages. Cheaper and more substantial appliances, both for cooking and room heating, must be placed on the market. Lastly, the price per unit for electric energy for heating must come down to ½d. Even at the present rates, the advantages of electric cooking have only to be more widely known to be better appreciated; and it is not necessary to wait for the perfection of electric room-heating before adopting it for cooking. The chief difficulty at present is the wiring problem, as well as the absence of experience. But these obstacles can only be removed by degrees. The demand makes the supply; but the supply can only come from demand. Nevertheless, I have the firmest faith in the future of electric heating, not merely in the workshop and factory, in large metallurgical operations or mechanical arts, but in its home application in cooking, water-heating, and room-warming, giving us not only light and power, but the most perfect, cleanly, and convenient source of heat to meet all the demands of domestic life, and serving to reduce the difficulties of monotonous but necessary domestic labours, which are not likely to be very greatly diminished in any other way.

Institution of Municipal Engineers.—A joint meeting of the Yorkshire and Northern Districts of the Institution will be held in Leeds on Saturday, the 7th prox. The programme prepared for the occasion includes visits to the Headingley pumping-station (electric) and the new filter-beds of the Leeds Corporation.

Heat Transfer Through Furnace Walls.—This subject has been investigated by Messrs. W. T. Ray and H. Kreisinger, of the United States Bureau of Mines. They used a special furnace 43 ft. 4 in. long over all, 3 feet wide, and 3 ft. 3 in. high, about 5 feet of the length being occupied by a mechanical stoker. A 2-inch air space separated the inner and outer walls, and a 1-inch layer of asbestos was used between the inner and outer arch rings. Temperature measurements were made at many places by thermocouples. The results are given in a bulletin issued by the bureau, and from them the authors conclude that, so far as loss of heat is concerned, a solid wall is preferable to a hollow one of the same total thickness, particularly if the air space is near the interior surface.

Gas Association Work Across the Atlantic.—According to an article communicated to the "American Gaslight Journal" for the 28th ult., there are in America fifteen Gas Associations, and five others having in their membership men connected with electric lighting and motor industries, especially those of the tramway type. The Canadian Gas Association and the Natural Gas Association bring up the total to 22. Of these Associations three are national in scope; the others covering either single or adjacent States. The New England Association of Gas Engineers is the oldest, having been formed in 1871. Of the other Associations, six were started prior to 1904, as follows: Society of Gas Lighting (1875), Guild of Gas Managers (1880), Michigan and Pacific Coast Gas Associations (1893), Missouri (1897), Kansas (1898), and Wisconsin (1900). During the past five years, fourteen Associations have been formed; and others are being tentatively considered. This marked increase in number, as well as in membership, is, the writer states, in line with all the other important industries of the country; and he thinks it augurs well for the gas section. The papers and discussions have increased in merit and broadened in scope.

CONVERTING CARBON MONOXIDE TO METHANE.

In a recent number of the "Journal für Gasbeleuchtung," Herr E. Erdmann dealt with the subject of the technical solution of the problem of preparing methane from carbon monoxide or non-poisonous illuminating gas from water gas. Pending a fuller notice of the article which is in preparation, we give the following abstract from the current number of the "Journal of the Society of Chemical Industry."

It is stated that the problem of converting the carbon monoxide in water gas into methane on a technical scale by the Sabatier and Senderens catalytic method has been solved in an experimental plant installed in England by the Cedford Gas Process Company. The failure of Elworthy's earlier attempt in this direction was due chiefly to two causes—viz., the deficiency of hydrogen in ordinary water gas, and the loss of activity of the nickel used as catalyst. These difficulties have been overcome in the process described in the paper, the principal new feature of which is that the water gas, after being washed and freed from tar and carbon dioxide, is partially liquefied in a Linde apparatus in order to separate it into a portion rich in hydrogen and another consisting mainly of carbon monoxide. It is found best to adjust the valves of the apparatus so that the gas evolved contains from 13 to 14 per cent. of carbon monoxide, and then to add sufficient of the portion rich in this gas (93 to 94 per cent.) to bring the content of it up to 17 per cent. When once the valves have been regulated, it is possible to obtain continuously a gas containing 17 per cent. of carbon monoxide, 79 per cent. of hydrogen, and 4 per cent. of nitrogen. The content of carbon monoxide at different times does not vary by more than a fraction of 1 per cent. The portion of the gas rich in carbon monoxide from the Linde apparatus is utilized for working the compressors. During its passage through the Linde apparatus, the gas is freed completely from the sulphur compounds which were the chief cause of the loss of activity of the nickel catalytic mass in the subsequent reduction process.

The reduction apparatus consists of three vertical quartz tubes, 1½ metres long and 12 centimetres in diameter, each containing pumice impregnated with 200 grammes of finely divided nickel. The tubes are contained in an iron casing, which is heated electrically to from 280° to 300° C. at the beginning of the process. The gas also is preheated before passing into the reduction chamber. After the reduction has once commenced, more than sufficient heat is evolved not only to maintain the temperature of reaction but to heat the entering gas to 300° C. From the reduction chamber the gas passes through a condenser (to separate the water) to the holder.

Details of an experimental run of 60 hours are given. Of gas rich in methane 392 cubic metres (13,840 cubic feet) were obtained from 1080 cubic metres (38,140 cubic feet) of crude water gas; and 268 cubic metres (9464 cubic feet) of carbon monoxide were obtained as a secondary product from the Linde apparatus. The water gas used contained 51·7 per cent. of hydrogen, 39·5 per cent. of carbon monoxide, 4 per cent. of carbon dioxide, and 4·8 per cent. of nitrogen. It had a heating value of 2542 in each case. The mixed gas entering the reduction chamber contained 80·9 per cent. of hydrogen, 16·3 per cent. of carbon monoxide, and 2·8 per cent. of nitrogen (calorific value 2592 calories); and after reduction it consisted of about 31 per cent. of methane, 62 per cent. of hydrogen, and 6 per cent. of nitrogen, with traces of carbon monoxide and dioxide, and having a heating value of 4220 calories.

The cost of the process depends primarily upon the cost of the water gas. For English conditions, the following figures are given:

	s.	d.
12,360 cubic feet of water gas, at 2·45d. per 1000 cubic feet	2	6·3
Cost of conversion into 4485 cubic feet of gas containing about 32 per cent. of methane, at 1·76d. per 1000 cubic feet of the latter	0	7·9
Cost of 4485 cubic feet of "synthetic gas" or 8½d. per 1000 cubic feet.	3	2·2

The working of the process in connection with bye-products coke-ovens is contemplated; and it is estimated that it will be possible to produce a "mixed gas" at a cost of 4·3d. per 1000 cubic feet (excluding freight of coal) by adding to the coke-oven gas an equal quantity of the "synthetic gas," and carburetting the mixture so that it has an illuminating power of 14 candles. The water gas can be replaced by Mond gas; and where this is available, it is undoubtedly the cheapest raw material for the production of the "synthetic gas"—1000 cubic feet of the valuable constituents (carbon monoxide, hydrogen, and methane) of Mond gas costing only 0·8d.

The current number of the "Engineering Review" contains an article on "Representative Scottish Works," in which reference is made to two in which readers of the "JOURNAL" are interested—viz., those of Sir William Arrol and Co., Limited, and Messrs. Stewarts and Lloyds, Limited. The writer says no name has shed more lustre on Scottish engineering achievement than that of the former firm, for the reason that none has executed work of more importance or greater magnitude; while there is perhaps no firm which is mentioned with greater esteem in iron circles than the latter, whose ramifications include all that is necessary for the production of iron and steel tubes by every process, and whose system of jointing assures absolute safety from leakage.

CORRESPONDENCE.

[We are not responsible for opinions expressed by Correspondents.]

Double Holiday Pay for Gas-Workers.

SIR,—Referring to your remarks upon the recent concession by the Gaslight and Coke Company of an extra week's pay for holidays, your readers may be interested to see the following extract from the Directors' minute book of the South Metropolitan Gas Company.

At a Meeting of the Board held at the Old Kent Road Works,
June 17, 1872.

"The Engineer and Secretary reported that the regular men in the Company's employ had given him great satisfaction in the manner they had performed their duties, and suggested—with a view of further attaching them to the Company and as a mark of appreciation of their conduct—that an extra week's pay be given to each man on the occasion of his going for his week's holiday.

"RESOLVED. That such suggestion be adopted."

The above shows that Mr. George Livesey was a pioneer in this movement, as he was in many others affecting the prosperity of the gas industry and the welfare of its workers.

The payment of double wages for holidays has been continued ever since.

CHARLES CARPENTER, Chairman,
South Metropolitan Gas Company.

709, Old Kent Road, S.E.,
Sept. 23, 1911.

Who are the Gas Companies, and Who the Gas-Stove Firms?

SIR,—I see in your latest issue that Mr. H. James Yates is endeavouring to allay the apprehensions in gas circles that electric cooking is going to be a keen competitor with gas for that purpose.

Quite apart from my personal opinion on the matter, could you tell me why certain gas companies have threatened to withdraw gas-stove orders from manufacturers who supply castings for electric cooking ranges?

It is a fact that such threats have been made, and have effectually stopped some firms supplying castings for electric cooking.

Surely if electricity (1d. per unit) is five times the cost of gas (2s. 6d. per 1000 cubic feet) for cooking, as you would have your readers believe, the gas companies in question must have other reasons than the fear of competition for such an action.

Can you or any of your readers tell me what these reasons are?

H. H. HOLMES,

Sales Manager, Borough of St. Marylebone Electric Supply.
York Place, W., Sept. 22, 1911.

[Quite in accordance with the electrical mode, Mr. Holmes draws deeply on his imagination. There are no apprehensions to allay in gas circles respecting any competition from the electric-cooker; but there are a few claims made for the latter and against gas-cookers that have, in the ordinary course of commercial competition, to be combatted. It is also within our province to keep our readers informed as to the aspirations, experiences, and claims of electricians in this matter. But we fail to detect even a molecule of apprehension in this. Regarding the paragraph of the letter commencing "Surely if electricity (1d. per unit) is five times the cost of gas (2s. 6d. per 1000 cubic feet) for cooking, as you would have your readers believe," let us ask Mr. Holmes a question so as to start on a proper footing: Does he deny, or does he agree, that the relations between the B.Th.U. that a unit of electricity is capable of generating and the B.Th.U. that a pennyworth of gas (at 2s. 6d.) is capable of generating, are approximately 3500 and 16,500? That is the point made last week in our "Correspondence" columns; and it is not a question as to what we would have our readers believe, but it is a question of fact. We know that our electrical friends do not like this as the commencing point of the argument, as it quickly leads them into a *cul de sac* in the matter of the capacity of their cooking appliances for developing increased efficiency. Then Mr. Holmes asserts that certain gas companies have threatened to withdraw gas-stove orders from manufacturers who supply castings for electric cooking-ranges; and he says it is a "fact" that such threats have been made, and have effectually stopped some firms supplying castings for electric cooking. We invite Mr. Holmes to drop covert allegation, and to state openly who are the gas companies (plural) from whom the threats emanated, and who are the firms (plural) who, in consequence of the threats, refused to supply electric-cooker castings. He declares that what he states is a "fact." If it is a "fact," no harm can come to him from making an open and substantiating statement in our columns. This would have much more effect than the form of his present assertion. We see no reason whatever why any gas company should make the supply of electric-cooker castings a reason for boycotting any gas-stove firm—inasmuch as the depriving of a gas-stove firm of the business, only means its transference to other quarters. We really fail to see what purpose is to be served by exercising influence in the manner suggested by Mr. Holmes. It is, of course, quite conceivable that gas-stove firms would be loath to supply their special gas-stove castings for competitors to use. However, we do know this, that the gas-stove firms have about as much work as they can get through in executing

orders for gas stoves and fires of all descriptions—in fact, the past two winter seasons have seen some of them working beyond normal time in order to comply with demand.—ED. J.G.L.]

GAS-STOVE MAKERS' DENIALS.

Since the foregoing was written, we have made inquiries direct to the gas-stove makers of this country, as to the truth of Mr. Holmes's allegation; and there is indignant denial from all quarters as to gas companies ever having brought any pressure to bear in the manner indicated. Four of the firms inform us that we are at liberty to use their names in support of their denial; but as the other nine letters do not mention similar permission, we will (in the absence of authorization) give extracts from the letters:

(1) We are pleased to inform you that we have not received a threat in any shape or form from any gas company we deal with with regard to the matter in question; and you are at liberty to use our name to support a denial of the allegation.

(2) As far as we are concerned, there is no truth in any suggestion that gas companies have threatened to withdraw orders from us should we supply castings for electrical cooking ranges.

(3) We have to say that no such statement from any gas undertaking in regard to supplying electrical companies with either castings or cooking-stoves has ever come to our notice.

(4) We may say that we have not supplied any such castings, nor have we received any threats from gas companies.

(5) We have no knowledge of the matter here, nor do we think there is any possibility of it having reference to this company. However, we wrote our works on the subject last night, and will write you further on receiving their reply.

(6) No such steps as you mention have been taken by gas companies in connection with our firm.

(7) We have no knowledge of gas companies withdrawing gas-stove orders on account of our making castings for electric cooking-ranges.

(8) *Re* antagonism of gas companies to firms supplying castings to electric companies, we have no knowledge, personal or otherwise, of such being a fact.

(9) We beg to say this is the first intimation we have ever received of this matter.

(10) We are not aware of any such threat having been made to us.

(11) We have never had any difficulty in the direction you name.

(12) No such steps have been taken by any gas company that we supply, and, further, most gas companies are fully alive to the drawbacks and difficulties that confront the system of cooking by electricity. It is difficult to credit what Mr. Holmes asserts.

(13) A telephonic message from another leading firm of gas-stove makers gives us full permission to use their name in denying that any gas company have issued such a threat as the one referred to in our Marylebone correspondent's letter.

With these letters in our possession, we again challenge Mr. Holmes to substantiate his statement by publishing the names of the gas companies and of the gas-stove firms to whom he refers. In the absence of the justification, our readers will know the proper judgment to pass on that gentleman's assertion.—ED. J.G.L.

The Carbonizing Chambers and Gasholder at Vienna.

SIR,—In the "JOURNAL" for Sept. 5 a view was given (p. 586) which is designated as an illustration of an inclined carbonizing chamber plant at the Leopoldau Gas-Works belonging to the City of Vienna. That is a mistake. The plant in question is a horizontal carbonizing chamber plant for a daily production of more than 7,500,000 cubic feet, heated by a central generator plant. At the Simmering Gas-Works, Vienna, a similar plant of 2,200,000 cubic feet (which was recently enlarged to a daily production of 6,300,000 cubic feet) has been working for some months now. The figures named in the "JOURNAL" respecting the inclined carbonizing chambers plant are correct. The plant, however, does not exist at the Leopoldau works, but is at the Simmering Gas-Works.

Further, may I say that the gasholder, which is seen in the background of the view, is not the same holder the crown of the bell of which was damaged while being tested in August. The damaged holder (which will soon be renewed) is about eight miles from the Leopoldau works. It is, however, filled from that works by means of a high-pressure pipe-line.

Vienna, Sept. 16, 1911.

F. MENZEL, Director.

[We thank Herr Menzel for pointing out the mistakes into which we were led by the correspondent to whom we were indebted for the photograph and particulars that were published in our Sept. 5 issue.—ED. J.G.L.]

Development of Bye-Product Treatment.

SIR,—In your issue of Sept. 19, Mr. G. Stanley Cooper, in his article on the "Development of Bye-Product Treatment," says:

The principal feature of the Otto-Hilgenstock direct process—i.e., the absence of all ammoniacal liquor—cannot be worked in connection with benzol recovery owing to cooling being necessary, and consequently condensation would take place and some liquor would be produced. If, however, the process is modified, so as to produce a small amount of liquor, benzol can be recovered efficiently. But in this case, distillation is necessary, if the whole of the ammonia is to be recovered.

It is quite true that where the Otto direct recovery system is in operation, and where benzol scrubbers are employed, it is necessary to cool the gas, but only after it has passed through tar sprays and a saturator; and consequently a certain amount of condensings are obtained. But all the ammonia has been taken out of the hot gas previous to cooling.

So, contrary to Mr. Cooper's statement, there is absolutely no need for any distillation—in fact, there is no ammoniacal liquor to distil.

It should also be remembered that as no lime is used, and as all the ammonia has previously been taken out of the gas, the condensings from the coolers before the benzol scrubbers are neutral, and so have very little solvent action on the sulphuretted hydrogen and the cyanogen compounds in the gas. The bulk of these obnoxious impurities therefore passes on with the gas, and is burnt in the oven-flues. On the other hand, the waste liquor from the old indirect methods, as well as from the Koppers semi-direct recovery system, not only contains lime (which is itself highly deleterious) but also quantities of poisonous sulphur and cyanogen compounds.

In the Otto system, the gas leaving the coolers passes to the benzol scrubbers, where the benzol is washed out of the gas by means of creosote oil, and subsequently recovered in the usual way. To the writer's knowledge, an Otto-Hilgenstock direct recovery plant with a benzol plant attached on the above lines is at the present time working, and giving thoroughly good results, at Messrs. Cochran's colliery at New Brancepeth, co. Durham.

Norwood Terrace, Headingley, Leeds, Sept. 21, 1911.

J. B. DEAKIN.

Is Capital Injured More Than Labour by Strikes?

SIR,—The above is a question that should be put pointedly to the miners' agent, M.P.'s of the Socialist group, and also to Fabian parliamentary candidates who are masquerading in Monday morning suits of productive-labour overalls. It is being put to themselves by thousands of reflecting men of all shades of thought and all colours of politics, since Mr. Thomas, ex-M.P., made the startling statement that the Miners' Federation, during the prolonged strike at the Cambrian Collieries, Limited (of which he is the Chairman), had paid out more money in strike pay than would have purchased the great Cambrian collieries, and made the colliers owners of one of the greatest properties in South Wales. These extensive collieries, however, are still the property of the shareholders; and the colliers have gone back to the pits as workers (after using up huge accumulated funds, or liquid capital, sufficient to buy the pits outright, apart from having lost about twelve months' wages), with only their labour remaining again in their possession, to win the coal at the same price per ton as they were receiving when they came out on strike.

I shall leave it to others more *au fait* with the teachings of Adam Smith's great book to apportion the injury done respectively to capital and labour during the long strike at the Welsh collieries. I am, however, sufficiently cognizant of the laws of economic science to know that at the collieries the work is carried on, not for the immediate benefit of the shareholders (many of them comparatively poor thrifty people), but firstly to pay the wages of the miners. It is capital which provides the wages of the sinkers and surfacemen; and without capital (the savings of others) the workers could not be maintained during the long and expensive non-productive preliminary operations before the coal is reached. It is capital which provides the costly plant and machinery to equip the pit; and without capital it could not be started. With plenty of capital to start new ventures and develop new industries, there is always better employment for labour. This is the essence of the teaching of political economy, confirmed by the experience of commercial history; and this experience is right up against the lachrymose vapourings of Labour-Socialism.

As a practical trained miner, a certificated colliery manager of thirty years ago, and a modern mechanical manufacturing engineer of to-day, I am glad to notice, in my travels in the colliery districts, a thoughtful mood springing up recently among miners; and in conversation with former mine mates, I was pleased to find they realize some of the elementary truths of economics, and have of late begun to grasp, in part, the commercial axiom that a man gains wealth when he employs productive labour, and sees his savings grow less while he sustains non-productive workers, whether in sinking a coal pit, building new gas-works, erecting a factory, or equipping a modern engineering works. Still, though the thrifty small business men or saving workers see their savings dwindle for a time, as well as those of big capitalist investors, they believe their capital will come back with a profit. Capital moults betimes, to be followed by a full-feathered period of golden-egg-laying, or the capital hen would never sit.

Three things are essential to the paying production of useful products—labour, capital, and brains; and in this scientific and inventive age, the greatest of these is brains. The great agricultural and industrial chemists—the late Sir James B. Lawes, Bart., and the late Dr. Ludwig Mond—whose epoch-making discoveries doubled production, were the greatest benefactors of mankind; and the inventors and manufacturers of appliances who increase production and improve or save labour are hardly less so. Let me repeat, it is capital and brains which provide the wages of labour; therefore the workers should give little heed to Socialistic demagogues, who untruthfully proclaim that "labour creates all capital." The day worker in the mine, the gas-works stoker, the moulder in the foundry, and the engineer in the works, will be most useful to themselves, and greater aids to their brethren, if they go on pondering (now that they have begun) the truth that it is brains and capital, by inventions and improvements to plant and machinery, which help the daily wage-earners to better wages, less exertion, and more home comforts. Whatever Fabians and Labour-Socialists may preach and teach, the incontrovertible truth is contained in the foregoing sentence; and as technical and commercial knowledge spreads and deepens among the toiling masses, either above or below ground, the "flapdoodle" Fabians who talk much about divide while not any of them provide, will be as much ridiculed, when they denounce owners of savings, as are "splay-headed" drivellers who "toil not neither do they spin," when they attempt to belittle the benefits rendered to the Empire by the brain-workers who are the world's greatest wealth producers.

This letter having already run to an inordinate length, I shall, with your permission, in a future communication, answer the question generally with which I started; contenting myself meantime by asking your readers of all political colours to keep this in mind: Capital and labour are interdependent.

Bradford, Sept. 21, 1911.

GILBERT LITTLE.

LEGAL INTELLIGENCE.

NON-PAYMENT OF WATER-RATES.

A Question of Committal.

On Monday, the 11th inst., at the Altrincham Sessions, before a Bench of Magistrates, Mr. J. Hunt (Collector) appeared on behalf of the North Cheshire Water Company, and asked the Bench to commit a man recently residing at a Sale address for non-payment of water-rent and costs. He said that defendant was summoned to appear that morning, in person, to show cause why he should not be committed to prison. The circumstances were briefly as follows: The defendant was summoned two months ago and failed to appear. The usual order was then taken out, and subsequently the goods were marked on a distress order. It was, however, afterwards found that the furniture had already been in possession of another party for rent; and thus the distress warrant had to be returned "No effects." A further order was then granted calling upon the defendant to show cause why he should not be committed; but there had been a difficulty in finding him and serving him personally. Application was then made to the Bench to substitute service; and this was then duly performed by Inspector Sharp at the defendant's last-known place of business. In the alternative of defendant not appearing that morning, he applied that a committal order be granted.

The Bench stated that they could not grant the order, unless Mr. Hunt brought evidence to show means.

Mr. Hunt remarked that this course was impossible; for it was obvious that, if a previous Court had granted leave to substitute service, and they could not find the defendant, they could not show what income he had.

The Clerk pointed out that they could summon a member of the firm to give evidence as to the amount defendant received.

Mr. Hunt said a member of the firm would be a member of the defendant's own family, and would be clearly a hostile witness. Besides, there was the question of further costs and little likelihood of getting them back.

The Clerk said Mr. Hunt must either have the order dismissed or apply for an adjournment.

Mr. Hunt replied that he was bound to put before the Bench the extraordinary position he was in, assuming for the moment that they did not accede to his request for the defendant's committal. The Company had already been mulcted in costs amounting to over £1; they had carried out all the requirements of the law, and had attended the Court on several occasions; and the Magistrates had made out all the orders upon the defendant that the Company had asked for—all of which had been ignored. In such circumstances, he respectfully suggested that all a defendant had to do, provided he had no goods or had made away with them, was to ignore the orders of the Magistrates, and treat them with contempt—to render the whole process of the Court futile and inoperative. This case was not associated with the question of poverty or of no means to discharge the debt, but was a deliberate move to keep out of the way and to ignore the law. He submitted that he might reasonably ask the assistance of the Bench.

The Magistrates retired to consider their decision; and on their return, the Chairman said they had carefully considered the points raised, but there was not sufficient evidence to warrant committal.

Mr. Hunt then applied for the order to be adjourned for two months, which was agreed to.

HEAVY FINE FOR UNLAWFULLY USING WATER.

At the Aldershot Police Court on the 14th inst., a man named Greenwood was summoned for affixing a pipe to a surface drain without the consent of the Aldershot Gas and Water Company, and with unlawfully using water for other than domestic purposes.

Mr. Norman Clinton, who appeared for the prosecution, said the case was one of great gravity. Certain information came to the Company, with the result that a watch was kept on defendant's premises and certain tests made. It was found that about 10 o'clock at night, the water which had otherwise not been running on the premises, started to run freely. Immediately afterwards lights would appear upstairs; the defendant would go to bed; and all the lights would be turned out. He would therefore ask the Magistrates to presume that the water was to be allowed to run all night. This was discovered on Sunday night. On Monday a watch was kept; and it was found that the water was turned on and was running up to midnight, when the Company's witness left. The lights in defendant's house on the night had been out since 10.30. On the Tuesday, the Company's Superintendent with the police again visited the premises, and the same thing happened—water starting to run before defendant went to bed, and continuing to run. On looking through the scullery window they saw fixed to the tap over the sink a piece of india-rubber piping, which went to the waste hole and stopped the splashing. The water then ran into the gully outside, along a drain into a tank, and from the tank into a pond in defendant's meadow, 15 feet long, 5 feet wide, and 18 inches deep. The water continued through an open gully, 180 feet long, into another pond on defendant's premises, 60 feet long, 4 feet wide, and 9 inches deep. The capacity of the settling tank was 2000 gallons; the large pond, 1000 gallons; the small pond, 700 gallons; and the trench, 834 gallons. In the meadow were forty head of Government cattle, which required water; and this was the method adopted by defendant to get the necessary supply. The question of the amount of water had been tested. The running tap represented 500 gallons per hour, which meant more than 4000 gallons during the night—assuming it was turned on when defendant went to bed, and turned off at 6.30 a.m. This was going on to the Company's knowledge for three nights—representing a total of 12,000 gallons for the period. Counsel added that if defendant's cattle were turned out during June, July, and August, when hardly a drop of rain fell in

Aldershot, the Magistrates could form some idea of the amount of water that might be used by defendant during this period, because he could not have got the water from anywhere else.

A Superintendent (named Bell) in the employ of the Company, said that on Sunday, the 10th inst., he went to defendant's meadow, where he found two small ponds connected by a channel, and saw also running water. He was unable to trace the source of it that night. He took a sample of the water, and handed it next morning to the Medical Officer of Health. Having received the result of the analysis, he made investigations again on Monday. On that day there was no water running, neither was there between 8 p.m. and 10 p.m. After 10 p.m. he found water passing freely through the service-pipe. He saw the lights in defendant's house go out that night, and the water was running until midnight. On Tuesday night he went to the premises with Inspector West. At 10.30 p.m. the lights were out and the water was running very freely. He went on to the premises, and found the water was passing into the gully outside the scullery window. He called defendant, who came downstairs, and he told him he wished to investigate a serious leakage of water. Defendant said the scullery tap was running, and witness went with him to the scullery, where he found a rubber pipe connected with the tap, and water running through it into the sink. The tap was running full bore. Defendant admitted the tap would run until he got up in the morning; and he afterwards admitted that it had been running on the two previous nights. Witness subsequently took samples of water from the settling tank, the large pond, and the scullery tap. He bore out Counsel's statement with regard to the quantity of water running, and said the minimum charge would be 1s. 6d. per 1000 gallons.

Witness added that at the height of 3 feet there was a hole in the tank to allow the water to escape into the pond when there were 3 feet of water in the tank.

Inspector West said that defendant said to him, when asked to give an explanation: "It goes into the drain outside, then into a tank, and then into a pond at the bottom of the field. There are about forty cattle there belonging to the Commissariat. They only came last Friday, and most of them are going away to-morrow morning."

Dr. E. W. Routley, Medical Officer of Health, gave evidence that he had analyzed the samples of water, and was of the opinion they were mainly composed of Aldershot town water.

Defendant said he had plenty of water, and could pump 40 feet into the same tank. He admitted he had done a silly thing, but nothing so bad as the Company said.

Mr. Clinton said the case was a serious one, and as the penalties under the Act were very small, he asked that the Analyst's costs and the Company's legal costs might be allowed.

On the first charge defendant was fined £3 18s., including costs, and in the second case £2 8s. inclusive—a total of £6 6s.

Gas Matters at Maryport.

The Gas and Water Committee of the Maryport Urban District Council recently appointed a Special Committee to consider questions relating to a supply of coke-oven gas and the extension of the area of supply, and authorized them to call in an experienced gas engineer to advise thereon. The Special Committee submitted a report, in which they recommend: (1) That in view of the position taken up by the Flimby and Broughton Moor Coal and Fire-Brick Company as to the conditions of the supply of gas from the coke-ovens, the Committee are of opinion that it is useless to persevere at present with the negotiations, and recommend that they be dropped; and (2) that, in view of the report of Mr. Hepworth on the cost of making gas at the Council's works, the Gas and Water Committee be recommended to take the matter into consideration forthwith. The Gas and Water Committee having considered the report of the Special Committee, it was resolved that the first of the recommendations of the Special Committee be approved and adopted, and the negotiations with the Colliery Company dropped meanwhile. It was also resolved that the Special Committee be requested to further consider and report on the cost of manufacturing gas at their works.

Reduction in Price at Dumbarton.—The Dumbarton Town Council have reduced the price of gas by 3d. per 1000 cubic feet to ordinary, and 4d. to slot-meter, consumers; making the rates 2s. 6d. and 3s. respectively, which are among the lowest all-round prices in Scotland. The annual instalment of £500 will be transferred from profits to the suspense account to partly defray the cost of new purifiers and exhausters now being installed. These extensions form part of the scheme of the Manager (Mr. J. G. McGeachin) for remodelling the works.

Alliance and Dublin Consumers' Gas Company.—The accounts of this Company for the six months ended the 30th of June, which will be presented at the half-yearly meeting next Saturday, show that the total revenue was £153,715, and the expenditure, including interest on loan capital, &c., £113,840; showing a profit of £39,875. From this amount a sum of £5000 has been written off the suspense account; leaving a balance of £34,875, to which is to be added £5204 brought forward; making a total of £40,079 to the credit of the profit and loss account. The Directors recommend a dividend on the consolidated ordinary stock at the rate of 5 per cent. per annum, after payment of which a balance of £3545 will remain to be carried to the next account.

Gas-Cookers in Leeds.—Great difficulty is being experienced, even though they are working overtime, by the fitters of the Leeds Corporation Gas Department in keeping pace with the demand for gas-cookers. Last month a record was established; no fewer than 423 cookers being fixed by the department, as compared with 65 during the corresponding month of last year—an increase of 358. Thus last month over six times as many gas cookers were supplied as in the corresponding period of the previous year. The Manager (Mr. R. H. Townsley) explains that this enormous increase is chiefly due to the fact that the Gas Committee have reduced their charges for the use of the cookers. Whereas formerly the cost was 10 per cent. of the list price per year, it is now only 10 per cent. of the cost price to the Committee. In consideration of this reduction, the consumer has had to forego the right of ownership when the value of the cooker has been paid in rent.

MISCELLANEOUS NEWS.

GLASGOW DEPUTATION VISIT TO LONDON AND THE PROVINCES.

Inspection of High-Pressure Lighting Installations.

The deputation from the Corporation of Glasgow to view the high-pressure gas lighting in the City of London—consisting of Bailie Paxton (Convener of the Gas Supply Committee), Bailie Kirkland (Sub-Convener of the Gas Supply Committee), Councillor Pratt (Convener of the Lighting Committee), Councillor James Stewart (Bromielaw Ward), and Councillor James Stewart (Townhead Ward)—accompanied by Mr. Alex. Wilson (the Gas Engineer), Mr. J. J. Cairns (of the Town Clerk's Department), and Mr. S. B. Langlands (the Lighting Inspector), were received on Monday of last week at the Guildhall, in the absence of the Chairman of the Streets Committee, by Mr. Deputy Morton, M.P., accompanied by Mr. J. W. Domoney, L.C.C., and Mr. Deputy Wallace, J.P.

In the evening, the members of the deputation, together with Mr. Jacques Abady (Chairman of the Streets Committee of the City of Westminster), Mr. F. W. Goodenough (Controller of the Gas Sales Department of the Gaslight and Coke Company), Mr. W. Doig Gibb (Chief Engineer of the South Metropolitan Gas Company), and Mr. Stokes (Chief of the Maintenance Department of the South Metropolitan Gas Company), were hospitably entertained at De Keyser's Royal Hotel, and then proceeded to view the lighting in the following thoroughfares: Blackfriars Bridge Approach, over the bridge to the south side (South Metropolitan Gas Company), Queen Victoria Street, Cannon Street (where a demonstration was given of raising and lowering the centrally-hung inverted gas-lamps), the compressing station, Lower Thames Street, Eastcheap, Great Tower Street, over the Tower Bridge, and back to the Mansion House, Poultry, Cheapside (where a demonstration was given of raising and lowering the centrally-hung electric arc lamps), St. Paul's Churchyard, Ludgate Hill, New Bridge Street, and Fleet Street, to Temple Bar.

The deputation from Glasgow on Tuesday went to Birmingham. They were received at the Council House by the Lord Mayor (Alderman Bowater) and the members of the Birmingham Gas Committee, after which, accompanied by the Chairman and several members and officials of the Gas Department, they visited the high-pressure laboratories in Cornwall Street, and also the Windsor Street Gas-Works. Subsequently they inspected the high-pressure governor at King's Norton, and finally saw the system of lighting by high pressure in the Museum, in Victoria Square, and in Stephenson Place.

After inspecting the installations in the cities which it had been arranged to visit on this side, the deputation left England to pursue their investigations on the Continent.

CO-PARTNERSHIP AT PLYMOUTH.

A meeting of the employees of the Plymouth and Stonehouse Gas Company was held at the works last Thursday, to consider the scheme of co-partnership which was announced at the annual meeting of the Company. Sir Joseph Bellamy, the Chairman, presided; and most of the members of the Board were present, as were also Mr. Percy S. Hoyte (the Engineer and Manager), Mr. H. B. Heath (the Secretary), and other officials. Most of the employees attended the meeting, which was held in the dinner hour.

Sir JOSEPH BELLAMY referred to the announcement which he made at the annual meeting of the Company, of the Directors' intention to adopt a co-partnership scheme, and said they were following on the lines of some other gas companies, who had found the scheme work satisfactorily and to the advantage of all concerned. For some years, the Directors had been anxious that the workpeople should have a larger share of the profits; and the scheme would have been brought forward earlier, but for the fact that they had had to contend against keen competition, and to meet the conditions which arose through the doubling of the assessment of the works. In adopting the scheme, it was the desire of the Directors to give their employees something over and above what they were getting now. Nothing would be taken from them; and such benefits as were granted by the Workmen's Compensation Act and the like would still be theirs. Even the Company's non-contributory pension scheme would continue. Though there were few undertakings except gas companies which had adopted a co-partnership scheme, he did not see why many big works should not follow their lead. It would solve many difficulties if the employees were allowed to have a share in the progress made in prosperous times. The basis of their own scheme was that, as dividends went up, the bonus to the workmen should go up also. They took as a starting-point gas at 2s. per 1000 cubic feet, at which price the dividend on the capital invested was 5½ per cent. When gas went down to 1s. 7d., the present price, the shareholders were entitled to a dividend of 6½ per cent. Under the scheme, for each reduction of 1d. in the price of gas below 2s., the men would receive 1 per cent. on their year's wages. It had been decided that the scheme should operate for the past year as well as for the present year; and, as a result, he could announce that already the Directors had to distribute among them £750. For the present year, with the price of gas at 1s. 7d., it was estimated that the amount of distribution would be £938. The bonus would be payable on the weekly wages, and hours of overtime would be included in the reckoning. Taking the case of a stoker earning from £95 to £100 per annum, on March 31 next he would have £9 to his credit. The sum of £6 10s. would buy stock in the Gas Company; and the balance of £2 10s. would be divided between a fresh accumulating sum to buy more stock and a little deposit account on which they would allow 4 per cent. interest. The Directors hoped that the deposit account would only be drawn

upon in time of emergency, and that it would be a means of encouraging thrift. At present, the scheme would only apply to regular weekly wage-earners. For some years, the officials and clerical staff had been receiving a bonus, which would continue; and the Directors hoped to allow them to come in under the co-partnership scheme at a future date. Later on they might also include the casual employees.

Mr. J. WALTERS, foreman of the works, moved the adoption of the rules embodying the scheme, and said it was quite evident that it was for their advantage. He was pleased to find that they were to still have the benefit of the Workmen's Compensation Act.

Mr. W. FORD, foreman fitter, seconded; and the scheme was unanimously approved.

Sir JOSEPH BELLAMY expressed the hope that the scheme would be carried out as between man and man, and not as between employer and employee. It would be administered by a Committee, on which they would have equal representation. He was satisfied that, though the shareholders were making a sacrifice, in the long run it would pay. It was well for a Company to be on good terms with their workpeople; and £1000 lost to the shareholders came back in good feeling.

Mr. O. P. ELLIS, the Secretary to the Co-Partnership Fund, announced the arrangements made for the election of the Committee; and the meeting ended with a vote of thanks to the Chairman, proposed and seconded by two of the workmen.

PROGRESS OF THE BELFAST GAS UNDERTAKING.

A Successful Exhibition.

The Belfast Gas Committee are holding a highly successful gas exhibition in the Ulster Hall. All kinds of appliances are on view; but on the present occasion a special effort is being made to show the usefulness of gas for lighting at high pressure and for water heating. The high-pressure lighting is carried out by the Keith and Blackman Company, the Welsbach Incandescent Gaslight Company, and the Textile Illuminating Company. A large number of apparatus manufacturers are represented; and there are cookery lectures and demonstrations by Miss E. M. Dods. In the tea-room, the baking is done by gas in full view of the visitors; and elsewhere up-to-date laundry methods can be inspected in operation.

The exhibition was opened last Wednesday; and the occasion was marked by some interesting speeches. Alderman James Craig, the Chairman of the Gas Committee, who presided, recalled the fact that a gas exhibition was held in the building two years ago; but, though it was highly successful, it only touched a comparatively small number of the large body of consumers. The Committee therefore felt that it was necessary now to hold another exhibition, to show the ratepayers the latest and best gas appliances. There were at present almost 19,000 cookers and heating stoves in use in Belfast; but there was room for great expansion in this branch of the business. The Committee, and the Engineer (Mr. J. D. Smith), had done their best to make the exhibition as complete and instructive as possible.

The exhibition was then declared open by the High Sheriff of Belfast (Councillor Crawford M'Cullagh), who pointed out that the original Gas Company was started in 1823. At that time, the works were only capable of turning out 55,000 cubic feet of gas a day, whereas now the average daily output was over 12,500,000 cubic feet—in other words, 229 times as great. The real prosperity of the concern, however, seemed to have commenced when the Corporation acquired the property in the year 1874; the purchase price being fixed at £386,550. The transfer had proved of great advantage to the citizens, who not only enjoyed a very cheap gas supply, but, in addition, had a sum of £307,521 put to the credit of the rates. When they considered that these results had been achieved after having to bring the coal from the pit to the sea, and ship it to Belfast, at considerable cost, he thought great credit was due to the Gas Committee and the officials for the way in which they had managed the concern. They would remember the discussion which took place recently in the Council Chamber relative to the extension of the gas-works, when it was finally decided that the present works should be re-constructed and modernized so as to manufacture gas by the latest and most up-to-date principles. To carry this into effect would naturally mean the expenditure of large sums of money, the interest and sinking fund on which would amount to several thousand pounds annually. It was to be hoped that there would be a sufficient growth in the output to meet the increased expenditure, as he knew it was the wish of the Committee that not only should the ratepayers still enjoy the benefits they had had, but also that they should continue to have a supply of gas at the same particularly low rate.

Councillor Squire, in moving a cordial vote of thanks to the High Sheriff, remarked that the Corporation were at present embarking upon a very large expenditure; and he wanted the ratepayers to understand, so far as his view of the matter went, that it was not the intention of the Gas Committee that the ratepayers should pay a single penny of this heavy expenditure. It would be, he believed, from the extra profits received in connection with the up-to-date manufacture of gas that they would pay every penny of the money they were about to borrow. He had confidence also that they would not only do this, but, further, that at no very distant date they would be able to supply gas to the people of Belfast at 1s. 6d. per 1000 cubic feet. The last exhibition of gas fires and cookers had resulted in an increase of 20 million cubic feet in the yearly consumption. Encouraged by this, they wanted a further increase of 20 millions, or even 40 millions, as the outcome of the present display. They were undoubtedly going forward in the production of gas. At the last Council meeting it was stated that they were now 3 per cent. over last year, which in turn showed 5½ per cent. increase over the previous twelve months, and that again an advance of 7½ per cent. over the preceding year. Thus it would be seen that, not only were they holding their own, but they were going forward. He would like to say one word with regard to the electric lighting. As a citizen of Belfast, he wished every prosperity to the department. Undoubtedly, superhuman efforts were being made to supersede gas; but a realization of the desire was an utter impossibility.

SALFORD GAS SUPPLY.

Another Application to Parliament Contemplated.

It being intended to include in the next Bill of the Salford Corporation a number of gas clauses, negotiations are proceeding between a Sub-Committee of the Gas Committee of the Council and representatives of the different Local Authorities whose districts are within the Corporation gas-supply area, with the object of arriving at an amicable arrangement, so as to avoid opposition when the measure comes before Parliament. The preliminary conference was presided over by the Mayor of Salford (Alderman Phillips), who is also Chairman of the Gas Committee; and the following authorities were represented: Eccles Borough Council, Swinton and Pendlebury District Council, Worsley District Council, and Barton Rural District Council. It was decided, after two hours' discussion, that the Gas Sub-Committee should submit in writing their best terms to Mr. W. T. Postlethwaite, Clerk to the Swinton and Pendlebury Council, who will then call a meeting of the joint representatives; they in turn to report to their respective Councils on the proposals made.

When last before Parliament with a Bill including clauses for a reduction in illuminating power of the gas from 18 to 14 candles, and the purchase of additional land for gas-works extensions, the Corporation were opposed by the four authorities named, whose Counsel sought to limit the profits made by the Gas Committee and the handing over of large sums out of such profits in aid of the borough rates; while the differential rate obtaining for gas supplied to the out-districts was also objected to. The House of Lords Committee, presided over by Lord Donoughmore, after a sitting extending over several days, and hearing evidence on both sides, were prepared to agree to the insertion of a clause to the effect that the Corporation should be allowed to charge a sum which would fall under the following heads: (1) A fair price; (2) interest and sinking fund on the capital for the time being outstanding; (3) a share of a proper reserve fund, which had been mentioned—the Committee accepting the figure as $\frac{3}{4}$ per cent. per annum, and not exceeding 10 per cent. of the capital outstanding; (4) 1 per cent. on the capital outstanding. The Committee agreed that the same conditions should be placed upon the promoters as upon public companies in respect to the limitation of a carry-over; and they thought the capital should be raised, as and when required, with the consent of the Local Government Board. The Committee also considered that it would be fair to abolish the differential rate in the outside district represented before them; Barton to have a statutory right to the rate as everybody else. Further, the Committee thought a statutory obligation should be put upon the Corporation to charge the lighting fund with the cost of public lighting. Lastly, they expressed the opinion that a clause should be inserted in the Bill stating that if at any time, through discontinuance of the use of gas by the public, the gas undertaking of the Corporation became a total loss, and the outstanding capital be then chargeable on the rates, this charge should be shared by the ratepayers of the four outside districts represented before the Committee in proportion to the respective rateable values.

It will be remembered that, in view of the far-reaching effect of these proposals, the Bill was withdrawn by the Corporation of Salford. Alderman Phillips then pointed out that the gas undertaking existed primarily for the benefit of the inhabitants of Salford; and, secondarily, as an adjunct, came the supply to the out-districts. If the decision of Committee had been accepted, it would have practically taken away the power of the Corporation to make a profit out of the gas undertaking—a result which would have placed the ratepayers in a serious position. It is hoped that the negotiations now in progress may result in an agreement being arrived at between the Corporation and the Local Authorities concerned. In past years, all of them have spent large sums of money in contests over gas clauses in Bills.

HIGH-PRESSURE LIGHTING IN LEEDS.

It is stated that the experiments which have been carried out by the Leeds Corporation Gas Department with the installation of high-pressure gas-lamps in Calverley Street, are shortly to be supplemented by further trials of the system in Duncan Street and New Market Street. A special main for the purpose has already been laid; and a small compressing-house is being built on a piece of land rented from the Improvements Committee. It is anticipated that everything will be ready for the beginning of the demonstration in a month or six weeks' time. The ten lamps which have been in position in Calverley Street since May last have given every satisfaction. The main which is now being put down will be quite adequate to supply the whole of the centre of the city, if required. A strong effort is to be made to induce shopkeepers and others to take up the new system for outside illumination; and already one of the largest firms in the city are in communication with the department on the subject.

ALLOCATION OF PROFITS IN AID OF RATES.

In his annual abstract of accounts, the Borough Treasurer of Bolton (Mr. Percy Farnworth) introduces a new feature—viz., a preliminary report in which a synopsis of the finances of all departments is given under the respective headings; another useful feature introduced into the book being the placing in parallel columns of the figures for the previous year.

The accounts of the Gas Department for the year to March show the total working expenses for the past financial year to have been £116,251, compared with £115,454; while the income was £170,745, against £165,243—the increase in this case being due chiefly to higher prices obtained for the residual products. The amount transferred to the net revenue account was £4705 more than in the preceding year;

and after defraying the charges for interest and the redemption of debt, the disposable surplus was £29,136, or £4893 more than in 1909-10. Of this surplus, £20,000 was applied in aid of the rates, and £9136 transferred to the depreciation account; the available balance, after spending £28,364 on extensive renewals, principally at the Gas Street works, being £37,415.

The result of the year's working of the Water Department showed a profit of £1347, against a loss of £3891 on the previous twelve months; the decrease in the cost of reservoir maintenance, filtration, and treatment, and distribution contributing the sum of £10,689—a saving of £4303 on the year. Water rents and charges brought in £3930 more than before, notwithstanding the rebate of £642 allowed in respect of licensed premises; the increase being mainly due to a revision of the trade charges. There still remains a deficiency of £2902 on revenue account; but it is hoped to wipe off this adverse balance next year, and make a contribution to the reserve fund. The capital outlay during the year was £66,117, compared with £45,957 before; and the Borough Treasurer adds that the "interest and sinking fund charges will increase rapidly while the construction of new works is proceeding."

The total indebtedness of the borough is £4,237,545; and the property and permanent works, &c., amount to £5,145,415.

Mr. A. Pilling, one of the Elective Auditors for the borough, in his report on the Treasurer's accounts, urges two reforms—one being that grants in aid of rates from the profits made in the Gas Department should be lessened, so as to allow for a quicker redemption of capital; and the other that, along with this, they should accept the principle that the consumer is entitled to larger benefits by a reduction in the price of gas. Mr. Pilling expresses the hope that the ratepayers at every ward election will make a point of asking candidates this question: "To what extent do you justify charging excessive prices to gas consumers in order to provide rate relief?" Mr. Pilling adds: "I do not say the consumer should get all the profit; but I may give this information as to the mind of Parliament on the matter. On the recent federation of six Potteries towns, a clause was inserted in the Federation Act which compels the Gas and Electricity Committees in that area to so conduct the various works that no profit shall be made which can be handed over in reduction of rates. In the event of a profit being made in any one year, the price of electricity and gas must be so readjusted as to absorb the profit. These facts should compel consideration. Widnes gas at 11d. and 1s. 1d. per 1000 cubic feet may be beyond us. But what compensation in clear atmosphere it would be if we could displace coal by cheaper gas to a larger extent."

ELECTRICITY USERS AND GAS-COOKERS AT OLDHAM.

The Question of a Minimum Consumption of Gas.

The recommendation of the Oldham Corporation Gas Committee for the adoption of a scale under which people using gas-cookers would have to undertake to consume a minimum quantity of gas annually, according to the prime cost of the cooker, has been rejected by the Town Council. The scheme, of which some particulars appeared in the "JOURNAL" for Aug. 22 (p. 502), proposed that in each case where the minimum consumption of gas was not reached, a fine of 6d. per 1000 cubic feet should be imposed; and the scale was to apply alike to consumers of gas and electricity having gas-stoves in use.

It was argued by those who opposed the scale that the people who did not use gas would be likely to suffer from its operation. Dealing with this point, Mr. Stanbury said this was a principle which they ought to fight against. There was a tendency on the part of small householders in the town to enjoy the privilege of electric lighting. While they had this lighting, which was supplied by the same Corporation, and was a source of profit to them, they were to be denied the privileges they would have obtained if they had not had electricity. He (Mr. Stanbury) did not think this was right; and he hoped the gas-cookers would continue to be supplied to those wanting them.

Mr. Hirst, who also opposed the adoption of the proposal, said he did not know how the Gas Committee would apportion the amount for gas used for lighting and for cooking; but supposing they reckoned, under the "C" scale, 7000 cubic feet for the former and 5000 cubic feet for the latter, making up the minimum of 12,000 cubic feet, and only 10,000 cubic feet were consumed, the customer would be 2000 cubic feet short, and would have to pay 1s. But let them take the man who did not use gas for lighting purposes. If he only used 3000 cubic feet for cooking he would have to pay 4s. 6d.; the difference between 3000 and 12,000 cubic feet. In that case, the consumer would be penalized to the extent of 3s. 6d. for daring to prefer electricity to gas for lighting purposes. In fact, he would be paying 1s. 6d. per 1000 cubic feet more than the fixed scale for the gas actually used.

The Vice-Chairman of the Committee (Alderman Thompson) denied that by the scale any consumer would be penalized; and he argued that as the Gas Department was a trading concern they had a perfect right to get interest and redemption on the money they paid out. He illustrated the case of a man who had a gas-cooker and only used it at the week-ends, with the result that the gas consumed did not pay for the interest and redemption on the cost of the cooker. If people did not want to pay the cost, let them put in their own cookers.

The Chairman of the Committee (Alderman Wilde) pointed out that previously they had assumed 8000 cubic feet for lighting and a similar quantity for cooking. Now they had come down to 8000 cubic feet for the two. The figures on which they had based their calculations were that people wanted the Committee to put in gas where they had electricity on the same conditions as had been in existence for some time. The Council must remember that the gas undertaking was a commercial one, and that if the old scale continued they and the Engineer might be called upon to say they could not manage their department and make a profit. The Chairman added that he had a list of people who used electricity for lighting and gas for cooking, and only a few would be called upon to pay if the new scale were adopted.

By 21 votes to 11, an amendment was carried, to the effect that the scale be deleted from the minutes of the Committee.

OTTOMAN GAS COMPANY, LIMITED.

The Development of Smyrna.

The Ordinary General Meeting of this Company was held on Tuesday last, at the London Offices, No. 9, Queen Street Place, E.C.—Colonel JAMES LE GEYT DANIELL in the chair.

The SECRETARY (Mr. Thomas Guyatt) read the notice convening the meeting; and the report (noticed in the "JOURNAL" for the 12th inst., p. 699) and the statement of accounts were taken as read.

The CHAIRMAN, in moving the adoption of the report and accounts, referred with regret to the absence of Colonel Stephenson R. Clarke, C.B. Had Colonel Clarke been present, he remarked, they would have had an opportunity of congratulating him upon his honorable mention in the Coronation Gazette, inasmuch as he had been made a Companion of the Order of the Bath. Colonel Clarke had, however, been present the previous week at an important special meeting of the Board, which was fixed with a view to meeting their Engineer and Manager (Mr. John Gandon), who came over to England to discuss with the Consulting Engineer (Mr. Arthur F. Phillips) the question of an outlay of capital which was demanded for increasing the plant to cope with the development of Smyrna. It was now ten years since he (the Chairman) paid his visit to Smyrna; and he remembered telling the shareholders afterwards of the opinion he had formed with regard to the capabilities of the place. These capabilities had since been evidenced in a measure by the steady growth of the Company's business, which had far exceeded anything that he then contemplated. It was necessary, of course, that the Company should not only keep pace with what was going on, but should provide for what might be anticipated in the future. They had had the good fortune to be able to arrange for Mr. H. Ward Andrews, a member of the Board, to pay a visit to the works, over which he at one time presided; and he had made a very valuable report to his colleagues. It was everything in a place like Smyrna, and in a country like Turkey, that foreign capital should find its way in for the development of the interests from which the inhabitants were the first to reap direct advantage, because it would be almost impossible for the Turkish people to carry the work out with the benefit to themselves which they derived from having it undertaken by Europeans. There were at the present moment some works under consideration—and he believed they were financially well backed—which would involve the spending of some millions sterling of English money out there; and this would benefit not only Smyrna itself, but all the interests in the place. It was in view of all these facts that the Company had had to consider what capital outlay should be made; and this had been decided upon under the guidance of their Consulting Engineer. He thought that there was a splendid future for Smyrna. It was an extraordinarily fine port; and all that was required was good government and encouragement—not discouragement—for those who were helping towards its development. Turning to the business of the Company, the accounts before the shareholders would show them how things had been going. They had carbonized in the past six months nearly 1000 tons more coal, at a cost of only £383 more than was spent on coal in the corresponding period of the previous year. This was in a measure consequent upon the policy pursued by the Board—a policy which they had seen the advantage of, and to which he alluded twelve months ago—of arranging for the supply of coal two years in advance. The price of the coal worked out at 16s. 1d. per ton, as against 17s. 3½d. in 1910. The quantity of gas made and accounted for was 10½ million cubic feet more; and the make per ton was 11,010 cubic feet. There was naturally an increase in the number of public lamps under the terms of the new contract, of which this was the first year, and a consequent extension of the area and a corresponding increase in the total cost. There was an increase of some £2300 in the gas-rental, for which they had to thank the private consumers; and there was no reason for dissatisfaction in the matter of the residual products, which showed an increase of £1354. It would be observed that the amortization account had increased about £2450; and the reserve fund stood at £4000 more. He thought he had said enough to make the shareholders consider that the result of the past half-year's working was not unsatisfactory.

Mr. H. WARD ANDREWS seconded the motion; remarking that, on his recent visit to Smyrna, he was more than pleased with what he had seen—with the management of the works, with the results, and with the great increase in the population. It was most gratifying to him, as an original shareholder, and as the original manager of the works, to find such a satisfactory state of affairs. He would like to point out that in the accounts "Products, fittings, &c.," appeared in one item. A part of the £6817 under this heading was due to the fittings business, which was very extensive. They had no rivals worth talking about for doing fitting work. The fittings department of the Company's business was a big and increasing one; and he felt assured that, under the able management of Mr. Gandon, it would continue to develop.

The resolution was at once carried unanimously.

On the proposition of the CHAIRMAN, seconded by Mr. STRACHAN C. CLARKE, dividends for the half year were declared at the rate of 7 per cent. per annum on the preference shares, less income-tax, and at the rate of 8 per cent. per annum on the ordinary shares, tax free.

The CHAIRMAN proposed, and Mr. A. M. PADDON seconded, a hearty vote of thanks to the Engineer and staff in Smyrna and in England.

This was accorded, and suitably acknowledged by Mr. GUYATT and Mr. PHILLIPS.

A vote of thanks to the Chairman and Directors—on the proposition of Mr. A. W. OKE, seconded by Mr. H. F. DODGSON—brought the proceedings to a close.

Messrs. Thomas Glover and Co., Limited, of the Gothic Works, Edmonton, N., have sent us a copy of the new edition of their booklet giving a description of the mechanism and action of their dry gas-meters. It contains twelve pages of letterpress and a large folding plate; and it will be found suitable for use in classes on "Gas Distribution." Messrs. Glover will send copies on application.

USE OF TAR ON ROADS IN KENT.

We have received from Mr. H. P. Maybury, M.Inst.C.E., the Surveyor to the Kent County Council, his report for the year ended the 31st of March last, in which he gives the following particulars in regard to the use of tar for improving the surface of the roads in the county, in view of the motor traffic.

The mileage of roads in the rural districts is 576, and in the urban districts 20—a total of 596. The actual cost of maintenance, tar painting, and improvement work during the year was £94,253 15s.; being £715 17s. 10d. less than in the preceding year. Of this sum, £26,974 13s. 4d. was expended upon tar painting, widenings, kerbing, channeling, paving, and drainage works; representing £45·1 per mile. The cost of maintenance proper was, therefore, £112·8 per mile; being £11·8 per mile less than in the previous year. The tar-painting bill alone came to £20,594 3s.; 823,766 gallons of tar having been used upon 371 miles of surface. The area treated was nearly 5 million superficial yards. In addition to tar, 91 tons of special bituminous binding preparation, having asphalt as its base, was purchased; this costing £258 9s. 5d. Further, in the urban retaining districts the Council paid to the several authorities £4855 10s. 7d. for tar painting about 120 miles of road, representing 1,344,380 superficial yards; so that the total cost to the county fund of tar painting and kindred work was no less than £25,708 3s.

The total quantity of material put upon the directly maintained roads represented 117,531 tons or yards; being equal to 197 tons or yards per mile. This was less than in the preceding year; but Mr. Maybury says it is still an extremely large quantity—far above that used in almost any other county. Of the entire bulk of material used, 56,061 tons was granite and 12,529 tons Kentish rag tar macadam; the latter being an increase of 9801 tons over the quantity used in the preceding year. Mr. Maybury is pleased to be able to report that "if care is continued to be exercised in the preparation and laying of this material, good value to the county may be secured, and at the same time an important county industry assisted."

In the portion of the report dealing with administration, Mr. Maybury states that, notwithstanding the increase in the use of traction-engines, steam-lorries, and other self-propelled vehicles, the county roads have been maintained satisfactorily, and are much improved in strength; while the dust nuisance is almost a thing of the past. Upon the most important roads, and where the traction-engine and commercial motor traffic is greatest, he fears that the water-bound system and tar painting will have to give way to some more durable form of maintenance; and during the present year, with assistance from the Road Board, he is laying down several miles of granite macadam, grouting with a pitch matrix. He thinks it possible that this will be found, over a period of years, to be quite the cheapest form of construction to support the heavy vehicles.

STREET LIGHTING IN SHOREDITCH.

At the meeting of the Shoreditch Borough Council last Tuesday, the Lighting Committee presented a report in which they recommended the adoption of electric lighting in all the streets north of Old Street. The number of gas-burners in the district referred to is 1055; and the capital cost of laying about 14 miles of cables in 160 streets is approximately £8385. The cost of converting the lamps is estimated at £665 5s. The proposed charge to the general rate is 37s. per 50-candle power per annum, including lighting and the maintenance of lamps, which compares with the present cost of 40s. 3d. per annum. An important reason for the change put forward by the Committee was that it will enable the laying of cables of sufficient size to deal with a demand for lighting and power which at present cannot be met.

Mr. PORTER moved an amendment that the scheme should be referred back to the Committee. He said he thought it involved too great an expenditure for the Council to give one decision upon, and hoped the Committee would bring up a smaller scheme, as this would enable them to avail themselves of the many changes that were taking place in lighting methods. The statement was made in the report that the scheme would result in a reduction in the cost of public lighting; but this was quite contrary to the past experience of the borough in this respect. At the present time they were paying £2 for every £1 previously paid for gas lighting. He quite admitted that there was more light; but, judging from the past, he was inclined to the view that the Committee would not keep the expense within the limits mentioned in the report. There was another important point—viz., that the result of the scheme, if carried through, would be less revenue from the Gas Company in the way of assessment; and if this were so, the rates would have to bear the loss.

The amendment having been seconded,

Mr. BIBBY supported it, and suggested that a quarter of the scheme should be undertaken at first. He said the Council had paid dearly for going into "the first mad scheme of street lighting."

Several councillors having spoken in support of the scheme,

The CHAIRMAN OF THE COMMITTEE, replying to the criticisms, said the first scheme of street lighting in Shoreditch was by arc lamps; whereas in the new one they would use metallic filament lamps. It would take about three years to carry out the complete change, and it would be made in sections. He thought the Committee would have sufficient common sense not to carry out any work unless they were convinced that they were doing it upon the best system. Therefore the argument that something better might be discovered before the change was completed did not apply, as the work being done in sections, the Committee could avail themselves of all improvements. The assessment of the Gas Company would not be reduced, as they would not remove a single pipe from the district. The Committee stood by their figures, which were based upon the average number of hours the lamps would be alight. The charge was a fixed item.

Eventually the amendment was withdrawn, and the Committee's recommendation was adopted.

LECTURES ON ILLUMINATING ENGINEERING.

Syllabus of the Polytechnic Lectures.

In the "JOURNAL" for the 12th inst. (p. 663), it was announced that a course of twelve lectures on illuminating engineering had been arranged to be given at the Polytechnic, Regent Street, from Oct. 31 to Feb. 15 next. The lectures will be open to all who are interested in the subject: and the fee for the entire course will be 12s., or 2s. for single lectures. As some readers of the "JOURNAL" may be desirous of attending, we reproduce the syllabus.

ELECTRIC LIGHTING.

Glow Lamps.—Early history. General nature of electric supply. Variation in load, tariffs and basement rates, &c. Qualifications of a good glow lamp, efficiency, life, durability, &c. Carbon filament, Nernst, graphitized osmium, helium, tantalum, and tungsten lamps. Special problems in manufacture of tungsten lamps. Characteristic differences between carbon and metallic filaments. Effect of variations in voltage. Use of small transformers on lighting circuits. Low voltage lamps for signs, &c. Progress in making high-voltage low candle power units. Improvements in strength and durability. Drawn tungsten wire. Large candle power lamps for public lighting, &c.

Arc Lamps.—Nature of arc struck between carbon electrodes. Open arc lamps for direct and alternating current. Enclosed arc lamps. Flame arc lamps, characteristic distinctions from those using ordinary carbons. Colour, efficiency, burning hours, &c. Magnetite and Titanium arcs. Magazine arc lamps. Enclosed flame arc lamps (Jandus carbone, &c.). Miniature arc lamps. Devices for altering distribution of light ("Excello" dioptric globe, &c.).

Vapour Lamps.—Distinction between light from luminescent vapours and glowing solids. Mercury (Cooper-Hewitt) lamps, characteristic colour and efficiency. Quartz tube mercury lamps. Moore tube system. Effects of using nitrogen carbon dioxide, neon, &c. Value for colour matching. Phosphorescence and fluorescence. Future developments in electric illuminants.

GAS LIGHTING.

Early history of gas lighting. General nature of gas supply. Luminous flame burners, flat-flame, argand, albo-carbon, and regenerative systems. The bunsen burner and its application to incandescent lighting. Various systems of incandescent gas lighting, upright, horizontal, inclined, and inverted mantles, and their relative advantages. Qualities requisite in a good mantle, and methods of determining them. "Shocking" machines. Packing and transport of mantles. Progress made in regard to improvements in mantles. Colour of light from mantles. Use of non-collodionized mantles. Materials used in the manufacture of mantles, ramie and artificial silk. Efficiency of modern methods of lighting by gas. Adjustment of burners. Supervision and maintenance of installations.

Various types of burners. Self-intensified systems of gas lighting and the production of high-power units at ordinary district pressures. Recent progress. High-pressure systems—viz., high-pressure air, high-pressure gas, and high-pressure gas-air mixtures. Modern high-power units. Use of multiple-burner units for various purposes and their advantages. Centrally suspended street lamps, and means for raising and lowering for cleaning and maintenance. Automatic control of public and other lamps, various appliances, clockwork and pressure-wave systems of control. Distance control for indoor lighting, various systems, electric, pneumatic, &c. Self-lighting mantles and pyrophoric igniting appliances. Effects of calorific power of gas, shape of flame, pre-heating, and flame temperature. Modern problems in gas lighting, and future prospects. Calorific and illuminating power standards.

OIL, PETROL AIR GAS, ACETYLENE, &c.

Oil-lamps, conditions of efficiency and safety, value for private house lighting. Incandescent oil systems and their application to lighthouses. Incandescent paraffin and spirit lamps. Liquid gas, petrol air-gas systems. Acetylene lighting. Modern generating plants. Conditions for safety and efficiency. Types of burners. Portable lamps for mines. Flare lights. Dissolved acetylene. Application to railway and marine lighting. Automatic valves for buoys, &c. Use of above systems for emergency lighting and in remote districts, in the Colonies, &c.

ILLUMINATION FROM THE STANDPOINT OF THE EYE.

The anatomy of the eyeball, including the structure of the media and of the retina. The pupil reflex and the ascertained reactions of the eye to luminous stimuli. Fechner's law. Photometry in its physiological aspects. Relationship of illumination and visual power. Effects of over and under stimulations. Glare. Fatigue. Illumination as a hygienic requirement in school life, in home surroundings, in industrial occupations.

THE MEASUREMENT OF LIGHT.

Early ideas on photometry. Meaning of "candle power." Power of creating brightness and revealing detail, penetrating power, &c. Standards of light and their development. The international unit. Co-operation between British, Continental, and American laboratories. The photometer-room. The photometric bench. Practical precautions to secure accuracy. Sensitiveness of the eye and various photometers, grease spot, Joly, Lummer-Brodhun, flicker, &c. The problem of comparing lights of different colour. Studying distribution of light. Mean spherical candle power. Ulbricht globe and integrating photometers. Commercial and laboratory accuracy. Practical value to consumer and lamp maker. Buying and selling light.

ILLUMINATION AND ITS MEASUREMENT.

Value of illumination measurements in practice. Early forms of illumination photometers. Trotter, Harrison, Martens, Sharp and Miller, holophane, lumeter, and other apparatus. Measurement of surface brightness and reflecting power. Practical applications, testing wall papers, cinematograph screens, &c. Measurements in factories,

schools, libraries, &c. Street lighting photometry and street lighting contracts.

SHADES AND REFLECTORS.

Recapitulation of effect of light on the eye. Intrinsic brilliancy of various illuminants. Glare, its effects and avoidance. Practical illustrations in street, school, and shop lighting. Methods of screening illuminants. Indirect and direct lighting. Effects of shadow. Functions of shades, globes, and reflectors. The scientific distribution of light.

COMPARISON OF DAYLIGHT AND ARTIFICIAL LIGHTING.

Requirements of good illumination. Window space in interiors. Measurement of daylight. Ancient light problems. Applications in schools, factories, &c. Effect of wallpapers on day and artificial illumination. Planning the lighting installation and calculations of illumination beforehand.

COLOUR OF ARTIFICIAL ILLUMINANTS.

Comparison with daylight. Methods of testing colour. White lights. Methods of producing artificial daylight. Combinations of illuminants and use of special screens, &c., to imitate daylight. Application to silk-mills, dyeing-works, flower-shows, &c. Aesthetic aspects of colour. Theatre and spectacular lighting and scenic displays. Efficiency of modern illuminants and the production of invisible rays. Effects of ultra-violet light in causing the fading of colours, destruction of bacteria, &c. Fluorescence and phosphorescence and their use in producing special colour effects.

PRACTICAL LIGHTING PROBLEMS.

Examples of good and bad lighting in schools, libraries, factories, shops, offices, &c. Desk and table lighting. Problems in modern street lighting, and the proposed standard specification. Summary and conclusions.

STATISTICS OF WATER UNDERTAKINGS.

Extracts from the Census of Production Returns.

In the "JOURNAL" a fortnight since some statistics were given relating to the gas undertakings of the United Kingdom, extracted from the recently-issued Blue-book containing the conclusion of the series of preliminary tables summarizing the results of the returns made under the Census of Production Act, 1906. We may now give particulars in regard to the water-undertakings, which apply normally to the year 1907.

The tables are based on returns received in respect of water-works undertakings owned by companies (including hydraulic power companies) and public authorities. Private water-works owned by manufacturers, brewers, &c., for the supply of water for their own purposes are not included. The returns received in respect of the water-works at the Royal Arsenal and Royal Dockyard, Woolwich, are included with those received from local authorities in the tables relating to public authorities. Separate tables are given showing the particulars furnished in respect of the undertakings owned by companies and by public authorities.

Companies and authorities were directed to state as to the selling value of the water supplied (a) the net amount charged, less discounts, to private consumers, whether the charge was levied by rate or as rent or in any other way; and (b) the actual amount charged in the case of water supplied to another department of a local authority. Contributions from the local rates to make up any deficiency in the income of water-works undertakings are not included.

The total sum returned as the value of water supplied by companies and public authorities is £10,465,000, and in addition £144,000 was received from consumers for the fixing of meters, pipes, fittings, &c. Certain companies and local authorities purchased from other companies and public authorities water in bulk for distribution; and the sellers as well as the distributors included the price received in the value of their output. In the cases in which such duplicate entries have been identified, the value of the water thus supplied in bulk is estimated at about £109,000. Allowing for this duplication, the total value of the water supplied was about £10,356,000; and adding the amount (£144,000) received from consumers for fixing fittings, &c., the total output of water-works undertakings was about £10,500,000. In addition, the value of the water sold by railway companies, and included in a previous section of the preliminary tables under the heading of "other manufactures and work done," was £41,000; raising the total value of the water supplied in the United Kingdom in 1907, so far as returned to the Census of Production Office, to about £10,397,000.

Under the limitations imposed by the Census of Production Act, it was not possible to require in the compulsory part of the schedule a statement of the quantity of water supplied to consumers. A voluntary question was accordingly included in the schedule, requesting companies and local authorities to furnish information respecting the quantity of water supplied.

Companies and public authorities that supplied water to the value of £9,592,000 (or 91·7 per cent. of the aggregate value of the water supplied) stated that the quantity supplied by them was nearly 371,000 million gallons, or about 365,000 million gallons after deduction of water bought by one undertaking from another and returned by both. It may be estimated that the total quantity of water supplied by water undertakings was about 400,000 million gallons. No information is available as to the quantity of water supplied without special charge by a number of the smaller authorities or obtained from public wells.

The net output of all the water-works undertakings covered by the report was £9,052,000, this sum representing the total amount by which the value of the output of such undertakings, taken as a whole, exceeded the cost of the materials used in connection therewith and of water purchased in bulk. The actual cost of such materials was about £1,448,000, and that of water purchased in bulk about £109,000.

The average number of persons employed by water-works under-

takings on the four days for which the numbers were returned was 22,059—viz., 18,505 wage-earners and 3554 salaried persons.

DETAILS AS TO COMPANIES.

The total value of the water supplied by companies, including hydraulic power companies, is returned as £2,148,000. This sum includes the selling value of water purchased in bulk for distribution at the cost of about £22,000, of which water valued at about £20,000 was purchased from local authorities, and water valued at about £2000 was purchased from other companies. The latter sum involves duplication to this amount; so that the net value of the water supplied by companies is reduced to £2,146,000. In addition, £24,000 was received from consumers for fixing meters, fittings, &c. (exclusive of the cost of the meters, &c.); raising the value of the total output of water-works undertakings owned by companies to £2,170,000.

Companies that supplied water to the value of £1,747,000 (or about 81·3 per cent. of the aggregate value of the water supplied by companies) stated that the quantity supplied was 68,057 million gallons, of which about 850 million gallons were purchased in bulk from public authorities. Deducting about 50 million gallons bought by various companies from others and returned by both, the quantity of water distributed by the companies furnishing this information (including water sold in bulk to local authorities) was about 68,000 million gallons.

The working staff of water-works companies is not employed solely in the operation of the water-works, but also in works of construction, alteration, and repair in connection with the reservoirs, wells, aqueducts, mains, machinery, plant, &c. The cost of such work, whether immediately met out of capital or out of revenue, forms eventually a charge on the value of the water supplied. Consequently, it has not been taken as an addition to the "output" of water-works undertakings, in the meaning in which that term has been used for the purposes of the census. A summary of the particulars furnished in respect of the cost of such work done in the censal year (covering wages, materials, and establishment charges attributable to the work) is shown below; work given out to contractors not being included.

	Con- struction.	Alteration and Repair.	Total.
Work done by employees of companies—			
Water-works (including reservoirs, wells, aqueducts, conduits, mains from reservoirs, street mains, &c.)	£234,000	£174,000	£408,000
Buildings in connection with water-works	12,000	9,000	21,000
Machinery and plant in connection with water-works	8,000	53,000	61,000
Work not separately distinguished	57,000	12,000	69,000
Total cost of work done	£311,000	£248,000	£559,000
In addition, the value of works of construction, alteration, and repair			

of water-works, works, &c., carried out by builders and contractors, was returned as £1,802,000; and the cost of such work carried out by railway companies was £155,000.

The net output of the water-works undertakings conducted by companies was £1,727,000; this sum representing the total amount by which the selling value of the water supplied exceeded the cost of water purchased and the cost of the fuel and other materials used in pumping and distributing the water, and in the execution of works of construction, alteration, and repair. After elimination of the cost of water purchased by one company from another and returned by both, the actual cost of materials used and of water purchased from local authorities was about £443,000.

The average number of persons employed on the last pay-days in January, April, July, and October in connection with water-works undertakings conducted by companies is returned as 4716—viz., 3714 wage-earners and 1002 salaried persons; the total number being distributed by age and sex as follows: Males under 18, 105; over 18, 4584. Females under 18, none; over 18, 27.

DETAILS AS TO PUBLIC AUTHORITIES.

The tables are based on returns received from local and other public authorities in respect of water-works undertakings conducted by them for the sale of water for private and public purposes. Cases where the local authority control the supply of water, but do not charge for it (the cost being met out of the general rate), are not included in the tables; but the expenditure of the local authority in works of maintenance of the service is included.

The total value of the water supplied by public authorities is returned as £8,317,000. This sum includes the selling value of water purchased in bulk for distribution at the cost of about £87,000, of which water valued at about £9000 was purchased from companies, and water valued at about £78,000 from other public authorities. This latter sum involves duplication to this amount; so that the net value of the water that was supplied by local authorities is reduced to about £8,239,000. In addition, £120,000 was received from consumers for fixing meters, pipes, fittings, &c. (exclusive of the cost of the meters, &c.); thus raising to about £8,359,000 the value of the total output of water-works undertakings conducted by public authorities.

Public authorities who supplied water to the value of about £7,845,000 (or 94·3 per cent. of the aggregate value of the whole) stated that the quantity supplied was 302,703 million gallons, of which 300 million gallons were purchased in bulk from companies. Deducting about 4100 million gallons bought by various public authorities from others and returned by both, the quantity of water distributed by these authorities, including water sold to companies, was 298,600 million gallons.

As has already been explained in the case of companies, the working staff of the undertakings of public authorities is engaged not only in operating the water-works, but in works of construction, alteration, and repair in connection with the reservoirs, wells, aqueducts, mains, machinery, plant, &c. The cost of such work has not been taken as part of the output of the undertakings, but a summary of the particulars

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furnished in respect of the cost of such work (covering wages, materials, and establishment charges attributable to the work) is shown below ; work given out to contractors not being included.

	Con- struction.	Alteration and Repair.	Total.
Work done by employees of public authorities—			
Water-works (including reservoirs, wells, aqueducts, conduits, mains from reservoirs, street mains, &c.)	£533,000	.. £836,000	.. £1,369,000
Buildings in connection with water-works	10,000	.. 12,000	.. 22,000
Machinery and Plant in connection with water-works	16,000	.. 50,000	.. 66,000
Work not separately distinguished	—	.. —	.. 417,000
Total cost of work done			£1,874,000

In addition, the cost of the work done by local authorities in maintaining the service of water where the water was supplied free amounted to £19,000.

The net output of the water-works undertakings conducted by public authorities was £7,325,000 ; this sum representing the total amount by which the value of the water supplied exceeded the cost of water purchased and the cost of the fuel and other materials used in pumping and distributing the water and in the execution of works of construction, alteration, and repair. After allowing for the cost of water purchased by one public authority from another and returned by both, the actual cost of materials used and of water purchased from companies was about £1,034,000.

The average number of persons employed on the last pay-days in April,* July, and October, 1907, and January, 1908, in connection with water-works undertakings conducted by public authorities was 17,343—viz., 14,791 wage-earners and 2552 salaried persons ; the total being distributed by age and sex as follows : Males under 18, 286 ; over 18, 16,962. Females under 18, 1 ; over 18, 94.

* April, 1908, in the case of local authorities in Scotland.

NOTES FROM SCOTLAND.

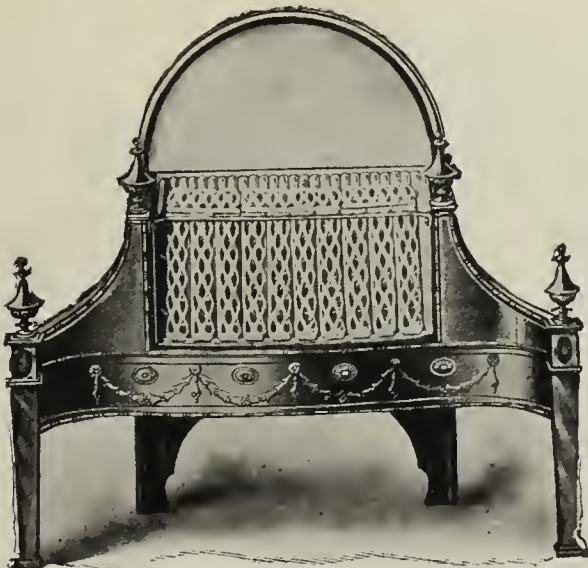
From Our Own Correspondent.

Saturday.

The valuation appeal case to which I referred last week as about to be heard in the Edinburgh Valuation Court was reached last evening ; and an opening statement was made by Mr. J. Duncan Millar, on behalf of the Gas Commissioners, who are the appellants. The case is, however, in the unfortunate position of being only partly heard, which takes away from the interest of it. Mr. Millar's statement was to the effect that the Commissioners were asking the Court to lay down and follow out the principles which were laid down by the Valuation

Appeal Court in the Gas Commissioners' appeal in 1909. The Assessor had gone so far in carrying out these principles, but not far enough, because on this occasion he had refused to deduct from the expenditure, in order to arrive at the valuation figure, feu-duties amounting to £259, and landlords' proportion of rates and taxes, amounting to £7819. In the case of a non-profit earning undertaking, such as that of the Gas Commission, a rule had been laid down—an artificial rule, he admitted, but still a necessary one—and it was upon the application of this that the appeal had been brought, so that the Court might decide that the rule must be applied, and applied fully, in this case. The Assessor, when deducting expenditure, ought to have deducted the whole expenditure. For the first time the Commissioners had been allowed Parliamentary and voluntary expenses. The total reduction claimed by the Commissioners in the city, in the burgh of Leith, and in the county of Midlothian, amounted to £8282. This would mean a saving of £1500 a year to the Gas Commissioners, which eventually would be a saving to the gas consumers. The case for the Assessor has yet to be heard. The decision in the Leith case, which was mentioned last week, has not yet been given.

The need of publicity cannot be better emphasized than by giving one or two quotations from a special article which was published in the "Dundee Advertiser" on Thursday of this week, under the captivating heading of "Light and Heat in the Home." The writer commences with a number of "useful hints" as to the reflective capacities of wall papers, and then goes on to say : "It is not the intention to discuss the merits of any particular form of illumination. The controversy between gas and electricity is largely a commercial one ; gas having the advantage in respect of small property by reason of its greater age. The difficulty of getting electric light into this class of property is one of wiring ; and until houses can be wired free, as is now the case with gas, no considerable progress can be anticipated. Gas users may be warned that hissing and flaring gas is bad. The unburnt gas which escapes in this manner is very dangerous, and may contain as much as 6 per cent. of the poisonous carbonic oxide. Another development which will benefit gas users considerably is now being worked out in London. This has for its object the maintenance of a steady pressure, which will do away with the need for gas regulators or burners, and enable the manufacture of gas-fittings for the pressure which each particular gas authority guarantees. The fitting of pressure regulators on meters will follow." Gas for lighting, it is to be observed, is not condemned, but is even admitted to have some advantage. This is, however, followed by a dreadful warning, and by the foreshadowing of costly appliances which it will be necessary to use. A good word is said for inverted incandescent gas lighting. Then the same service is rendered to the metallic filament electric lamp ; and the author lays down the dictum that "from the hygienic standpoint electricity is much the more preferable form of lighting, and its general introduction would mean an improved standard of public health, with the other desirable features which follow in its train." A well-written article, balancing the *pros* and *cons* of the rival luminants in quite a dexterous fashion, but taking care, in the end, to see that the balance is on the side which the writer mani-



The "Adams."

Write us for our List, which is as Artistic as the Gasfires themselves.

festly leans to. With such things going on in support of electricity, it is time that something was being done to bring the merits of gas for lighting and heating better before the community.

Another article which was published in the "Dundee Advertiser" this week, and which bears the impress of local origin, is to the following effect: "The people of Dundee have been slow to recognize the value of coke as house fuel. They lag behind many other communities in this respect. Still, they are now showing a growing partiality for it, and no doubt Dundee will soon take its proper place as a coke-consuming city. This state of matters is not due to any lack of supply, but to the failure of the citizens to avail themselves of the opportunity afforded for obtaining fuel both cheap and good. The Gas Commissioners produce from their works over 50,000 tons of coke annually, and the excess over local requirements has either to be shipped or sent by rail to other parts where the surplus can easily be disposed of. Bakers and tradesmen with heating installations in their premises were quick to recognize the economies which coke enabled them to effect. They were ahead of householders, who, practically five years ago, began to appreciate its value. The Gas Commissioners then agreed to give those small customers as much coke for 2d. as they could carry away with them, and in December last 5739 twopences were taken at the gas-works; no fewer than 414 men, women, boys, and girls, armed with bags, baskets, and barrows, being supplied on the last day of the year. An explanation of the dilatoriness of the Dundee householder in this respect is that in the tenement properties the bunker accommodation is exceedingly limited, and has not capacity for both coal and coke; the former being necessary to set the fire going. Coke is also finding its way into the houses of the better classes, who can purchase it at 12s. a ton *plus* cartage. It is extremely suitable for kitchen ranges, and mixed with small, cheap coal it generates more heat than the same quantity of ordinary household coal. Anxious to encourage the demand, the Gas Commissioners have adopted the policy that where the gas-producing properties of two kinds of coal are equal, and the prices are also similar, that giving the heating quality of coke is chosen. No doubt in a short time the demand from Dundee for all purposes will exceed the 15,000 tons about which it at present stands."

On Thursday, an inquiry was held in the Sheriff Court at Haddington into the circumstances attending the death of James M'Callum, gamekeeper at Newton Hall, East Lothian. M'Callum had charge of a petrol-gas plant. On the evening of Aug. 25, the gas was not satisfactory in the house, and M'Callum went to see to it. Just after he went out of the house the explosion occurred, and M'Callum was found lying about 20 feet away from the door of the gas-plant house. He was severely injured, and died on the 1st inst. Previous to his death, he stated that, before going into the chamber he heard a gurgling of water, and opened the door about 5 inches in order that he might see the engine. The explosion then occurred. He did not know what caused it, as he had not struck a light. Evidence was led to establish that there must have been an escape of gas, and a light, before the explosion could have occurred. The cause of the explosion remains a mystery; the verdict containing no finding upon this point.

CURRENT SALES OF GAS PRODUCTS.

[For Table of "Tar Products Prices," see p. 828.]

Sulphate of Ammonia.

LIVERPOOL, Sept. 23.

Although the demand has been fairly well maintained throughout the week, the upward movement which appeared ten days ago has not shown any further development. There has been rather a paucity of new business direct from consumers; but the requirements have still been sufficient to absorb current production without any material set-back. At the close, the nearest values for prompt delivery are: £13 17s. 6d. to £13 18s. 9d. per ton f.o.b. Hull; £13 18s. 9d. to £14 per ton f.o.b. Liverpool; and £14 1s. 3d. to £14 2s. 6d. per ton f.o.b. Leith. In the forward position no further first-hand business has transpired. Makers continue to quote £14 5s. per ton. f.o.b. principal ports for equal monthly quantities October-March or January-June; but it is reported that dealers are offering abroad at prompt price.

Nitrate of Soda.

The market for this article remains very steady, and values are well maintained at 10s. per cwt. for ordinary and 10s. 3d. for refined quality, on spot.

LONDON, Sept. 25.

Tar Products.

Markets for tar products still remain steady. Pitch is practically unchanged. Benzols are firm, with a fair amount of inquiry. Solvent naphtha is steady, and there has been a little more inquiry for this article. There is nothing fresh to report concerning crude carbolic. Creosote is firm, and a considerable business has been done at improved prices.

The average values during the week were: Tar, 21s. to 25s. *ex* works. Pitch, London, 40s. 6d. to 41s. 6d.; east coast, 40s. to 41s.; west coast, Manchester 39s. 6d. to 40s. 6d., Liverpool 40s. to 41s., Clyde 40s. to 41s. Benzol, 90 per cent., naked, London, 8½d. to 9d. f.o.b., North, 8½d. to 9d. f.o.b.; 50-90 per cent., naked, London and the North, 7½d. to 8d. f.o.b. Toluol, naked, London, 8½d.; North, 8d. to 8½d. Crude naphtha, in bulk, London, 4d. to 4½d.; North, 3½d. to 3¾d. Solvent naphtha, naked, London, 9½d. to 9¾d. f.o.b. North, 8d. to 8½d. f.o.b. Heavy naphtha, naked, London, 10½d. to 10¾d. f.o.b.; North, 9d. to 10d. f.o.b. Creosote, in bulk, London, 2½d. to 2¾d.; North, 2¾d. to 2½d. Heavy oils, in bulk, 2½d. Carbolic acid, casks included, 60 per cent., east coast, 2s. to 2s. 2d.; west coast, 1s. 11d. to 2s. 1d. Naphthalene, £4 10s. to £9 10s.; salts, 42s. 6d. to 45s., bags included. Anthracene, "A" quality, 1½d. to 1¾d. per unit, packages included and delivered.

Sulphate of Ammonia.

Although there has been a little more inquiry for this article during the past week, it has had no effect on prices; and in the majority

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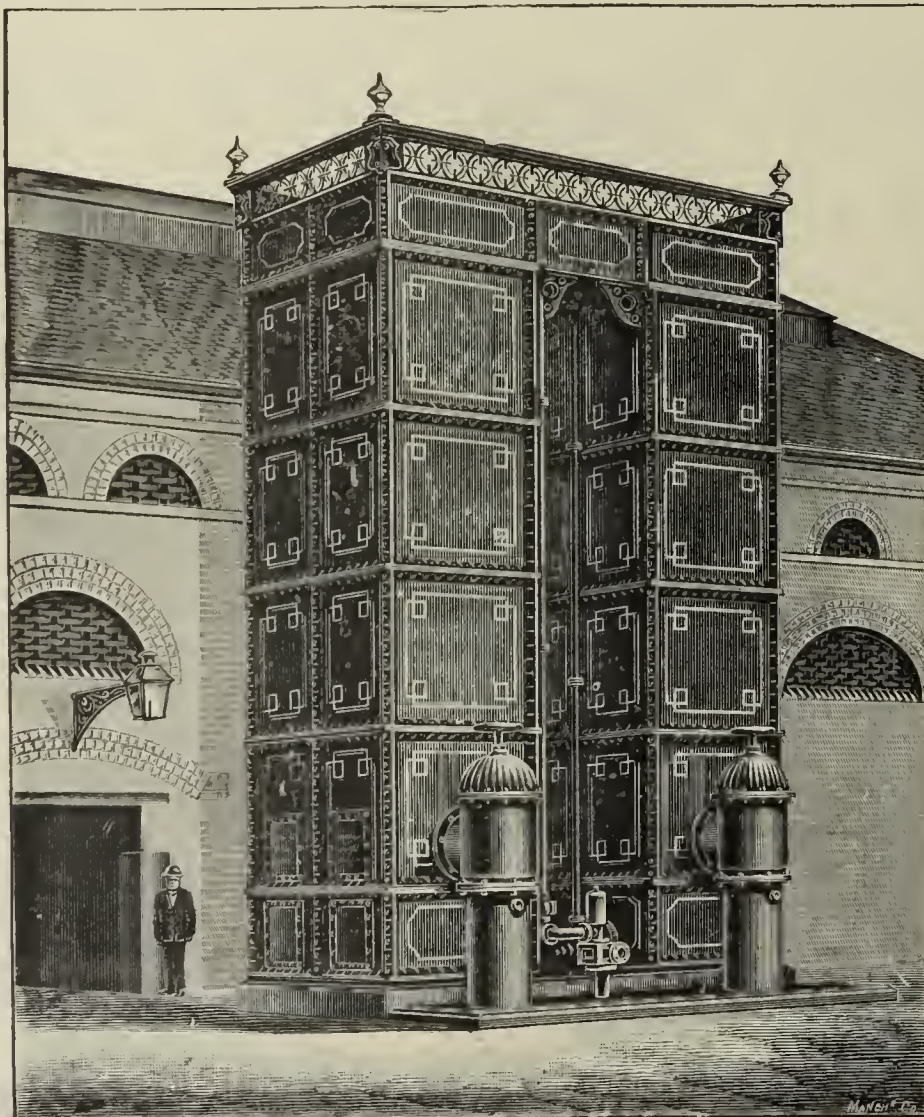
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ETRURIA,
NORWICH,
EAST HULL,
KINGSTON-ON-
THAMES,
BRISTOL,
WALKER AND
WALLSEND
and other Works.

of cases buyers are still holding out. Actual Beckton is quoted at £13 15s.; but outside London makes could be purchased in the neighbourhood of £13 7s. 6d. to £13 10s. Hull, £13 18s. 9d. to £14; Liverpool, £14. Leith makers are still holding out for £14 5s., but nominally the value is not more than £14 to £14 2s. 6d. at this port. Middlesbrough, £13 18s. 9d. to £14.

COAL TRADE REPORTS.

Northern Coal Trade.

There is a stronger demand in the Northern coal trade, and prices of some kinds are higher. Best Northumbrian steams are from 11s. 6d. to 11s. 9d. per ton, second-class steams are 9s. 6d. to 10s., and steam smalls are quiet at from 4s. 9d. to 6s. The demand is full, for best qualities, and the prices are firm; the shipments being rather pressing for the rest of this month. The output of gas coals is heavy, and meets the requirements, so that there is not much alteration in the values quoted. Prices are based on about 10s. 9d. per ton f.o.b. for best Durhams, and 9s. 6d. to 10s. for second-class coals. "Wear" specials are near 11s. 6d. per ton f.o.b. There is a steady demand for gas coals. The tenders have been sent in for the supply of gas coals for Gothenburg—30,000 tons for next year—and it is expected that the result will be known in about a week. Some further sales are spoken of for the Mediterranean ports; and from 17s. 3d. to 17s. 6d. per ton delivered is spoken of as a possible price. In the coke trade, the tone is steady; but gas coke now shows a larger output, and is slightly easier at 14s. 3d. to 14s. 6d. per ton f.o.b.

Scotch Coal Trade.

The foreign trade, chiefly for ell, continues to be strong. Splint is also in demand. Prices, even for small sorts, are advancing. The quotations are: Ell, 9s. 9d. to 10s. 6d. per ton f.o.b. Glasgow; splint, 10s. 6d. to 10s. 9d.; and steams, 9s. 3d. to 9s. 6d. The shipments for the week amounted to 354,208 tons—a decrease upon the preceding week of 36,241 tons, but an increase upon the corresponding week of 31,581 tons. For the year to date, the total shipments have been 11,575,985 tons—an increase upon the corresponding period of 123,166 tons.

Mellor (Derbyshire) Water Supply.—The Mellor Rural District Council have decided to apply to the Local Government Board for sanction to borrow £6900 for water-works purposes. At present there is no public water supply for the town and district, and the people have had to rely upon wells and other private sources. Of the £6900, a sum of £3600 is for the purchase of the present water-works belonging to Mr. Arkwright, and £3300 for augmenting the supply from springs on that gentleman's land at Cobden Edge.

Minimum Wage Agitation at Newcastle.

A mass meeting was held on Sunday morning, in the Collingwood Hall, Newcastle-on-Tyne, of the labourers employed in the distribution department of the Newcastle and Gateshead Gas Company, together with the pipe-layers, who are members of the National Amalgamated Union of Labour. The men are agitating for a minimum wage; and it was agreed that their applications should be forwarded to the Company for consideration. The labourers in the distribution department ask for a minimum wage of 26s. 6d. per week, which is, it is stated, the same as is paid at the Elswick and Redheugh works of the Gas Company; and the pipe-layers are asking the Company to consider an application for a minimum wage of 35s. per week. The latter contend that, to all intents and purposes, they are skilled workmen. Their wages vary between 27s. and £2 and upwards per week; and they consider 35s. a week a legitimate minimum to ask for.

Proposed Water-Works Purchase at Stoke-on-Trent.—Conferences of the local authorities interested have been held to discuss the advisability of a joint purchase of the undertaking of the Staffordshire Potteries Water-Works Company; and, as a result, the Water Committee of the Stoke-on-Trent Corporation have decided to recommend the Council to enter into negotiations to acquire the concern. The matter will come before the next meeting of the Council.

Gas-Workers' Wages at Birmingham.—A petition has been presented to the Birmingham Gas Department, through the Amalgamated Society of Gas Workers and General Labourers, asking for an increase of wages for men of all grades and a revision of holidays. The advance asked for varies from 4d. to 7d. per day for workers in the retort-house, and an equivalent of 2s. per week for all labourers. Application is also made for a week's holiday annually for all men regularly employed, in addition to the Bank Holidays; and holidays for short service men *pro rata*. The advances are asked for by reason of the increased cost of living, and of the new methods of gas manufacture adopted, which it is stated justify a revision of wages.

Keighley Gas Accounts.—The Keighley Town Council last Tuesday had before them the accounts and report of the Gas Committee for the past financial year. The gross receipts amounted to £17,848; and after making allowance for the payment of all charges, there was a net profit of £9133. Provision was made for the transfer of £6444 to the general district rates, leaving a balance of £2689. This, with £5531 brought forward from last year, made the total surplus £8220. Mr. J. Harrison, the Chairman of the Committee, moved that the transfer to the rates be approved, that £50 be handed over to the Victoria Hospital, and that the surplus balance be carried forward. He pointed out that the net profits had increased by £640, despite a reduction of 1d. per 1000 cubic feet in the price of gas. The Committee hoped, he said, to still further reduce the price. The recommendations were approved.

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Interior Fitting for converting a Coal Fire into a Gas Fire.

An Important Advantage

(quite distinct from its cheerful appearance) that this fire has over the inset fires which are being introduced this season is that it can be fitted without having to remove the existing bottom bars of the interior.

In many styles and sizes.



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WORKS: Gothic Works, EDMONTON, N.; Gothic Ironworks, FALKIRK; and Gothic Works, BIRMINGHAM.
SHOW-ROOMS AND BRANCHES: 25, Princes St., Oxford Circus, W.; 136, Renfield St., GLASGOW; 56, Broad St., BIRMINGHAM;
83, Old Market St., BRISTOL; 13, Whitworth St. West, MANCHESTER; 8, Exchange Place, Donegall St., BELFAST;
333, Queen St., MELBOURNE; and 12, Cunningham Lane, Pitt Street, SYDNEY.

New Catalogues, &c.

We have received from Messrs. Sawyer and Purves the new edition of their catalogue and price list of wet and dry gas-meters. It consists of four sections—the first being devoted to gas-meters; the second, to test holders, governors, and gauges; the third, to main-taps, brass fittings, and gas-fitters' tools; and the fourth, to steam and water fittings, lamps and lamp-columns, and sundries. These are followed by tables and other useful information. The illustrations and particulars of the firm's manufactures occupy about 120 large quarto pages; and they are preceded by views of the works. The book is quite an artistic production. Another catalogue which has just come to hand is that of the New Inverted Incandescent Gas-Lamp Company, Limited, containing illustrations and particulars of the "Nico" inverted incandescent gas-burners, mantles, gas-fittings, arc lamps, and accessories, in great variety. The Bland Light Syndicate have sent us their new season's catalogue, which is very comprehensive. It shows not only the several types of Bland inverted burners, "Blanlite" indoor and outdoor lamps, Bland-Graetzin lamps, and upright and inverted mantles, but a large collection of brackets, pendants, hall-lamps, brass fittings, tools, &c. We have received from Messrs. Robert Boby, Limited, of Upper Thames Street, E.C., an illustrated pamphlet containing particulars of their "Neckar" patent water-softening and boiler mud extracting apparatus, which combines purification of water by filtration with softening by admixture with a reagent, and the automatic removal from the boiler of the deposit produced during the evaporation of the softened water.

Gas-Workers' Wages at Rochdale.—The Works Sub-Committee of the Rochdale Corporation Gas Committee have postponed for a month the consideration of an application made by the Gas-Workers' and General Labourers' Union for advances in pay to various classes of employees engaged at the gas-works.

Gas Exhibition at Airdrie.—A comprehensive exhibition of gas appliances was opened in the Memorial Hall, Airdrie, N.B., on the 13th inst., and proved a source of great attraction to the townspeople, who visited it in large numbers. Some beautiful examples of gas-stoves, the latest types of burners, hot-water heaters, and trade appliances utilizing gas, were shown; the exhibitors being Messrs. Ewart and Co., Messrs. Falk, Stadelmann, and Co., Messrs. Fletcher, Russell, and Co., Messrs. R. & A. Main, Messrs. James Milne and Son, Messrs. Parkinson and W. & B. Cowan, the Richmond Gas Stove and Meter Company, Messrs. J. & W. B. Smith, and Messrs. John Wright and Co. Cookery lectures were given by Miss E. M. Dodds, late Principal of the Dundee School of Cookery, and they drew a large number of ladies; special features of attraction being the demonstrations of paper-bag cookery. Laundry work was done by Misses Bryden and Darling, of Glasgow. So great was the interest shown in the exhibition, that the Gas Committee decided to continue it for three days longer than was originally intended.

Seaford Public Lighting.—At a recent meeting of the Institution of Municipal Engineers, at Lewes and Seaford, Mr. Boyd A. Miller, the Engineer and Surveyor to the Seaford Urban District Council, read a paper on the drainage and sanitary administration of the town. In the course of it he referred to the public lighting, the gas for which is supplied by the Seaford Gas Company, Limited. The District Council have 173 lamp-posts, which were formerly supplied with gas through a meter fixed in each post. There is now a wet meter fixed to 22 of the lamps; and from this the whole are averaged. The Council pay 3s. 10d. per 1000 cubic feet for the gas consumed. The lamps are lighted, cleaned, and repaired by the Council's staff. The Welsbach "C" bye-pass burner, with globe and metal top, is used, owing to the high winds with which the town is visited. Gun-fire controllers are employed in the outlying districts.

A Progressive Lincolnshire Gas Company.—For a small concern making only about 8 million cubic feet of gas per annum, and situated a long distance from the coalfields, the Holbeach Gas Company, Limited, are showing a commendable determination to be progressive. The Chairman (Mr. Robert Merry) has lately circularized the consumers on the subject of obtaining the utmost value for the amount they spend on gas, which can best be done by using incandescent burners. These, however, he points out, must be kept in proper order; and therefore someone has been engaged to call periodically upon the consumers, advise them as to their fittings, and attend to their burners free—charging only for the renewal of mantles, which are supplied by the Company. The new official has been well received by all but some tradespeople who have hitherto done the work. As a further step forward, the Company have reduced the price of gas from 4s. 2d. to 3s. 9d. per 1000 cubic feet, as from the 1st inst.

Bexhill Water and Gas Company.—The report for the half year to June 30, to be presented at the meeting of the Bexhill Water and Gas Company on Thursday., states that the accounts show a balance at the credit of profit and loss, and available for dividend, of £4967. The Directors recommend that a dividend be declared for the six months at the rate of 6 per cent. per annum on the capital of £34,000 authorized by the Acts of 1885 and 1892, and at the rate of £4 4s. per cent. per annum on the capital of £114,570 authorized by the Act of 1896, Order of 1901, and Act of 1904, less income-tax. This, with provision for income-tax, will absorb £3,426, leaving £1541 to be carried forward to the next account. The fact that the Hastings Corporation had deposited a Bill in Parliament which, in the opinion of the Directors, would have seriously affected the Company's rights, was referred to in the last half-yearly report; and it was stated that the Directors had lodged a petition in opposition thereto. This opposition resulted in obtaining for the Company protective clauses of great and permanent advantage. During the past half year, the yield of water from the several sources of supply has continued satisfactory; and the considerably increased demands made upon the resources of the Company, owing to the phenomenal drought during the present summer, have been successfully met.

THE "CANNON" FIRES AGAIN

STILL ANOTHER HIT.

The Improved "IRIS" Gas Fire.

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in Official Smoke Abatement
Tests for Efficiency, 1906.

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DEEPFIELDS, Near BILSTON, Staffs.

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The Reduction in Gas Charges at Radcliffe.—As was stated recently, the Directors of the Radcliffe and Pilkington Gas Company have decided to make a further reduction in the price of gas, to come into force after the inspection of the meters at the end of the current quarter. The following is the scale of net prices that will then obtain, according to the notice issued by Mr. James Braddock, Manager and Secretary to the Company: When the quarterly consumption is under 250,000 cubic feet, 2s. 9d. per 1000 cubic feet; 250,000 feet and under 500,000 feet, 2s. 8d.; 500,000 cubic feet and over, 2s. 7d.; for gas-engines and certain trade purposes, 2s. 4d.; for large users, 2s. 1d. There will also be a reduction in the price of gas supplied through prepayment meters.

Proposed Purchase of the Ashbourne Gas-Works by the District Council.—At an adjourned meeting of the Ashbourne District Council on Monday last week, it was decided that the members should go into committee for the consideration of the gas question, and to hear the opinions of Mr. Woolley, Solicitor, of Derby, and Mr. J. F. Bell, the Engineer of the Derby Gas Company, both of whom were in attendance. Mr. Woolley explained the effect of the Council's opposition to the Ashbourne Gas Company's Bill, and answered questions bearing upon the proposed purchase of their undertaking. Mr. Bell said he had visited the gas-works that day, and also replied to several interrogations put by the members. On the Council resuming as an ordinary meeting, it was proposed that proper notice be issued, under the Borough Funds Act, 1872, calling a Council meeting for the purpose of passing a resolution to deposit a Bill in Parliament for the purchase of the business of the Company.

The Directors of the Monte Video Water-Works Company, Limited, have declared an interim dividend of 6 per cent. per annum, tax free, on the 37,500 old shares, for the half year ended the 30th of June.

The assessment of the Coventry Corporation gas undertaking for poor and district rate purposes has just been increased by £1000. The Gas Committee have decided that no objection shall be raised to the higher figure.

The Directors of the Consolidated Water-Works Company of Rosario, Limited, have declared an interim dividend of 6 per cent. per annum, free of tax, on the 25,000 old ordinary shares, for the half year ended the 30th of June.

One of the results of the strike at the Lancashire and Yorkshire Railway Company's works at Horwich has been that gas is being installed at the Railway Institute there, to take the place of the electric light, the current for which was supplied from the works.

The Burgess Hill Urban District Council have decided to support the local Water Company in their opposition to the scheme of small holdings now being promoted by the East Sussex County Council; danger being apprehended as to the pollution of the water supply from Whitelands, Ditchling.

The Coventry Corporation have applied to the Local Government Board for their sanction to a loan of £10,000 for extensions of water-mains. The Board have authorized the raising of £6000, repayable in thirty years; this sum being the amount estimated, on the basis of past expenditure, to be required for the next three years.

An application has been made by some of the workmen of the Hebden Bridge and Mytholmroyd Gas Board asking for a full week's holiday and pay in each year, and cessation of work at 12 o'clock noon on Saturdays, instead of 1 o'clock as heretofore. The Manager was asked to make inquiries as to what other companies and corporations are doing in the matter.

The profits of the Glenboig Union Fire-Clay Company, Limited, including £1749 brought in, amount to £27,347. The Directors recommend that £4000 should be set aside for depreciation, £3000 written off the cost of new electric plant, and a dividend of 10 per cent., together with a bonus of 2½ per cent., paid, both free of tax—leaving £1597 to be carried forward.

The Society of British Gas Industries met on Little Aston Golf Course, Birmingham, on Friday, the 15th inst., by invitation of the Chairman of the Council (Mr. H. James Yates), to take part in a golf competition for a large silver cup presented by Mr. Yates to the members of the Society. There was a good attendance of members; and a very enjoyable time was spent on the links—the members being entertained to luncheon by Mr. Yates at the Golf Club House. The cup, which was won by Mr. P. B. de Clegg Mellor (of Messrs. John Hall and Co., Limited, of Stourbridge), is to be competed for annually. Mr. Mellor has invited the members to play the competition next year on his links at Stourbridge.

We learn from the "Financial News" that at the recent meeting of the Directors of the Mannesmann Roehren Werke, the balance-sheet for the year ended June 30 last, was presented. The returns of the German works showed an increase from 37,763,587 marks to 46,216,669 marks; while the total returns of all works at home and abroad belonging to the Mannesmann concern amounted to 72,136,787 marks, compared with 61,921,373 marks last year. Of the net profit—3,831,271 marks against 3,944,461 marks (the sum brought forward not included)—191,562 marks will be placed to a second reserve which is to be formed, 2,812,500 marks will be paid as a dividend of 12½ per cent. on the old shares, and 468,750 marks as a dividend of 6¼ per cent. on the new shares. The sum carried forward to next year's accounts is 808,014 marks. The prospects for the new year were stated to be favourable.

In the last number of the "JOURNAL" (p. 761), reference was made to a successful exhibition of gas cooking and heating appliances which had been held in the Town Hall, Burton-on-Trent. In connection with it, cookery demonstrations were given by Miss E. M. Smith, who, as already stated in our columns, has been engaged by the Gas Committee of the Corporation specially for this purpose. At the close of one of the demonstrations, a suggestion was made that a brief *résumé* of the lectures would be useful to ladies who had not always been able to see and hear all that was going on, as well as to others who had been prevented from getting to the Town Hall. In compliance with this suggestion, Miss Smith prepared some useful notes on "How to Use a Gas Cooking-Stove to the Best Advantage;" and they appeared in the "Burton Evening Gazette" last Wednesday. They occupy nearly a column, and include not only hints as to properly using a gas-stove, but remarks on paper-bag cookery, recipes for afternoon tea scones, milk rolls, and maids of honour—of much use in the household.

GAS COMPANIES' STOCK AND SHARE LIST.

Referred to on p. 794.

Issue.	Share.	When Dividend.	Dividend or Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.	Issue.	Share.	When Dividend.	Dividend or Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.
£			p.c.				£ s. d.	£			p.c.				£ s. d.
1,551,868	Stk.	Apl. 12	5	Alliance & Dublin Ord.	81—84	..	5 19 1	200,242	Stk.	Aug. 31	6	Lea Bridge Ord. 5 p.c.	118—120	..	5 0 0
374,000	Stk.	July 14	4	Do. 4 p.c. Deb.	93—95	..	4 4 3	561,000	Stk.	Aug. 16	10	Liverpool United A.	212—214	+2	4 13 6
250,000	5	May 12	7	Bombay, Ltd.	64—65	..	5 3 8	718,100	"	"	7	Do. B.	162—164	+½	4 5 4
50,000	10	Aug. 31	15	Bourne-) 10 p.c. . .	28½—29½	..	5 1 8	306,083	"	June 30	4	Do. Deb. Stk.	102—104	..	3 16 11
311,810	10	"	7	mouth Gas } B 7 p.c. .	164—165	..	4 3 7	75,000	"	June 15	6	Malta & Mediterranean	4½—5	..	6 0 0
75,000	10	"	6	and Water } Pref. 6 p.c.	144—145	..	4 1 4	560,000	100	Apl. 1	5	Met. of } 5 p.c. Deb.	101—103	..	4 17 1
380,000	Stk.	Aug. 16	13	Brentford Consolidated	256—261	..	4 19 7	250,000	100	"	4½	Melbourne } 4½ p.c. Deb.	101—103	..	4 7 5
330,000	"	"	10	Do. New . . .	198—203	..	4 18 6	541,920	20	May 31	3½	Monte Video, Ltd.	123½—13½	..	5 5 8
50,000	"	"	5	Do. 5 p.c. Pref.	120—122	..	4 2 0	1,775,892	Stk.	July 28	4½	Newcastle & Gt. Tesh'd Con.	103—105	..	4 3 4
206,250	"	June 15	4	Do. 4 p.c. Deb.	97—99	..	4 0 10	529,705	Stk.	June 30	3½	Do. 3½ p.c. Deb.	87—89	..	3 18 8
220,000	Stk.	Aug. 31	11	Brighton & Hove Orig.	216—221	..	4 19 7	55,940	10	Aug. 31	7/70	North Middlesex 7 p.c.	143½—15½	..	4 10 4
246,320	"	"	8	Do. A Ord. Stk.	156—159	..	5 0 8	300,000	Stk.	Apl. 27	8	Oriental, Ltd.	138—140	..	5 14 4
490,000	"	Apl. 12	12½†	British . . .	45½—46½	—½	5 7 6	60,000	5	Apl. 12	8	Ottoman, Ltd.	63—74	..	5 10 4
120,000	Stk.	June 30	4	Do. 4 p.c. Deb. Stk.	94—96	..	4 3 4	31,800	53	Aug. 16	13	Portsea Island A	132—136	..	5 1 0
109,000	"	Aug. 16	6	Bromley, A 5 p.c. . .	115—120	..	5 0 0	60,000	50	"	13	Do. B	122—125	..	5 4 0
165,700	"	"	4½	Do. B 3½ p.c. . .	85—90	..	5 0 0	100,000	50	"	12	Do. C	117—122	..	4 18 4
82,278	"	"	5½	Do. C 5 p.c. . .	105—110	..	5 0 0	398,490	5	May 31	8	Primitiva Ord.	74—75	..	5 6 8
55,000	"	June 30	3½	Do. C 5 p.c. Deb.	82—84	..	4 3 4	796,980	5	June 30	5	Do. 5 p.c. Pref.	5½—5½	—½	4 11 1
250,000	Stk.	"	4	Buenos Ayres 4 p.c. Deb.	95—97	..	4 2 6	488,900	100	June 1	4	Do. 4 p.c. Deb.	97—99	..	4 0 10
100,000	10	"	—	Cape Town & Dis., Ltd.	2—3	..	—	312,650	Stk.	June 30	4	River Plate 4 p.c. Deb.	95—97	..	4 2 6
100,000	10	"	—	Do. 4½ p.c. Pref.	4—5	..	—	250,000	10	Mar. 24	12†	San Paulo, Ltd.	21½—22½	..	5 6 8
100,000	Stk.	June 30	4½	Do. 4½ p.c. Deb. Stk.	80—83	..	5 8 5	115,000	10	"	6	Do. 6 p.c. Pref.	12—12½	..	4 16 0
157,150	Stk.	Aug. 16	5	Chester 5 p.c. Ord.	107—109	..	4 11 9	125,000	50	July 1	5	Do. 5 p.c. Deb.	50—51	..	4 18 0
1,513,280	Stk.	"	5/9/4	Commercial 4 p.c. Stk.	111½—113½	..	4 16 1	135,000	Stk.	Aug. 31	10	Sheffield A	237—239	+2	4 3 8
560,000	"	"	5½	Do. 3½ p.c. do.	105½—107½	..	4 19 3	209,984	"	"	10	Do. B	237—239	+2	4 3 8
475,000	"	June 15	3	Do. 3 p.c. Deb. Stk.	76—78	..	3 16 11	523,500	"	"	10	Do. C	235—237	..	4 4 5
800,000	Stk.	May 31	4	Continental Union, Ltd.	86—90	..	4 8 11	70,000	10	June 15	7	South African	8½—9½	..	7 7 4
200,000	"	"	7	Do. 7 p.c. Pref.	135—137	..	5 2 2	6,429,895	Stk.	Aug. 16	5/9/4	South Met., 4 p.c. Ord.	116—118	..	4 12 8
492,270	Stk.	"	5½	Derby Con. Stk.	122—124	..	4 8 9	1,895,445	"	July 14	3	Do. 3 p.c. Deb.	78½—80½	..	3 14 6
55,000	"	"	4	Do. Deb. Stk.	104—105	..	3 16 2	209,820	Stk.	Aug. 16	8½	South Shields Con. Stk.	150—152	..	5 11 10
840,150	10	July 28	10	European, Ltd.	183—193	..	5 2 7	605,000	Stk.	"	5	S'th Suburb'n Ord. 5 p.c.	173½—179½	..	4 14 9
16,160,600	Stk.	Aug. 16	4/14/8	Gas-) 4 p.c. Ord. . .	106—107	..	4 8 5	60,000	"	"	5	Do. 5 p.c. Pref.	115½—117½	..	4 5 1
2,600,000	"	"	3½	light } 3½ p.c. max. . .	83—85	..	4 2 4	117,058	"	July 14	5	Do. 5 p.c. Deb. Stk.	121—123	..	4 1 4
4,062,235	"	"	4	and } 4 p.c. Con. Pref.	101—103	..	3 17 8	502,310	Stk.	May 12	5	Southampton Ord.	108—110	..	4 10 11
4,531,705	"	June 15	3	Coke } 3 p.c. Con. Deb.	79—81	..	3 14 1	120,000	Stk.	Aug. 16	7½	Tottenham } A 5 p.c. .	145—148	..	4 16 3
258,740	Stk.	Sept. 14	5	Hastings & St. L. 3½ p.c.	94—96*	..	5 4 2	483,940	"	"	5½	and } B 3½ p.c. .	115—117	+1	4 16 1
82,500	"	"	6½	Do. do. 5 p.c.	—	..	—	149,470	"	June 15	4	Edmonton } 4 p.c. Deb.	96—98	..	4 1 8
70,000	10	Apl. 27	11	Hongkong & China, Ltd.	17½—18	..	6 2 2	182,880	10	June 15	8	Tuscan, Ltd.	87—94	..	8 13 0
131,000	Stk.	Sept. 14	7½	Ilford A and C . . .	147—150*	..	5 0 0	149,900	10	July 1	5	Do. 5 p.c. Deb. Red.	96—98	..	5 2 0
65,780	"	"	6	Do. B . . .	120—123*	+1½	4 17 7	236,476	Stk.	Aug. 16	5	Tynemouth, 5 p.c. max.	113—115	..	4 6 11
65,500	"	June 30	4	Do. 4 p.c. Deb. . .	94—96	..	4 3 4	255,636	Stk.	Aug. 31	6½	Wands- } B 3½ p.c. .	142—145	..	4 14 10
4,940,000	Stk.	May 12	9	Imperial Continental	180—183	..	4 18 4	85,766	"	June 30	3	worth } 3 p.c. Deb. Stk.	71—73	..	4 2 2
1,235,000	Stk.	Aug. 16	3½	Do. 3½ p.c. Deb. Red.	90—92	..	3 16 1								

Prices marked * are "Ex. div."

† Next dividend will be at this rate.

TAR PRODUCTS PRICES.

Representative manufacturers give the following as fair current values for the week ending Sept. 23. Prices are net, and they include the usual packages and delivery f.o.b., f.a.s., or f.o.r., as customary.

Article.	Basis.	London.	North-East Coast.	East Coast, Yorks.	West Coast.		Glasgow.
					Liverpool.	Manchester.	
Tar, crude	per ton	—	20/- 25/6	21/- 25/-	—	21/- 25/-	—
Pitch	"	42/6	40/-	40/-	40/-	39/6	40/-
Benzol, 90%	per gallon	1/-	-/10	-/9½	-/9½	-/9½	-/9½
Benzol, 50-90%	"	—	-/10	-/9	—	-/9	-/9½
Toluol, 90%	"	—	-/10 -/10½	-/9	-/10	-/10	-/10
Crude naphtha, 30%	"	—	-/4½	-/3¾	-/3¾	-/3¾	—
Light oil, 50%	"	—	-/3½	-/3½ -/3¾	-/3½	-/3½ -/3¾	—
Solvent naphtha, 90-160	"	—	-/10 -/10½	-/10	-/10	-/10	-/11
Heavy naphtha, 90-190	"	—	-/11	-/11	-/11½	-/11½	-/11
Creosote in bulk	"	-/2¾ -/2½	-/2½	-/2½	-/2½	-/2½	-/2
Heavy oils.	"	—	-/2½ -/2½	-/2½	-/2½	-/2½	-/2½
Carbolic acid, 60's.	"	2/4	2/2	2/3	—	2/1	2/2
Naphthalene, crude drained salts	per ton	—	43/9	42/6	47/6	47/6 50/-	—
" pressed	"	—	60/-	63/-	60/-	60/- 72/6	—
" whizzed.	"	—	—	—	70/- 72/6	65/- 75/-	62/6
Anthracene	per unit	-/2	-/1½	-/1½	-/1½	-/1½	—

WANTED, FOR SALE, CONTRACTS, &c., ADVERTISEMENTS IN THIS WEEK'S "JOURNAL."

Appointments Vacant.

GAS ENGINEER (as Representative). No. 5441.
MANAGER (Chili). No. 5453.
ASSISTANT CHEMIST. No. 5447.
DISTRIBUTION DEPARTMENT. No. 5445.
GAS-FITTERS. Bolton Corporation Gas-Fittings Department.
TRAVELLER OR REPRESENTATIVE. "J." 41, Ashford Road, Cricklewood.

Appointments Wanted.

CHEMICAL PLUMBER. No. 5450, c/o Mr. King, 11, Bolt Court, Fleet Street, E.C.
EXPERIENCED ORGANIZER, &c. No. 5451.

Agencies Wanted.

BY ENGINEER AND ENGINEERING FIRMS. No. 5446, No. 5449, and No. 5452.

Plant, &c. (Second-Hand), for Sale.

EXHAUSTER, &c., AND TAR-EXTRACTOR. Mr. J. Hawksley, Great Yarmouth.
INCANDESCENT LAMPS, &c. Paragon Works, Shepherd's Bush.
PURIFIERS, &c. W. J. Jenkins and Co., Retford.

Plant, &c. (Second-Hand), Wanted.

GASHOLDER, &c. No. 5448.

Factory to Let (London).

Box 6414, c/o Willings.

Stocks and Shares.

ANNFIELD PLAIN GAS COMPANY. By Auction. Oct. 5.
DARTFORD GAS COMPANY. By Auction. Oct. 3.
EAST GRINSTEAD GAS AND WATER COMPANY. By Auction. Oct. 3.

SOUTH KENT WATER COMPANY. By Auction. Oct. 3.
SOUTHEND WATER-WORKS COMPANY. By Auction. Oct. 3.
WOKING WATER AND GAS COMPANY. By Auction. Oct. 17.
WORTHING GASLIGHT AND COKE COMPANY. By Auction. Oct. 17.

TENDERS FOR

Oxide.

SALFORD GAS DEPARTMENT.

Storage Hoppers, Conveyors, Generating Plant for Stoking Machinery, and Alterations, &c.

PERTH GAS DEPARTMENT. Tenders by Oct. 14.

Sulphuric Acid.

LEICESTER GAS DEPARTMENT. Tenders by Oct. 7.

NOTICES TO CORRESPONDENTS, ADVERTISERS, AND SUBSCRIBERS.

No notice can be taken of anonymous communications. Whatever is intended for insertion in the "JOURNAL" must be authenticated by the name and address of the writer; not necessarily for publication, but as a proof of good faith.

COPY FOR ADVERTISEMENTS for the "JOURNAL" should be received at the Office NOT LATER than TWELVE O'CLOCK NOON ON MONDAY, to ensure insertion in the following day's issue.

Orders for Alterations in, or stoppages of, PERMANENT ADVERTISEMENTS should be received by the FIRST POST on SATURDAY.

Wanted, For Sale, and Tender Advertisements, Six Lines and under, 3s.; each additional Line, 6d.

TERMS OF SUBSCRIPTION to the "JOURNAL."

United Kingdom: One Year, 21s.; Half Year, 10s. 6d.; Quarter, 6s. 6d.

Payable in advance. If credit is taken, the charge is 25s. a year.

Abroad (In the Postal Union): £1 7s. 6d., payable in advance.

All Communications, Remittances, &c., to be addressed to
WALTER KING, 11, BOLT COURT, FLEET STREET, LONDON, E.C.
Telegrams: "GASKING, LONDON." Telephone: P.O. 1571a Central.

OXIDE OF IRON.

O'NEILL'S OXIDE

For GAS PURIFICATION.

LARGEST SALE OF ANY OXIDE.

SPENT OXIDE PURCHASED IN ANY DISTRICT.

GAS PURIFICATION & CHEMICAL CO., LD.,
PALMERSTON HOUSE,
OLD BROAD STREET, LONDON, E.C.

WINKELMANN'S

"VOLCANIC" FIRE CEMENT.

Resists 4500° Fahr. Best for GAS-WORKS.

ANDREW STEPHENSON, 182, Palmerston House, Old Broad Street, LONDON, E.C. "Volcanism, London."

TAR WANTED.

THOMAS HORROCKS & SONS, LTD.,

Albert Chemical Works, BRADFORD,
MANCHESTER.

Pitch, Creosote, Brick and Fuel Oils, Benzol, Solvent Naphtha, Carbolic, Sulphate of Ammonia.

J. & J. BRADDOCK (Branch of Meters Limited), Globe Meter Works, Oldham, and 45 & 47, Westminster Bridge Road, LONDON, S.E.
WET AND DRY GAS-METERS, PREPAYMENT METERS, STATION METERS, AND GOVERNORS.
REPAIRS RECEIVE PROMPT ATTENTION.

Telephones: 815 Oldham, and 2412 Hop, London.

Telegrams—

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OXIDE OF IRON (BOG ORE)

ANY QUANTITY. ANY PORT. ANY STATION.

DONALD M'INTOSH,

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DUTCH OXIDE OF IRON.

SPENT OXIDE PURCHASED IN ANY DISTRICT.

THE First Dutch Bogore Co., Ltd.,
NYMEGEN, HOLLAND.

General Manager (for England and Wales)—

W. T. P. CUNNINGHAM,

71, Arcadian Gardens, Wood Green, LONDON, N.

General Manager (for Scotland)—

J. B. MACDERMOTT, 11, Bothwell St., GLASGOW.

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SPENT OXIDE PURCHASED.

BALE'S FIRE CEMENT.

PAINT FOR GAS-WORKS.

"KLEENOFF," THE COOKER CLEANER.

BALE & CHURCH, LTD.,

5, CROOKED LANE, LONDON, E.C.

SULPHURIC ACID.

SPECIALLY prepared for the Manufacture of SULPHATE OF AMMONIA.

SPENCER CHAPMAN & MESSEL, LTD.,

with which is amalgamated WM. PEARCE & SONS, LTD.

36, Mark Lane, LONDON, E.C. Works: SILVERTOWN.

Telegrams: "HYDROCHLORIC, LONDON."

Telephone: 1588 AVENUE (3 lines).

D. ANDERSON AND COMPANY,

GAS LIGHTING ENGINEERS AND CONTRACTORS,

18 & 20, FARRINGTON ROAD, LONDON, E.C.

Telegrams:

Telephone:

"DACOLIGHT LONDON."

2336 HOLBORN.

ROBERT DEMPSTER & SONS, Ltd.,
Contractors for Complete CARBONIZING PLANTS and every description of GAS APPARATUS, ELEVATING, CONVEYING, and TELPHERAGE PLANTS, also STOKING MACHINERY, ROSE MOUNT IRON-WORKS, ELLAND.

SULPHURIC ACID.

SPECIALLY prepared for Sulphate of AMMONIA Makers by

CHANCE AND HUNT, LIMITED,

Works: OLDBURY, WENNESBURY, AND STAFFORD.

Address Correspondence and Inquiries to OLDBURY, WORCS.

Telegrams: "CHEMICALS, OLDBURY."

SPENCER'S PATENT HURDLE GRIDS.

THE very best Patent Grids for Holding Oxide Lightly.

See Illustrated Advertisement, Aug. 1, p. 325.

AMMONIA Waste Liquor Disposal.

Purification Plant.

Results Guaranteed. No Working Costs.

JOHN RADCLIFFE, Chemical Engineer, EAST BARNET.

ENQUIRIES SOLICITED.

FOR Gas-Works Plant of Every Description; also SULPHATE OF AMMONIA and SULPHUR RECOVERY PLANTS,

C. & W. WALKER, LIMITED,

DONNINGTON, NEWPORT, SALOP.

JOHN RILEY & SONS, Chemical Manu-facturers, Hapton, near Accrington, are MAKERS of Special SULPHURIC ACID, for Sulphate of Ammonia Making. Highest percentage of Sulphate of Ammonia obtained from the use of this Vitriol, which has now been used for upwards of 50 years. References given to Gas Companies.

GAS PLANT for Sale—We can always offer NEW and SECOND-HAND GAS APPARATUS, including Retorts and Fittings, Condensers, Exhausters, Scrubbers, Washers, Purifiers, Gasholders, Tanks, Valves, Connections, &c. Also a few COMPLETE WORKS. Compare Prices and Particulars before ordering elsewhere.

FIRTH BLAKELEY, SONS, AND COMPANY, LIMITED, Church Fenton, near LEENS.

"GUIDE to Patents, Trade Marks and DESIGNS," 1910. 4th Edition. Contains concise information on British, Colonial, and Foreign Patents, &c. All Inventors and those interested should send for free copy to J. S. WITHERS & SPOONER, Chartered Patent Agents, 323, High Holborn, LONDON. "Phone: 480 HOLBORN. Telegrams: "Improvably, London."

BROTHERTON & CO., LIMITED.

Offices: City Chambers, LEENS. Correspondence invited.

AMMONIA.

Consumers in any form are invited to correspond with CHANCE AND HUNT, LTD., Chemical Manufacturers, OLDBURY, WORCS.

GAS-WORKS requiring Extensions should Communicate with FIRTH BLAKELEY, SONS, AND CO., LIMITED, Dewsbury, who make a Speciality of Catering for the Smaller Gas Concerns. Prices Reasonable; quality and results, the best. Satisfaction Guaranteed.

SULPHURIC ACID—Specially prepared for Sulphate of AMMONIA and BENZOL Recovery Plants. JOHN NICHOLSON & SONS, LTD., Hunslet Chemical Works, LEENS. Tele. : "NICHOLSON, LEENS." Telephone : (Two lines), Nos. 2420 and 2421.

AMMONIACAL Liquor wanted.

CHANCE AND HUNT, LTD., Chemical Manufacturers, OLDBURY, WORCS. Telegrams: "CHEMICALS."

SULPHURIC ACID for Sale, specially suitable for making Sulphate of Ammonia. BROTHERTON AND CO., LTD., Chemical Manufacturers. Works: BIRMINGHAM, LEENS, SUNDERLAND, and WAKEFIELD.

WANTED—Tar and Ammoniacal Liquor. Any Quantity. GRINDLEY AND COMPANY, LIMITED, Rawcliffe, near Goole, YORKSHIRE.

AMMONIACAL Liquor wanted.

BROTHERTON AND CO., LTD., Ammonia Distillers. Works: BIRMINGHAM, GLASGOW, LEEDS, LIVERPOOL, SUNDERLAND, AND WAKEFIELD.

HYDRATED OXIDE OF IRON.

PREPARED from Pure Iron.

Twice as rich as Bog Ore.

Gives no back Pressure.

The Cheapest in the Market.

READ HOLLINAY AND SONS, LTD., HUDDERSFIELD.

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BROTHERTON AND CO., LTD., Tar Distillers. Works: BIRMINGHAM, GLASGOW, LEENS, LIVERPOOL, SUNDERLAND, AND WAKEFIELD.

J. E. C. LORD, Ship Canal Tar-Works, Weaste, Manchester. Pitch, Creosote, Benzols, Toluol, Naphtha, Pyridine, all kinds of Cresylic Acid, Carbolic Acid, Sulphate of Ammonia, &c.

"GAZINE" (Registered in England and Abroad). A radical Solvent and Preventative of Naphthalene Deposits, and for the Automatic Cleaning of Mains and Services.

It is also used for the enrichment of Gas.

Manufactured and supplied by C. BOURNE, West Moor Chemical Works, KILLINGWORTH, or through his Agent, F. J. NICOL, Pilgrim House, NEWCASTLE-ON-TYNE.

Telegrams: "DORIO," Newcastle-on-Tyne. National Telephone No. 2497.

PATENTS AND TRADE MARKS

PUBLICATIONS, "MERCHANDISE MARKS ACT, and Decisions thereunder," 1s.; "TRADE SECRETS v. PATENTS," 5d.; "DOCTRINE of EQUIVALENTS, Mechanical and Chemical," 6d. "SUBJECT-MATTER of PATENTS," 6d.

MEWBURN, ELLIS, & PRYOR, Chartered Patent Agents, 70 & 72, Chancery Lane, London, W.C. Telegrams: "Patent London." Telephone: No. 243 Holborn.

SULPHATE OF AMMONIA

SATURATORS and all LEAD and TIMBER WORK in Connection with Sulphate Plants.

We guarantee promptness with efficiency for Repairs.

JOSEPH TAYLOR AND CO., CENTRAL PLUMBING WORKS, BOLTON.

Telegrams: "SATURATORS, BOLTON." Telephone 0848.

FOR Instructions on Polishing and

Cleaning Gas-Cookers and Gas-Fittings, read Canning Handbook on Polishing, Electro-Plating, and Lacquering. Fully illustrated. Price 2s. 3d., post free; abroad, 2s. 6d.

W. CANNING AND CO., BIRMINGHAM, and 18 to 20, St. John's Square, Clerkenwell, LONDON, E.C.

IMPERIAL COLLEGE OF SCIENCE AND TECHNOLOGY,

South Kensington, London, S.W.,

INCLUDING

ROYAL COLLEGE OF SCIENCE,

ROYAL SCHOOL OF MINES, AND

CITY & GUILDS (ENGINEERING) COLLEGE.

A SPECIAL Course of Advanced Lec-

tures as follows will begin during October next:— Subject:

"Gaseous Fuel and Combustion,"

Conducted by

Professor W. A. BONE, D.Sc., Ph.D., F.R.S.

Particulars of this and other Courses to follow Free on Application to the Secretary.

UNIVERSITY OF LEEDS.

DEPARTMENTS OF COAL GAS, FUEL, AND METALLURGY, AND ELECTRICAL, CIVIL, MECHANICAL, AND MINING ENGINEERING.

THE Work of these Departments is carried on in separate Blocks of Buildings specially equipped for Systematic Instruction.

Prospectus may be had Free on Application from the Registrar.

The next Session begins on Oct. 3, on which day the Entrance Examination will be held at Ten a.m. and Two p.m.

THE

Sir John Cass Technical Institute,

JEWRY STREET, ALDGATE, E.C.

Principal:

CHARLES A. KEANE, D.Sc., Ph.D., F.I.C.

The following Special Courses of Instruction will be given during the Autumn and Lent Terms, 1911-12:—

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By WESLEY J. LAMBERT, Assoc.Inst.C.E.

(Chief Metallurgist, Royal Gun Factory, Woolwich Arsenal.)

A Course of 24 Lectures followed by suitable practical work commencing **Thursday, October 5, 1911.**

LIQUID, GASEOUS AND SOLID FUEL.

By J. S. BRAME.

(Lecturer on Chemistry at the Royal Naval College, Greenwich.)

A Course of 20 Lectures, Monday Evenings, 7 to 8. Commencing **Monday, October, 16, 1911.**

These Courses of Instruction are arranged to meet the requirements of those engaged in Chemical and Engineering Works, or who are concerned with the use of Fuel as a Motive Power.

Detailed Syllabus of the Courses may be had upon Application at the Office of the Institute or by letter to the **Principal.**

CITY AND GUILDS TECHNICAL COLLEGE, FINSBURY.

(Leonard Street, City Road, E.C.)

EVENING LECTURES.

AN Inaugural Lecture on "Gyroscopes and the Gyro-Compass" will be given on October 3rd, at 8 p.m. Admission free. The chair will be taken by Mr. S. W. LUARN, Joint Honorary Secretary of the Institute.

"The Calorimetry of Fuels."

A Special Course of Six Lectures on "The Calorimetry of Fuels" will be given by Messrs. J. H. COSTE, F.I.C., and E. R. ANDREWS, F.I.C., on Wednesday Evenings from 8 to 9 p.m., commencing on Oct. 4.

In connection with this Course of Lectures a series of Demonstrations on Fuel Analysis will be given by Mr. B. R. JAMES, F.I.C., in the Engineering Laboratory on Tuesday evenings from 6 to 8 p.m., commencing on Oct. 10.

FEE FOR THE COURSE, 6s.

For further Particulars of this Special Course, and Information Respecting the Day and Evening Classes at the College, Apply to the REGISTRAR, City and Guilds Technical College, Leonard Street, FINSBURY, E.C.

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Temporary Offices:

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Correspondence Classes are about to resume. Instruction private, individual, and thorough. Courses and results better than ever.

Address, 11, Avondale Place, Halifax.

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passes and 8 medals during the past Five years, in Gas Engineering. Classes for 1912 Exams, now working. Illustrated Lectures. Low Fees. Write for our new Gas Engineering Calendar, post free.

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THE Longridge Gas Company, Ltd.,

THANK the Applicants for the Position of GAS MANAGER and SECRETARY, and announce that the same is now FILLED.

CHEMICAL Plumber and Leadburner,

Thoroughly Practical in all branches and the Erection of Towers, Chambers, Tanks, Acids, and Sulphate of Ammonia Plants. Can Take Charge. References from Leading Firms. (Any distance).

Address No. 5450, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

SOLE Agency Wanted for a First Class

Speciality for Gas-Works, by a Firm of Engineers in London having a Valuable and Extensive Connection with Gas-Works.

Full Particulars should be sent to No. 5446, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

GENTLEMAN. Experienced in Organi-

zation, Management and Accounts of large Concerns, Thorough Knowledge of Gas, its Appliances and Uses, and of Allied Trades, is open for APPOINTMENT. Address, No. 5451, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

A BIG profit for Agents.—Agents

wanted to make good money selling "Frugals"—the wonderful gas-savers. Every private and business house needs them; liberal Profits. Write at once for Terms and Particulars. LEFTWICH & Co., Gas Lighting Dept., 34, James Street, Camden Town, LONDON, N.W.

MANAGER wanted for an 8-Million

Gas-Works in Chili. Healthy climate.

Commencing Salary, £250 per Annum. House, Coal, and Gas, and Second-Class passage free for self and family. Must have had Charge of Works and Distribution. None but Energetic, Pushing Young Men need Apply.

Apply, by letter, giving Particulars of Experience, Age, &c., stating if married, to No. 5453, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

ENGINEER, about to take up Sole

Agency in Birmingham district for a well-known Firm of Gas Engineers, requires one or two additional AGENCIES.

Address, in confidence, No. 5452, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

WANTED, a Gas Engineer, of Good

Address, to introduce a new Process to Gas Managers. Must be a good Chemist, Energetic, and well acquainted with Gas-Works Practice. A suitable Man will be well paid.

Apply, by letter, stating Age, Experience, and when at liberty, to No. 5441, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

TRAVELLER or Representative

required for entirely New and Startling GAS SIGN producing all the Mechanical Change Effects produced by Electricity. Positive proof of intimate knowledge and past Extensive Business with Gas Companies essential.

Address, J., 41, Ashford Road, Cricklewood, LONDON.

BOLTON CORPORATION GAS-FITTINGS DEPARTMENT.

WANTED, Two or Three good all-round GAS-FITTERS. Must be accustomed both to Iron and Compo. Fixing. Wages, 8½d. to 9½d. per hour. None but specially good men need Apply. Applicants must state Age.

Applications, together with Testimonials, to be addressed to the undersigned.

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WANTED, at once, a Young Man for the DISTRIBUTION DEPARTMENT of large Gas-Works near London. Must be of Good Address, and have a thorough Technical Knowledge of Outdoor Work.
Apply, by letter, stating Age, Salary required, &c., to No. 5445, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

ASSISTANT Chemist required. Must be Experienced and Accurate in Analysis of Inorganic Materials, Gas and Bye-Products, and familiar with the routine Tests of a Gas-Works. Salary, £100 per Annum.
Apply, stating Age, Qualifications, and Experience, to No. 5447, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

AN Engineering Firm, having a Valuable Connection in Lancashire and Yorkshire, with Offices in Manchester, is desirous of securing one or two First-Class British or Foreign AGENCIES.
Address, No. 5449, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

STRONGLY Built Factory, Stone Staircase, Three Good Floors 2000 Sup. Ft. each, Flat Roof, Crane, Steam Power. Premises easily adapted. Located just off Golden Lane, E.C., 7 or 14 years' lease.
Address S., Box 6414, WILLINGS, 125, Strand, W.C.

GASHOLDER wanted, Second-Hand, with or without Steel Tank. Capacity, about 12,000 Cubic Feet.
Offers, stating full Particulars and Prices, to No. 5448, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

FOR SALE.—Incandescent Lamps. Ten Powerful Exterior, and 100 Interior GAS PENDANTS.
Apply PARAGON WORKS, 131, Uxbridge Road, SHEPHERD'S BUSH.

GAS-EXHAUSTER FOR SALE.

FOR SALE.—A Gas-Exhauster with Steam-Engine complete. Made by Messrs. Gwynne & Co., of Essex Street, Strand, in 1874, designed to pass 21,000 Cubic Feet per hour, at a speed of 100 revolutions per minute.
The Exhauster has recently been overhauled and is in good order and can be inspected at the Lowestoft Gas-Works by Appointment with Mr. JOSEPH HAWKLEY, of 2, York Road, GREAT YARMOUTH, to whom Offers should be addressed.

FOR SALE—Two new 12 feet Square Water Lute PURIFIERS, complete with Grids, Covers, Valves, Connections, and Lid Lifting Gear. In Stock.
For further Particulars Apply to W. J. JENKINS & Co., LIMITED, Beehive Works, RETFORD.

PERTH TOWN COUNCIL. (GAS DEPARTMENT.)

THE Perth Town Council invite TENDERS for OVERHEAD COAL STORAGE HOPPERS, CONVEYORS, CAPSTANS, and ELECTRIC GENERATING PLANT for STOKING MACHINERY, also ALTERATION and EXTENSION of existing COAL ELEVATOR and HOIST.

Drawings may be seen, and copies of Specifications, Schedules, and Form of Tender, obtained, on Application to W. B. M'Luskv, Engineer, Gas Department, Perth.
Tenders, sealed and endorsed "Contract —" to be lodged with the undersigned on or before Oct. 14 next.

The Town Council shall not be bound to accept the lowest or any offer, and reserve to themselves the right to let the various works to one or more Contractors.

JOHN BEGG,
Town Clerk.

City Chambers, Perth,
Sept. 22, 1911.

COUNTY BOROUGH OF SALFORD. (GAS DEPARTMENT.)

THE Gas Committee invite Tenders for the Purchase of about 2000 Tons of SPENT OXIDE.

Full Particulars may be obtained on Application to Mr. WILLIAM W. WOODWARD, Engineer, Gas Offices, Bloom Street, SALFORD.

CORPORATION OF LEICESTER. (GAS DEPARTMENT.)

SULPHURIC ACID.

THE Gas Committee of the Leicester Corporation are prepared to receive TENDERS for the Supply of SULPHURIC ACID, made from either native Sicilian Brimstone, Recovered Sulphur, or Pyrites. Specific Gravity in each case to be stated. The Price to include Free Delivery by Rail into elevated Tanks, 27 feet high, at the Chemical Works, Aylestone Road, Leicester.

Probable quantity, about 2000 Tons, to be Delivered during the ensuing Twelve Months.

Tenders, addressed to Mr. Alderman T. Smith, J.P., Chairman, and endorsed "Tender for Sulphuric Acid," to be Delivered at these Offices not later than Eleven o'clock a.m. on Saturday, Oct. 7, 1911.

The Committee do not bind themselves to accept the lowest or any Tender.

HUBERT POOLEY, Assoc. M.Inst. C.E.
Engineer and Manager.

Gas Offices, Millstone Lane,
Leicester, Sept. 19, 1911.

SALES BY AUCTION OF GAS AND WATER STOCKS AND SHARES.

MESSRS. A. & W. RICHARDS beg to notify that their SALES BY AUCTION OF NEW CAPITAL ISSUED UNDER PARLIAMENTARY POWERS, and of STOCKS and SHARES belonging to EXECUTORS and other PRIVATE OWNERS in LONDON, SUBURBAN, and PROVINCIAL GAS and WATER COMPANIES, take place PERIODICALLY at the Mart, TOKENHOUSE YARD, E.C.

Terms for Issuing New Capital, and also for including other Gas and Water Stocks and Shares in these Periodical Sales, will be forwarded on Application to MESSRS. A. & W. RICHARDS, at 18, FINSBURY CIRCUS, E.C.

By order of the Directors of the
SOUTHEND WATER-WORKS COMPANY.

NEW ISSUE OF 1250 £10 NEW ORDINARY FIVE PER CENT. MAXIMUM SHARES.

MESSRS. A. & W. RICHARDS will SELL THE ABOVE BY AUCTION, at the Mart, E.C., on Tuesday, Oct. 3, at Two o'clock, in Lots.
Particulars of the AUCTIONEERS, 18, FINSBURY CIRCUS, E.C.

By order of the Directors of the
DARTFORD GAS COMPANY.

NEW ISSUE OF £5000 ORDINARY STOCK.

MESSRS. A. & W. RICHARDS will SELL THE ABOVE BY AUCTION, at the Mart, E.C., on Tuesday, Oct. 3, at Two o'clock, in Lots.
Particulars of the AUCTIONEERS, 18, FINSBURY CIRCUS, E.C.

By order of Trustees and other Owners.
SOUTH KENT WATER COMPANY.
200 £10 FULLY PAID ORIGINAL ORDINARY SHARES.

EAST GRINSTEAD GAS AND WATER COMPANY.

£438 "A" STOCK, AND 38 "A" "B" AND "C" £10 SHARES.

MESSRS. A. & W. RICHARDS will SELL THE ABOVE BY AUCTION, at the Mart, E.C., on Tuesday, Oct. 3, at Two o'clock, in Lots.
Particulars of the AUCTIONEERS, 18, FINSBURY CIRCUS, E.C.

By order of the Directors of the
WOKING WATER AND GAS COMPANY.

NEW ISSUE OF £3000 FOUR PER CENT. PERPETUAL DEBENTURE STOCK.

MESSRS. A. & W. RICHARDS will SELL THE ABOVE BY AUCTION, at the Mart, E.C., on Tuesday, Oct. 17, at Two o'clock, in Lots.
Particulars of the AUCTIONEERS, as above.

By order of the Directors of the
WORTHING GAS LIGHT AND COKE COMPANY.

NEW ISSUE OF £3500 CONSOLIDATED ORDINARY STOCK.

AND
£1500 FOUR PER CENT. PERPETUAL DEBENTURE STOCK.

MESSRS. A. & W. RICHARDS will SELL THE ABOVE BY AUCTION, at the Mart, E.C., on Tuesday, Oct. 17, at Two o'clock, in Lots.
Particulars of the AUCTIONEERS, as above.

ANNFIELD PLAIN AND DISTRICT GAS COMPANY.

SHARE CAPITAL { AUTHORIZED £36,000,
ISSUED £34,510.

SALE OF FIVE PER CENT. CUMULATIVE PREFERENCE SHARES OF £10 EACH.

MR. J. T. MOORE, Auctioneer, has been Instructed, under the provisions of the Act of Parliament, to SELL BY PUBLIC AUCTION at the Store Old Committee Room, Annfield Plain, on Thursday, the 5th of October, at Seven o'clock in the Evening precisely, in separate lots, 149 Five per cent. Cumulative Preference Shares.

Particulars of Sale can be obtained from the Secretary, Mr. WILFRED H. KENT, at 50, Cannon Street, LONDON, or of the MANAGER, Gas-Works, Annfield Plain, Co. DURHAM, or of the AUCTIONEER, Mr. J. T. Moore, Front Street, Dipton, Co. DURHAM.

HEATHCOTE GAS COAL

from the

Grassmoor Collieries
CHESTERFIELD.

Rich in Illuminating Power and Yield of Gas.
Above the Average in Weight and Quality of Coke.

Maintains a High Standard in Residuals.

THOMAS DUXBURY & CO.

16, DEANSGATE, MANCHESTER,
Best Gas Coal and Cannel, giving High Illuminating Power, Large Yield per ton, and reasonable in Price.

Telegrams: "DARWINIAN, MANCHESTER."
Telephone 1806.

MIRFIELD GAS COAL UNEQUALLED.

Sperm Value 878·85 lbs. per ton.

Please apply for Price, Analyses, and Report to the

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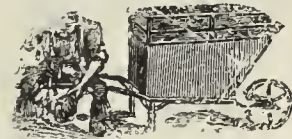
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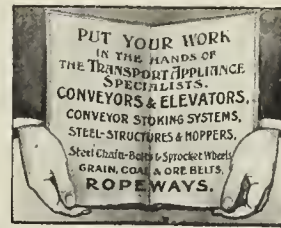
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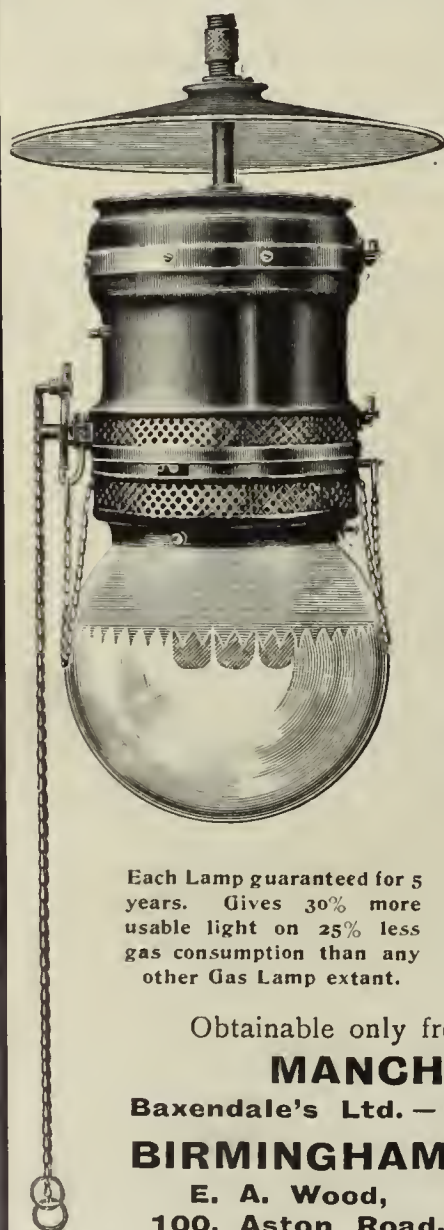
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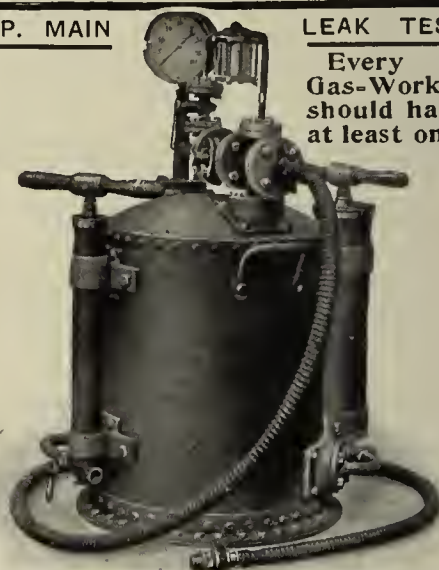
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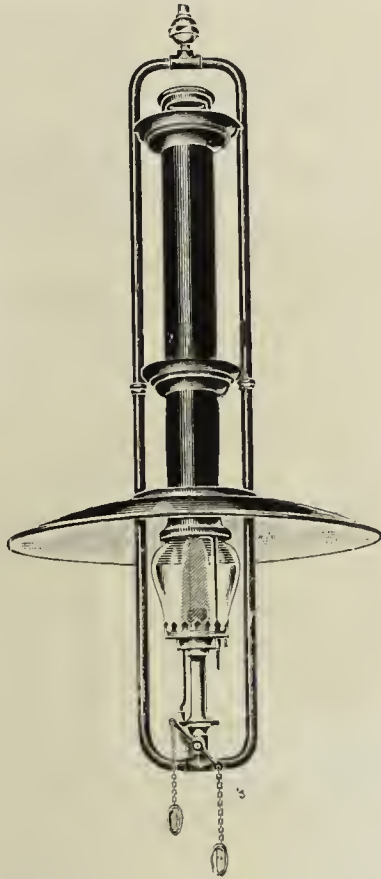
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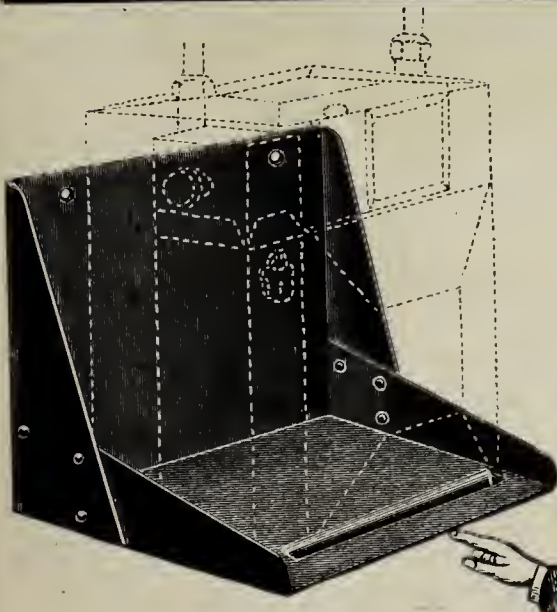
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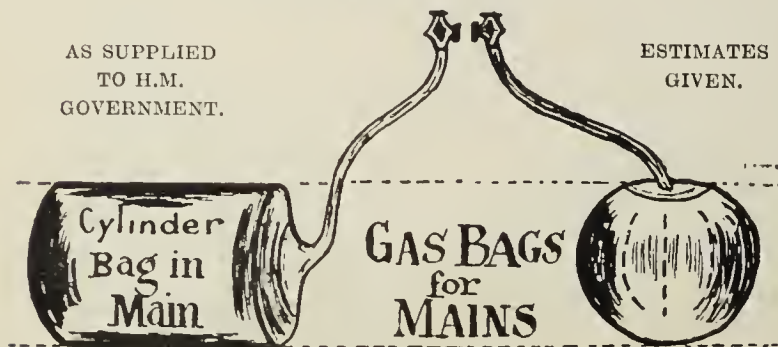
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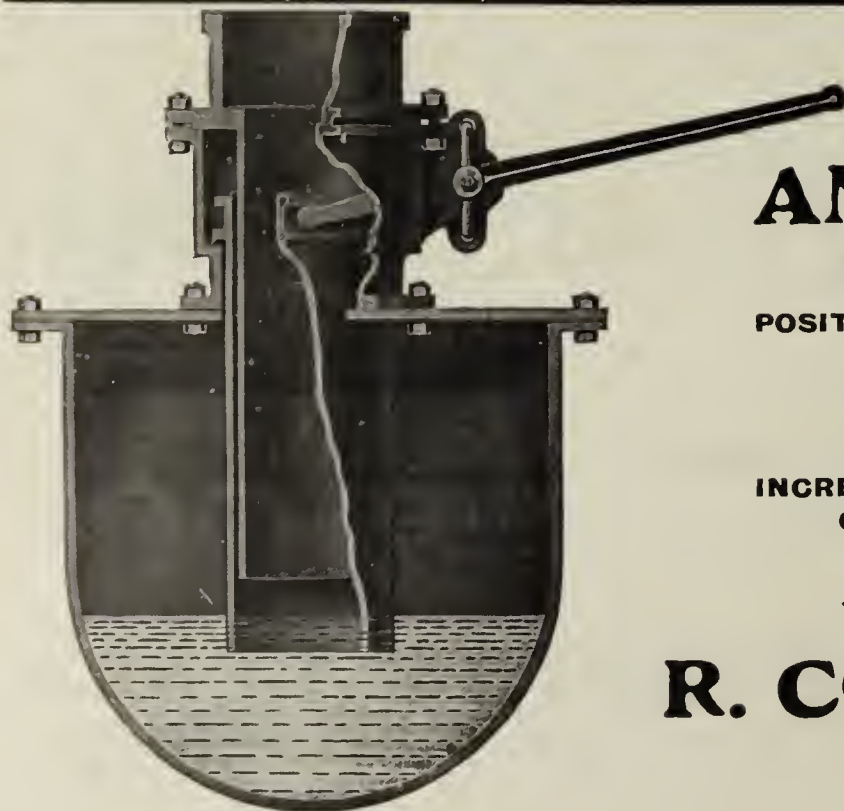
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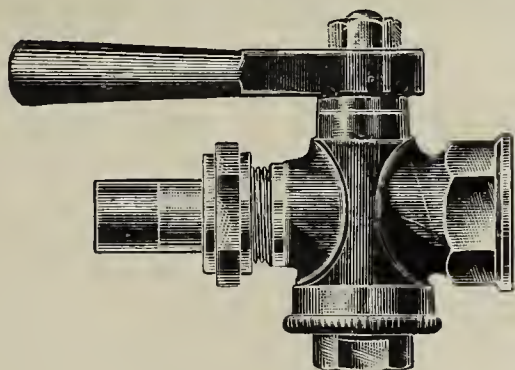
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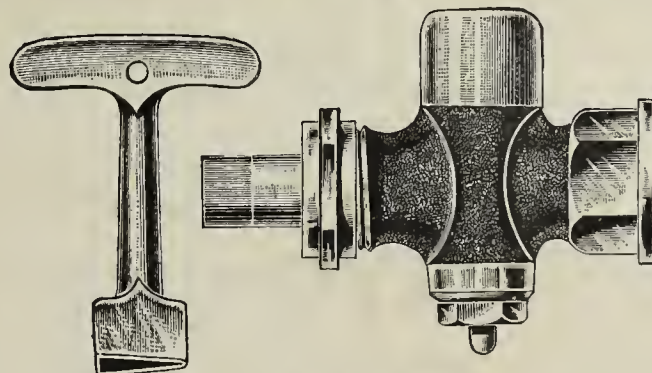
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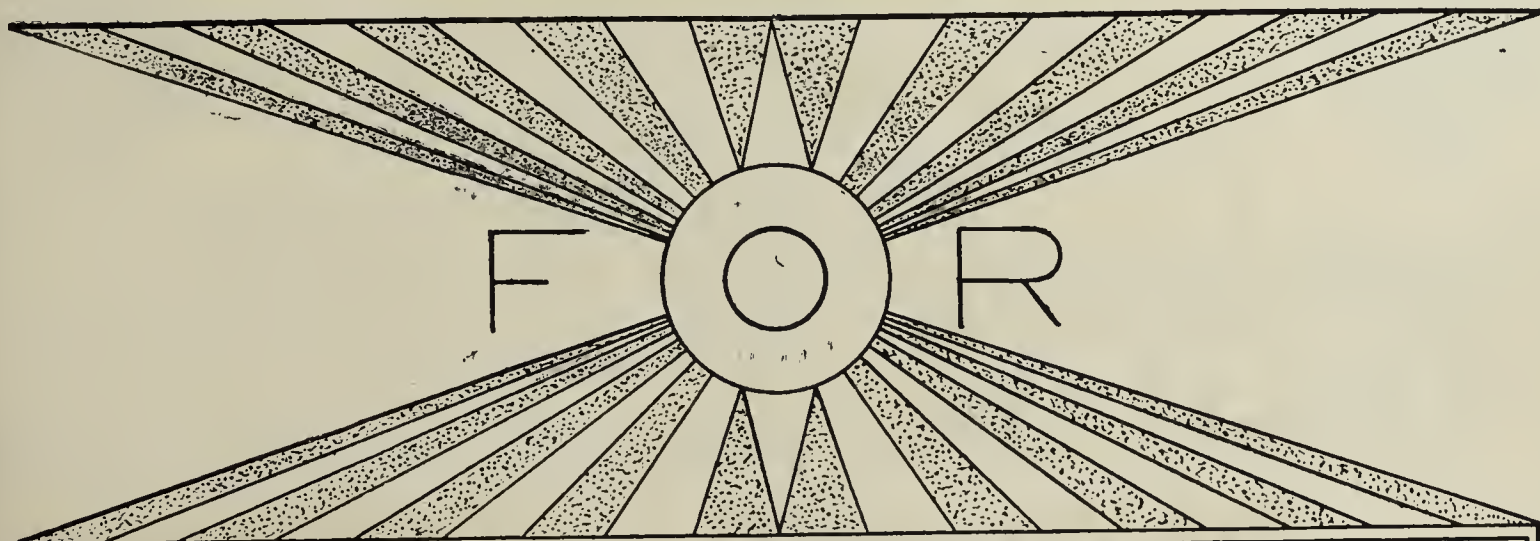
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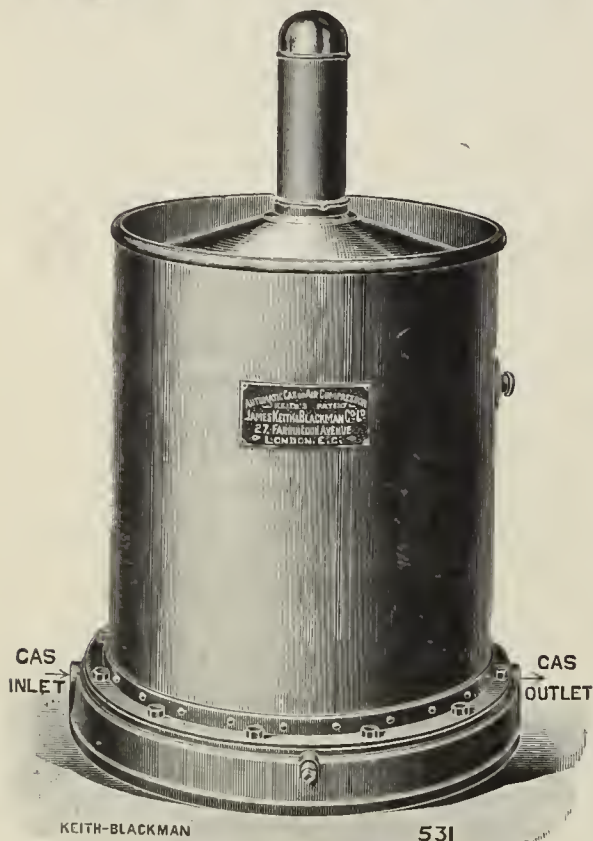
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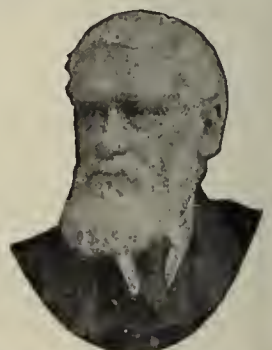
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